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Méthode pour l'évaluation du potentiel et de l'utilisation touristiques de sites géomorphologiques

Jean-Pierre Pralong*

Abstract

This paper presents a method for assessing tourist and exploitation values of geomorphological sites in a tourist and recreational context. Its aim is to propose criteria to quantify and qualify their potential in terms of scenic/aesthetic, scientific, cultural/historical, and social/economic values, and the use of this potential in terms of degree (spatial and temporal use) and modality (use of the four mentioned values) of exploitation. Concerning the scientific value, the following criteria are taken into account: palaeogeographical interest, representativeness, natural rarity, integrity and ecological interest. This method was based on the study of geomorphological sites (glacial, karstic, and hydrographic) of the areas of Chamonix Mont-Blanc (Haute-Savoie, France) and Crans-Montana-Sierre (Valais, Switzerland). In this paper, the assessment of the tourist value and of its components is first presented and developed. Then, the assessment of the exploitation value allows the notion of use intensity to be determined. Finally, a comparison of the two first stages is carried out in order to analyse and discuss the potential and use of the studied geomorphological sites.

Key words: geomorphological sites, assessment method, tourist value, exploitation value, Chamonix Mont-Blanc, Crans-Montana-Sierre.

Résumé

Cette contribution présente une méthode permettant d'évaluer les valeurs touristique et d'exploitation des sites géomorphologiques dans un contexte touristique et de loisirs. Son but est de proposer des critères pour qualifier et quantifier leur potentiel en termes de valeurs scénique, scientifique, historico-culturelle et socio-économique ainsi que l'utilisation de ce potentiel en termes de degré (utilisation spatio-temporelle) et de modalité (utilisation des quatre valeurs citées) d'exploitation. Concernant la valeur scientifique, les critères suivants sont pris en compte : intérêt paléogéographique, représentativité, rareté naturelle, intégrité et intérêt écologique. Cette méthode a été développée à partir de sites géomorphologiques (glaciaires, karstiques et hydrographiques) des régions de Chamonix Mont-Blanc (Haute-Savoie, France) et Crans-Montana-Sierre (Valais, Suisse). Dans cet article, l'évaluation de la valeur touristique et de ses éléments constitutifs est présentée et développée dans un premier temps. L'évaluation de la valeur d'exploitation permet ensuite de définir la notion d'intensité d'utilisation. Enfin, une comparaison des deux premières étapes est conduite afin d'analyser et de discuter le potentiel et l'utilisation des sites géomorphologiques étudiés.

Mots clés *: sites géomorphologiques, méthode d'évaluation, valeur touristique, valeur d'exploitation, Chamonix Mont-Blanc, Crans-Montana-Sierre.*

Version française abrégée

M. Panizza et S. Piacente (1993, 2003) de même que G. Quaranta (1993) définissent les sites géomorphologiques comme des formes de terrain qui ont acquis une valeur scénique/esthétique, scientifique, culturelle/historique, sociale et économique du fait de la perception humaine de facteurs géologiques, géomorphologiques, historiques et sociaux. Ce processus est qualifié de « valorisation » par

J.-P. Pralong et E. Reynard (2005). Dans un contexte touristique et de loisirs, ces différentes valeurs peuvent être considérées comme les constituants de la valeur touristique d'un site géomorphologique. Ainsi, tous les biens, services et infrastructures touristiques créés à partir de formes du terrain sont le résultat de l'utilisation de cette valeur et de ses composants. Cette utilisation peut se comprendre en termes de degré et de modalité d'exploitation, constitutifs de la valeur dite d'exploitation (voir ci-dessous).

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Dans ce sens, il est possible d'évaluer le potentiel et l'exploitation de sites géomorphologiques par différents critères (tableaux 1 à 6) au moyen de scores standardisés compris entre 0 et 1. Conçus à partir des définitions que donne M. Panizza (1998) des éléments que nous estimons constitutifs de la valeur touristique et de ceux que nous proposons pour déterminer la valeur d'exploitation, les critères et les échelles de scores de cette méthode d'évaluation sont inspirés de V. Grandgirard (1997) et G. Quaranta (1993) pour la valeur scénique/esthétique, de P. Coratza et C. Gusti (2005) pour la valeur scientifique, de D. Rojsek (1994) et V. Rivas et al. (1995) pour la valeur culturelle/historique, et de V. Rivas et al. (1995) et M. Panizza (1998) pour la valeur sociale/économique. En ce qui concerne la valeur d'exploitation, les critères choisis permettent d'évaluer, d'une part l'utilisation spatio-temporelle d'un site géomorphologique (degré d'exploitation) et, d'autre part, l'utilisation des valeurs constitutives de sa valeur touristique (modalité d'exploitation).

