

ΠΡΟΤΑΣΗ ΓΙΑ ΤΗΝ ΕΠΙΛΟΓΗ ΓΕΩΛΟΓΙΚΩΝ ΚΑΙ ΓΕΩΜΟΡΦΟΛΟΓΙΚΩΝ ΘΕΣΕΩΝ ΚΑΙ ΤΗΝ ΑΝΑΚΗΡΥΞΗ ΤΟΥΣ ΩΣ ΓΕΩΛΟΓΙΚΑ ΜΝΗΜΕΙΑ, ΣΤΗΡΙΖΟΜΕΝΟΙ ΣΕ ΠΡΟΚΑΘΟΡΙΣΜΕΝΑ ΚΡΙΤΗΡΙΑ.

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Περίληψη

Στην εργασία αυτή γίνεται μια πρόταση δημιουργίας διεθνούς γεωλογικού πλαισίου, για την επιλογή γεωλογικών θέσεων και την ανακήρυξη τους ως Γεωλογικά Μνημεία, στηριζόμενοι σε προκαθορισμένα κριτήρια. Επίσης παρουσιάζεται ένα ολοκληρωμένο σύστημα ταξινόμησης, βάση του οποίου είναι εύκολο οι προταθέντες γεωλογικές θέσεις να κατηγοριοποιηθούν. Τέλος προτείνονται ένα σύνολο κριτηρίων, τα οποία πρέπει να προκαθορισθούν, να προεπιλεγούν και να είναι διεθνώς αποδεκτά, ώστε να γίνουν η απαραίτητη βάση για την επιλογή και ανακήρυξη τους των γεωλογικών θέσεων ως Γεωλογικά Μνημεία.

A PROPOSAL FOR THE STAGES OF THE SELECTION AND ESTABLISHMENT GEOLOGICAL AND GEOMORPHOLOGIC SITES AS GEOLOGICAL MONUMENTS, THE CLASSIFICATION OF THEM AND THE CERTAIN CRITERIA FOR THIS SELECTION.

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Abstract

This paper involves the suggestion of the establishment of an international frame, to include the geological sites and their definition as Geological Monuments. A complete system of classification of these sites is also analyzed. Conclusively, a batch of criteria are suggested, which must be defined, and be internationally approved, to become the basis of nominating a geological site as Geological Monument.

Λέξεις κλειδιά: γεωλογικά μνημεία, διεθνές γεωλογικό πλαίσιο, κριτήρια επιλογής.

Key words: geological monuments, international geological frame, selection criteria.

1. Introduction

During the last decade, a new contemporary effort to approach basic geoscientific topics has taken place. This approach studies the protection of the Human Environment and the maintenance of the Natural and Cultural Heritage. This is about a new orientation within the Geo-sciences, which is based on the concept that the geological sites management is as indispensable as the conservation of the protected habitats for the existence and evolution of this planet.

Some important international organisms have organized meetings, congresses, and networks for this purpose. Such organisms are: the UNESCO (United Nations Educational, Scientific and Cultural Organization), the World Heritage Committee, the ICOMOS (International Council on Monuments and Sites), the IUCN (World Conservation Union), the ICCROM (International Center for the Study of the Preservation and Restoration of Cultural

Property), the IUGS (International Union of Geological Sciences), the ProGeo (European Association for the Conservation of the Geological Heritage). Geologists have also taken other initiatives individually.

The purpose of these activities is the creation of an international coordinated or European network of common research.

There are certain problems in the development of this plan that block the geologists' work and these are the following:

- The great number of suggested geological sites
- The variety of national and regional suggested sites is not uniformly distributed
- The lack of international, national and continental records including the acknowledged sites
- The lack of a classification system
- The variety of criteria or, on the contrary, the total lack of common criteria to work on the evaluation of the proposals
- The lack of a global legislative system of selection
- The lack of international geological contracts
- The individual, social, regional economical parameters that affect the submission of every proposal

In this article, the authors try to put forward some resolutions on the maintenance of the geological sites, which is a very delicate and important topic for everyone.