Pour le calcul des scores, les formules mises au point considèrent la valeur touristique comme la moyenne de ses éléments constitutifs et la valeur d'exploitation comme un système de coordonnées (x ; y) formé respectivement du degré et de la modalité d'exploitation. Pour les valeurs spécifiques de la valeur touristique, des moyennes de leurs critères ont été établies. Dans l'ensemble, les résultats obtenus permettent de comparer d'une part, la valeur touristique de différents sites et catégories de sites géomorphologiques (J.-P. Pralong et E. Reynard 2005) et, d'autre part, leur potentiel touristique en regard de leur exploitation (tab. 7). La force ou la faiblesse des scores obtenus par cette méthode fait aussi ressortir les facteurs explicatifs de l'utilisation différentielle de ces sites: degré de préservation trop contraignant, manque d'intérêt culturel, risques naturels non maîtrisés, etc.

Cette méthode d'évaluation a été développée, testée et appliquée dans les régions de Chamonix Mont-Blanc (Haute-Savoie, France) et de Crans-Montana-Sierre (Valais, Suisse) sur des sites d'intérêt glaciaire (Mer de Glace, glacier des Bossons), karstique (lac souterrain de St-Léonard, grotte de Vaas) et hydrographique (Finges, gorges de la Diosaz). Afin de la valider complètement, il serait nécessaire de la tester sur des sites façonnés dans des contextes topographiques variés (montagne, plaine, zone littorale) et dans des contextes touristiques différents (tourisme de masse, tourisme diffus).

Introduction

According to M. Panizza and S. Piacente (1993, 2003) and G. Quaranta (1993), geomorphological sites (or geomorphological assets) are defined as geomorphological landforms and processes that have acquired a scenic/aesthetic, scientific, cultural/historical and/or a social/economic value due to human perception of geological, geomorphological, historical and social factors. This process is called optimization by J.-P. Pralong and E. Reynard (2005). From a tourist and recreational point of view, these four different

values may be considered as exclusive components of the tourist value of a geomorphological site. All tourist goods, services and infrastructure created from geomorphological landforms and processes result from the use of this value and its four components, which is understood in terms of degree and modality of exploitation.

In this sense, it is possible to assess the potential and exploitation of geomorphological sites by using several values (scenic/aesthetic, scientific, cultural/historical, and social/economic in relation to degree and modality), criteria (see Tab. 1, 2, 3, 4, 5, and 6) and marks from 0 to 1 by quarter-points. Therefore, this assessment method enables a comparison, on the one hand, of the tourist value of different sites and categories of geomorphological sites (Pralong and Reynard, 2005) and, on the other hand, of their tourist potential with their actual use. Moreover, from the criteria scores and their differences, factors of explanation of the differentiated uses of geomorphological sites may be underlined (e.g. too small area or elevation, lack of cultural interests, presence of natural hazards, etc.).

This assessment method has been developed, tested and applied in the areas of Chamonix Mont-Blanc (Haute-Savoie, France) and Crans-Montana-Sierre (Valais, Switzerland), in relation to the case studies of Mer de Glace and Bossons glaciers, karstic (underground lake of St-Léonard and Vaas cave) and hydrographic (Finges and Diosaz gorges) case studies. In this paper, the assessment of the tourist value and its components is first presented and developed. Then, the assessment of the exploitation value allows the notion of use intensity to be determined. Finally, a comparison of the two first stages is carried out in order to analyse and discuss the potential and use of the studied geomorphological sites.