2. Stages of selection process

We are about to resolve the problem of what way that scientists would follow to establish a site as "geological monument". Usually, the standards introduced are regional, economic, social, peripheral or even personal whereas they must be objectively scientific and educational. Thus, our main care should be the research of an internationally acknowledged system of evaluation and selection of a site (Wimbledon, 1996).

The proposal for an internationally approved system of evaluating geological sites includes the stages given below (Figure 1):

- 1st Stage: vote and application of a legislative frame. Apart from the appropriate laws (national and international) Geo-Contracts, intercontinental contracts, international agreements should be also included in this step (Sturm, 1996b). The legislation should promote a balanced development of the topic under discussion.
- 2nd Stage: Establishment of Committees to appropriately examine the proposed geo-sites. The Committees should be consisted of geologists, basically, who would be supposed, firstly, to start by recording and listing the Geological Monuments, in national, peripheral, continental and global context.
- This is a preliminary stage and it is necessary to set up an International Committee of Supervising Geological Monuments under the aegis of UNESCO (United Nations). This Committee would balance the interest expressed by the countries or the regions, which are, so far, different from place to place. In addition, the Committee's task would be the research of new geo-sites located in countries or regions that have not been "sensitive" to such an important issue. The final task of the Committee would be the processing of the submitted Projects of Conservation, Protection and Management of the proposed Geo Monuments.

- 3rd Stage: Submission of the proposals to establish the geological Monuments. Each proposal will be submitted:
 - by the scientists of these Committees
 - by other geologists
 - by national the regional authorities
- A file with justified data must accompany the project and must analyze the natural, educational, aesthetic, and geological features that justify the submission of the suggested site. As a conclusion, the project must propose a Plan of Conservation, Protection and Management of the site for the authorities that will be entitled to apply it.
- 4th Stage: Classification of the submitted projects. The proposed geological sites are classified in terms of the general appearance, the protection they need, the purpose of use, the interest expressed and the importance of their location.
- 5th Stage: Registration of the submitted proposals by the Committees mentioned above. In this stage, the sites are registered at categories.
- 6th Stage: Selecting the geological sites that fulfill given standards so as to be nominated as Geological Monuments. After classifying the geosites the Committees compare the "candidates" each other or each of them with other existent Geological Monuments. The final classification is based on their natural geological characteristics under given globally approve standards.
- 7th Stage: Definition of a geological site as Geological Monument. The Committee is defining the proposed geo-site after fully examining the file.
- 8th Stage: Putting forwards the Plan of Conservation, Protection and Management of the proposed Geological Monument. After the process of nominating a new geological Monument, all necessary activities for the Enacting, the Approval (from the International Committee of Supervising the Geological Monuments), and Application of the Plan of Conservation, Protection and Management (Sturm, 1996a).

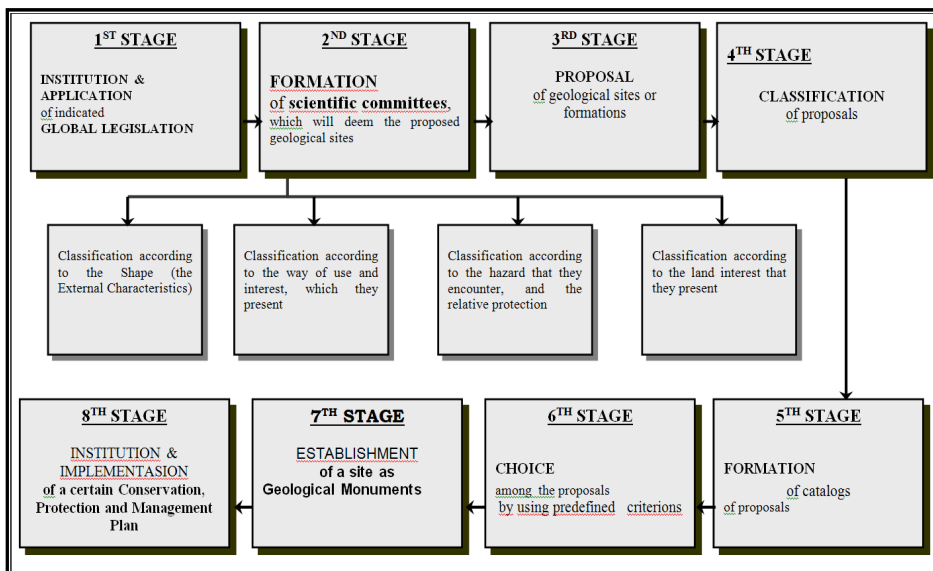


Figure 1. The stages and the choice process of the proposed geological sites, in order to be established as geological monuments

3. Classifying the submitted geological sites

Before any evaluation and selections takes place, the recording and listing of the proposed geo-sites must be done in order to compare and assess their common features. For example it is not possible to compare a palaeo-coast endangered by natural or human causes with a cave or a relic formation. Therefore, a comparison exists among formations with the same natural or geological characteristics, or being at the same risk, or needing the same protection. Consequently, the proposed projects must be firstly classified and then compared with existing Geological Monuments or other proposed locations with similar features.

In this paper is suggested four ways to classify the geo-sites (Bathrellos et al., 2004), according to the combination of the classifications given below (Table 1), so that every parameter is taken into consideration.

3.1 Classification as regards the Appearance or the Shape (outward features).

The observation and the use of the outward characteristics can be an important tool in our effort to classify the geo-formations. Consequently we have:

1. Hydrological formations (geomorphologic) such as: springs, rivers, lagoons, delta, old river delta, river meanders, and detached parts of meanders, terraces, alluvial fans, bajandas, warm jet-springs, relics of glaciers, mosaic surfaces, waterfalls, etc
2. Coasts and coastal formations (geomorphologic) such as: coasts, old-coasts, bays, natural harbours (ports), spits, tombolos, fjords etc
3. Relic forms of weathering (geomorphologic) such as: rock masses, arcs or natural bridges (generated by the sea or wind activity), gorges, canyons, fiords, forms of sea weathering, round blocks of granite, deserts, plunge pools, sculptures etc.
4. Karstic forms (geomorphologic) such as: caverns, dolines, poljes, karstic holes, swallow holes, hums, uvalas, etc.
5. Eolian (geomorphologic) shapes such as: dunes
6. Shapes and formations of biological activities: beach rocks, barrier reefs, coral reefs, atolls, etc.
7. Shapes of palaeo-environments.
8. Shapes of palaeo-climates.
9. Stratigraphic shapes: stratigraphic profiles, sequences, sedimentary structures, sedimentary profiles, etc.
10. Palaeontological shapes: fossiliferous shapes, petrified forests, taphocoenosis, etc.
11. Geotectonic shapes: faults, thrusts, saggings, landslides, characteristic joints, horn peaks, overthrust nappes, etc.
12. Shapes of mining and economical activity: abandoned or ancient mines and quarries, obvious mineral deposits, etc.
13. Petrologic and petrographical shapes: rock occurrences, columnar structures, etc.
14. Volcanic shapes: calderas, volcanic craters, volcanic cones, fumarolas, volcanic formations, spines, etc.
15. Geohistoric and archeo-geomorphologic shapes.
16. Compound geological shapes: waterfalls, beach rocks, mud volcanoes, dunes, thermal - hot springs, etc.
17. Cosmic shapes: meteorite craters, etc.