Tourist value assessment

The tourist value assessment includes four values: scenic, scientific, cultural and economic. Precise criteria and specific scales of scoring have been defined for each constituent of the tourist value, notably inspired by V. Grandgirard (1997) and G. Quaranta (1993) for the scenic/aesthetic one, by P. Coratza and C. Gusti (2005) for the scientific one, by D. Rojsek (1994) and V. Rivas *et al*. (1995) for the cultural/historical one, and by V. Rivas *et al*. (1995) and M. Panizza (1998) for the social/economic one. In this sense, the tourist value is considered as the mean of these four different values, and is expressed by:

Vtour = (Vsce + Vsci + Vcult + Veco) / 4, where *Vtour* is the tourist value, *Vsce* the scenic/aesthetic one, *Vsci* the scientific one, *Vcult* the cultural/historical one, and *Veco* the social/economic one. No weighting is introduced, because there is no objective reason to think that a specific value is less important than the other one when we have to determine the theoretical tourist potential of a site.

As defined by M. Panizza (1998), the scenic value especially depends on the spectacular and intrinsic aspect of a geomorphological site. The scientific value is based on natural rarity, didactic exemplarity, palaeogeographical testi-

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Scenic 1: Number of view points	-	single	2 or 3	4, 5 or 6	more than 6
Scenic 1 considers the number of view points accessible by a pedestrian pathway. Each must present a particular angle of view and be situated less than 1 km from the site.					
Sce 2: Average distance to view points [m]	-	less than 50	between 50 and 200	between 200 and 500	more than 500
Linked to Sce 1, Sce 2 corresponds to the sum of the shortest distances between each view point and the site divided by the number of view points taken into account by Sce 1.					
Sce 3: Surface	-	small	moderate	large	very large
For Sce 3, the whole surface of the site is considered. For each kind of site (glacier, cave, etc.) a quantitative scale of area scoring [ha] is defined in relation to all the identical sites of the study territory.					
Sce 4: Elevation	nil	low	moderate	high	very high
For Sce 4, the whole elevation of the site is considered. For each kind of site (glacier, cave, etc.) a quantitative scale of elevation scoring [m] is defined in relation to all the identical sites of the study territory.					
Sce 5: Colour contrasts with site surroundings	identical colours	-	different colours	-	opposite colours
Sce 5 considers the colour contrast between the site and its direct environment. A particular colour includes all its numerous shades; dark grey and light grey are considered as identical colours.					

Table 1 – **Criteria and scale of scoring used to assess the scenic value.**

*Tableau 1 – **Critères et échelle de scores pour l'évaluation de la valeur scénique.***

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Scientific 1: Palaeogeographical interest	-	low	moderate	high	very high
Scientific 1 depends on the palaeogeographical interest of the site as testimony for reconstructing the morphoclimatic evolution of a territory. A historical study site has a greater interest.					
Sci 2: Representativeness	nil	low	moderate	high	very high
Sci 2 depends on the didactic and exemplary characteristics of the site for laymen in geomorphology. The site legibility is due to its own quality and general configuration.					
Sci 3: Area [%]	-	less than 25	between 25 and 50	between 50 and 90	more than 90
For Sci 3, the score is assessed by the site area divided by the whole area occupied by all identical sites of the study territory as defined by Sce 3. The final score is expressed in percent.					
Sci 4: Rarity	more than 7	between 5 and 7	between 3 and 4	between 1 and 2	unique
For Sci 4, the score is assessed by the number of identical sites of the study territory as defined by Sce 3. A rare site may be an example of a different morphoclimatic environment from the present.					
Sci 5: Integrity	destroyed	strongly deteriorated	moderately deteriorated	weakly deteriorated	intact
Sci 5 depends on existence of natural hazard, on natural evolution and on human (infrastructure, crowds, vandalism) factors that affect the site and its degree of preservation.					
Sci 6: Ecological interest	nil	low	moderate	high	very high
Sci 6 depends on the interest (species rarity), diversity (species number) and natural dynamic (ability of environment to evolve naturally) of fauna and flora of the site.					

Table 2 – **Criteria and scale of scoring used to assess the scientific value.**

*Tableau 2 – **Critères et échelle de scores pour l'évaluation de la valeur scientifique.***

mony, and ecological value of a geomorphological site. The cultural value depends on an art event or a cultural custom in relation to a geomorphological site, while the economic value is based on the usable and workable characteristics of a geomorphological site (e.g. in a tourist and recreational context). In this sense, different objective criteria with a specific scale of scoring may be used to assess these values:

Vsce= (Sce 1 + Sce 2 + Sce 3 + Sce 4 + Sce 5) / 5, where *Sce 1*, *Sce 2*, *Sce 3*, *Sce 4* and *Sce 5* correspond to the criteria scores mentioned in table 1. No weighting is introduced because there is no objective reason to discriminate a specific criterion.

Vsci= (Sci 1 + Sci 2 + 0.5 x Sci 3 + 0.5 x Sci 4 + Sci 5 + Sci 6) / 5, where *Sci 1*, *Sci 2*, *Sci 3*, *Sci 4, Sci 5* and *Sci 6* correspond to the criteria scores mentioned in table 2. Weighting is introduced because *Sci 3* and *Sci 4* both assess the natural rarity in relation to *Sce 3*.

Vcult= (Cult 1 + 2 x Cult 2 + Cult 3 + Cult 4 + Cult 5) / 6, where *Cult 1*, *Cult 2*, *Cult 3*, *Cult 4* and *Cult 5* correspond to the criteria scores mentioned in table 3. Weighting is introduced because *Cult 2* may also assess the number of literary mentions, which are seen as proportional to any iconographic material.

Veco= (Eco 1 + Eco 2 + Eco 3 + Eco 4 + Eco 5) / 5, where *Eco 1*, *Eco 2*, *Eco 3*, *Eco 4* and *Eco 5* correspond to the criteria scores mentioned in table 4. No weighting is introduced because there is no objective reason to discriminate a specific criterion.

Exploitation value assessment

The exploitation value assessment includes two components. In the same way as for the tourist value, criteria and scales of scoring have been defined for each constituent value of the exploitation one. In this sense, this value is understood in terms of degree (coordinate x) and modality (coordinate y) of exploitation:

Vexpl = (Vdeg; V mod), where *Vdeg* is the degree of exploitation and *Vmod* the modality of exploitation. The relationship between these two values may define three kinds of exploitation (low, intermediate, high) in terms of intensity.

The degree of exploitation considers the spatial and temporal use of a geomorphological site, whereas the modality takes into account the use of the four constituent values of the tourist value of a geomorphological site: no weighting is introduced because there is no objective reason to discriminate a specific criterion. In this sense, different objective criteria with a specific scale of scoring may be used to assess these values:

Vdeg= (Deg 1 + Deg 2 + Deg 3 + Deg 4) / 4, where *Deg 1, Deg 2, Deg* 3 and *Deg 4* correspond to the criteria scores mentioned in table 5. Vmod = (Mod 1 + Mod 2 + Mod 3 + Mod 4) / 4, where *Mod 1, Mod 2, Mod* 3 and *Mod 4* correspond to the criteria scores mentioned in table 6.

Final assessment

Following the two first stages of the assessment method, the resulting scores enable different comparisons to be made. In relation to some application examples (tab. 7), the most distinctive characteristics are briefly presented.

All constituent values of the tourist value of the *Mer de Glace* (one of the most famous and most visited glaciers in the Alps) are clearly high, in contrast to *Vaas* cave, *St-Léonard* lake or *Diosaz* gorges. However, there is a low use of the scientific and cultural values (lack of didactic optimization compared to their potential), whereas its degree of exploitation is very high, as is the use of its scenic and economic values. This is also the case for *Diosaz* gorges.

Far from being a profitable business exploitation, *Finges* (a large alluvial plain formed by the *Rhone* river and a Lateglacial rock fall) and the *Bossons* glacier (the biggest icefall in the Alps starting from the top of the *Mont-Blanc*) present a use more oriented towards the scenic and scientific poles proportionally to their high specific potential. In these two cases, the didactic interest and sensitivity of the people exploiting these sites are obvious.

Concerning the *St-Léonard* lake and *Vaas* cave, two karstic and underground sites considered as speleological geosites, their use is completely different as their exploitation value indicates, although their tourist potential is quasi identical with a relevant contrast between their components. Due to the natural risk management, the first site welcomes about 100,000 visitors per year whereas only 1000 visit the second one!

The analysis may be more developed, when sites of a same category (glaciers, lakes, caves, etc.) are compared by using the criteria scores of each value. For instance, the *St-Léonard* lake and *Vaas* cave are quite different in terms of scientific value due to their representativeness and integrity. In comparison to the use of these interests, the first site, which is potentially less didactic and preserved, offers a lot of educational material whereas none are offered at the second site. In this case, the existence of uncontrolled natural risks explains that peculiarity, which lowers the economic value of *Vaas* cave as well as limiting protection and a regional level of attractivity. Thus, the use of its economic potential is weak in terms of number of visitors; for that reason, this site presents no exploitation infrastructure and its surface is smaller than one hectare.