3.2 Classification as regards the danger they are exposed to and the protection they need.

Almost all geological sites and geo-forms are exposed to dangers stemming by human activities; people do not respect their environment. Thus, these geological sites are often at a risk and require protection and management. As a result, it is possible to classify these sites into the following categories:

- regions of Full Protection by every activity
- regions of protection and physical activities
- regions gently affected by human intervention
- National Geological Parks
- protected Formations and Sites
- regions of moderate activities
- regions of any kind of activities

3.3 Classification as regards the Purposes of the Use and how attractive they are

The geological sites and the geological formations may attract the public interest depending on their outward appearance or the unusual information they provide. Therefore, we can classify them as following:

- regions of educational or instructing interest
- regions of historical or religious interest associated with the natural beauty
- regions of purely geological interest
- regions of tourist interest along with the natural beauty and the geological information
- regions with economic profit
- regions of various interest

	<i>CLASSIFICATION</i>	<i>SPECIES OF CATEGORIES</i>	
Classification according to the Shape (the External Characteristics)	Hydrologic geomorphologic shapes	springs, rivers, lagoons, river deltas, river meanders, terraces, alluvial fans, bajadas, thermal - hot springs, geyser jets, glaciers, glacial tillites, mosaic surfaces, waterfalls	
	Shore line and coastal (geomorphologic) shapes	shore lines, abandoned - palaeo-shore lines, gulfs, bays, Spits, tombolos, fjords	
	Residual shapes (geomorphologic) of erosion and weathering	rock masses, arches and bridges (formations of marine or eolian origin), gorges, canyons, fjords, marine erosion formations, deserts, plunge pools, sculptures	
	Karst and Eolian (geomorphologic) shapes	caverns, dolines, poljes, karstic holes, swallow holes, hums, uvalas	
	Shapes and formations of biological activities	beach rocks, barrier reefs, coral reefs, atolls	
	Shapes of palaeo-environments		
	Shapes of palaeo-climates		
	Stratigraphic shapes	stratigraphic profiles, sequences, sedimentary structures, sedimentary profiles	
	Palaeontological shapes	fossiliferous shapes, petrified forests, taphocoenosis	
	Geotectonic shapes	faults, thrusts, saggings, landslides, characteristic joints, overthrust nappes	
Classification according to the hazard and the relative protection	Shapes of mining and economical activity	abandoned or ancient mines and quarries, obvious mineral deposits	
	Petrologic and petrographical shapes	rock occurrences, columnar structures	
	Volcanic shapes	calderas, volcanic craters, volcanic cones, fumarolas, volcanic formations, spines	
	Geohistoric & archo-geomorphologic shapes		
	Compound geological shapes	waterfalls, beach rocks, mud volcanoes, dunes, thermal - hot springs	
	Cosmic shapes	meteorite craters	
	Regions of Absolute Protection of all kinds of activities	Classification according to the land interest	Regions of global (universal) interest
	Protection and Natural Activities region		Regions of continental interest
	Regions which are affected from human activities and interventions with no harm		Regions of national interest
	National Geological Parks		
Protected Shapes and Locations	Regions of local interest		
Mild Activities Regions			
Regions in which any kind of activities take place			
Classification according to the way of use and the interest	Regions of didactic and educational interest		
	Regions of historic interest		
	Regions of geological interest		
	Regions of touristic interest		
	Regions of economical interest		
Regions of diverse interest			

Table 1: The classification of geological sites and monuments.

3.4 Classification as regards the location itself

The geological sites or formations may attract the public interest at a local, national or international level (frame). According to this, we can have the classifications given below:

- a) sites of international interest
- b) sites of continental interest
- c) sites of national interest
- d) sites of local interest

During the classification, it is necessary to combine the ways of classification, so as to evaluate every feature.