Conclusion and perspective

Geomorphological sites may become natural and tourist resources, because of human exploitation of their scenic, scientific, cultural and (or) economic interests, components of their tourist value, in order to develop recreational activities and induce economic effects. As proposed, the assessment of degree and modality of exploitation enables a definition of the intensity of their use from a spatial and temporal point of view and determination of the use of their potential.

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Cultural 1: Cultural and historical customs	without link	weakly linked	moderately linked	strongly linked	initiatory of custom(s)
Cultural 1 depends on the symbolic relevance and heritage weight of the site for a community. This criterion is defined by the cultural and historical customs without taking into account physical vestiges or buildings.					
Cult 2: Iconographic representations	never represented	represented 1 and 5	represented 6 and 20	represented 21 and 50	represented 50 or more
To assess Cult 2, all historical pictures of the site are counted (painting, drawing, engraving, photography). Quality of picture(s) may be taken into account by giving a higher score.					
Cult 3: Historical and archaeological relevance	no vestige or building	weak relevance	medium relevance	high relevance	very high relevance
Cult 3 is defined by the presence and relevance of historical, architectural and (or) archaeological vestiges and (or) buildings on the site. Their quality may be considered by giving a higher score.					
Cult 4: Religious and metaphysical relevance	no relevance	weak relevance	medium relevance	high relevance	very high relevance
Cult 4 is defined by the religious and (or) metaphysical relevance related to the site. This criterion includes popular beliefs.					
Cult 5: Art and cultural event	never	-	occasionally	-	at least once a year
To assess Cult 5, art and cultural events concerning the site are considered. An event may take place on the site itself or not. A no longer existing event can still give an average score.					

Table 3 – **Criteria and scale of scoring used to assess the cultural value.**

*Tableau 3 – **Critères et échelle de scores pour l'évaluation de la valeur culturelle.***

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Economic 1: Accessibility	more than 1 km of track	less than 1 km of track	by a local road	by a road of regional importance	by a road of national importance
Economic 1 depends on the distance of the site from means of transportation and their relevance. In case of accessibility by cable car or train, the scale must be adapted.					
Eco 2: Natural risks	uncontrollable	not controlled	partially controlled	controlled – residual	no risk
Eco 2 depends on the risk level of the site and its management policy (consciousness level, protection infrastructure, etc.). Anthropogenic risks are not directly considered by this criterion.					
Eco 3: Annual number of visitors in the region	less than 10.000	between 10 and 100.000	between 0.1 and 0.5 million	between 0.5 and 1 million	more than 1 million
For Eco 3, the theoretical visitor potential of the site is taken into account by the annual number of visitors of the biggest resort in the region. Thus, the given score is identical for sites of a same region.					
Eco 4: Official level of protection	complete	limiting	-	not limiting	no protection
Eco 4 considers the official level of protection of the site. For this criterion, the economic exploitation is seen as inversely proportional to the limiting characteristic of the protection level.					
Eco 5: Attraction	-	local	regional	national	international
Eco 5 balances Eco 4, because the absence of protection may be a tourist and economic disadvantage for site exploitation in terms of attraction of visitors from various origins.					

Table 4 – **Criteria and scale of scoring used to assess the economic value.**

*Tableau 4 – **Critères et échelle de scores pour l'évaluation de la valeur économique.***

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Degree 1: Used surface [ha]	nil or ex situ	less than 1	between 1 and 5	between 5 and 10	more than 10
Degree 1 depends on the surface used for tourist and economic exploitation of the site. This surface may be totally, partially or not at all situated on the site.					
Deg 2: Number of infrastructure	nil or ex situ	1	between 2 and 5	between 6 and 10	more than 10
To assess Deg 2, infrastructure of conveyance, information, accommodation, visits and souvenirs situated on the used surface are taken into account. Pedestrian paths are not considered.					
Deg 3: Seasonal occupancy [day]	-	from 1 to 90 (1 season)	from 91 to 180 (2 seasons)	from 181 to 270 (3 seasons)	from 271 to 360 (4 seasons)
Deg 3 depends on the number of days or seasons of use of the site surface per year. In case of discontinuous exploitation during the year, the score is the result of the annual mean.					
Deg 4: Daily occupancy [hour]	-	less than 3 hours	between 3 and 6	between 6 and 9	more than 9 hours
Deg 4 depends on the number of daily hours of use of the site surface. In case of variable daily exploitation during the year, the score is the result of the annual mean.					