4. Selecting the geological monuments according to specified criteria.

In this paragraph the authors suggest the use of combined specified criteria to result to a globally approved system of evaluating the geological sites and the geological formations. The standards are the base of selecting geo-forms (Figure 2), which are listed together after the classification and the registration of the submitted proposals. It is very important to make lists in a global, continental, national and regional frame including Geological Monuments and which have been defined according to objective standards (Bathrellos, 2000). Composing any list of Geological Monuments, Geological Forms and Universal Monumental Locations, must be everything but a patchwork of regional or national proposals. The suggestion involving the application and the use of the Evaluation Plan includes the following specified criteria:

A Geological Monument should:

- 1) be a typical example from one of the greatest phases of the History of the Earth
- 2). provide important information for the Earth and its evolution (the evolution of life, the geological or the geomorphologic processes that occurred)
- 3). be justified by its location
- 4). be a proof of the given geological siting
- 5). be the evidence of a particular way of genesis
- 6). have a particular morphology
- 7). be a typical example of ecological or biological processes in terms of the development of a habitat
- 8). represent special natural phenomena
- 9). own a natural beauty, a significant aesthetic and be impressive and striking to people
- 10). comprise natural inhabitants which shall represent and maintain the bio-diversity.
- 11). be a habitat made of either rare and exceptional organisms, or, endangered species.
- 12). provide with educational benefits,
- 13). provide with the research
- 14). give prospects of rescue and maintenance
- 15). possibly demonstrate local social development
- 16). possibly demonstrate economic and tourist development
- 17). possibly demonstrate market opportunities
- 18). be a unique cell of regional and national promotion
- 19). be particularly rare
- 20). be particularly spread
- 21). be physically accessible

Combining and sorting out these criteria result to the basis of universally approved and reliable system of assessment and selection of the geological sites. Nobody may show disbelief towards the List of the Geological Monuments that have been selected with global reliable standards. Apart from the number or the justification of each submitted proposal, the objective judgement will aid the great purposes of this indubitable acknowledgement of the Geological Monuments.

IMPRESSION OF A STAGE OF THE EARTH HISTORY	SPECIFIC GEOLOGIC SURVEY	SPECIFIC GEOLOGIC CHRONO-SETTING	PARTICULAR WAY OF CREATION	PARTICULAR MORPHOLOGY
EVIDENCE OF ECOLOGIC OR BIOLOGIC FERMENTATIONS	EVIDENCE OF EXCEPTIONAL NATURAL PHENOMENON	SIGNIFICANT AESTHETICS	<u>BIODIVERSITY</u>	HABITAT OF REAR ORGANISMS
CONTRIBUTION TO EDUCATION	CONTRIBUTION TO RESEARCH	PROBABILITY OF PRESERVATION & CONSERVATION	ABILITY OF LOCAL SOCIAL DEVELOPMENT	ABILITY OF ECONOMICAL TOURIST DEVELOPMENT
ABILITY OF ECONOMICAL COMMERCIAL DEVELOPMENT	ABILITY OF LOCAL & NATIONAL PROMOTION	WITH UNIQUE <u>RARENESS</u>	WITH UNIQUE EXTENSION	EASY APPROACH (NATURAL & OPTIC)

Figure 2 Predefined criteria, used for the choice of a proposed geological site as a geological monument.

5. Conclusions

In this paper is described the suggestion of the establishment of an international frame, to include the geological sites and their definition as Geological Monuments.

The proposal for an internationally approved system of evaluating geological sites includes: vote and application of a legislative frame, establishment of Committees to appropriately examine the proposed geo-sites, submission of the proposals to establish the geological monuments, classification of the submitted projects, registration of the submitted proposals by the Committees mentioned above, selecting the geological sites that fulfil given standards so as to be nominated as geological monuments definition of a geological site as geological monument putting forwards the Plan of Conservation, Protection and Management of the proposed geological monument.

In addition, it is suggested four ways to classify the geo-sites: classification as regards the Appearance or the Shape (outward features), classification as regards the danger they are exposed to and the protection they need, classification as regards the Purposes of the Use and how attractive they are, classification as regards the location itself.

Finally, a group of criteria are suggested, which must be defined, and be internationally approved, to become the basis of nominating a geological site as Geological Monument.

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