Table 5 – **Criteria and scale of scoring used to assess the degree of exploitation.**

*Tableau 5 – **Critères et échelle de scores pour l'évaluation du degré d'exploitation.***

In the perspective of sustainable development, all these values must be used proportionately to their relevance in order to guarantee their current and future conservation and exploitation, and to maintain their level of interest. The pro- posed method may contribue to attaining these goals by quantifying values of geomorphological sites and by under- lining factors that explain their different uses. Thus, it is nec- essary that all the different stakeholders directely or indi-

CRITERIA / SCORES	0	0.25	0.5	0.75	1
Modality 1: Use of the scenic value	no advertising optimization	1 support & 1 product	1 support & some products	some means of support & 1 product	some means of support & products
Modality 1 depends on the use of the scenic features of the site assessed by its advertising optimization via different types of support (brochure, billboard, web site, media, etc.) and products.					
Mod 2: Use of the scientific value	no didactic optimization	1 support & 1 product	1 support & several products	several means of support & 1 product	several means of support & products
Mod 2 depends on the use of the scientific interests of the site assessed by its didactic optimization via different means of support (exhibition, guided tour, educational signs) and products.					
Mod 3: Use of the cultural value	no didactic optimization	1 support & 1 product	1 support & several products	several means of support & 1 product	several means of support & products
Mod 3 depends on the use of the cultural interests of the site assessed by its didactic optimization via different means of support (exhibition, guided tour, educational signs) and products.					
Mod 4: Use of the economic value [person]	no visitor	less than 5.000	between 5 and 20.000	between 20 and 100.000	more than 100.000
Mod 4 depends on the use of the economic potential of the site assessed by its number of visitors per year. The score does not express the profit earning of the site.					

Table 6 – **Criteria and scale of scoring used to assess the modality of exploitation.**

*Tableau 6 – **Critères et échelle de scores pour l'évaluation de la modalité d'exploitation.***

SITES / VALUES	Vscenic (Modality 1)	Vscientific (Modality 2)	Vcultural (Modality 3)	Veconomic (Modality 4)	Vtourist (Vdegree ; Vmodality)
Mer de Glace	0.7 (1)	0.75 (0.25)	0.75 (0.25)	0.75 (1)	0.74 (0.94 ; 0.63)
Bossons glacier	0.85 (0.75)	0.8 (1)	0.71 (0.75)	0.75 (0.5)	0.78 (0.56 ; 0.75)
Diosaz gorges	0.75 (1)	0.75 (0)	0.42 (0)	0.75 (0.75)	0.67 (0.69 ; 0.44)
Finges	0.85 (1	0.9 (1)	0.71 (0.5)	0.7 (0.5)	0.79 (0.69 ; 0.75)
St-Léonard lake	0.5 (1)	0.55 (0.75)	0.3 (0.75)	0.8 (1)	0.54 (0.63 ; 0.88)
Vaas cave	0.65 (0.25)	0.85 (0.25)	0.08 (0)	0.45 (0.25)	0.51 (0.31 ; 0.19)

Table 7 – **Some examples in the areas of Chamonix Mont-Blanc (Haute-Savoie, France) and Crans-Montana-Sierre (Valais, Switzerland) assessed in 2003 using the proposed method.**

*Tableau 7 – **Quelques exemples de sites des régions de Chamonix Mont-Blanc (Haute-Savoie, France) et Crans-Montana-Sierre (Valais, Suisse) évalués en 2003 selon la méthode proposée.***

rectly involved become aware of these issues, because a dangerous lack of recognition exists concerning the interests (and vulnerability) of geodiversity. From a local to an international level, stakeholders of the social, political, administrative and economic system are concerned.

To completely validate this method, its values and criteria should be tested in various topographical (mountain, plain, seacoast) and tourist (mass tourism, soft tourism) settings in order to adapt the scales of scoring. Subsequently, this approach could be used to define carrying capacity of geomorphological sites as a fonction of their recreational activities and of their evolution in terms of potential and exploitation.

Acknowledgements

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