

## GEOPARKS AND GEOLOGICAL HERITAGE AS PROMOTORS OF SUSTAINABLE DEVELOPMENT

***José BRILHA***

*Universidade do Minho, Escola de Ciências,  
Departamento de Ciências da Terra, Braga (Portugal)*



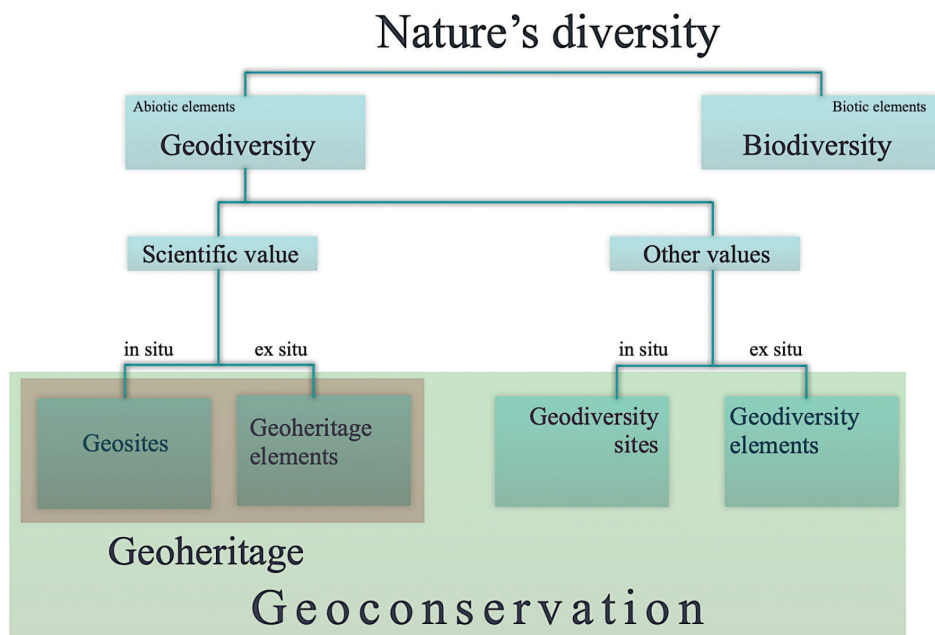
### **Geological heritage<sup>1</sup>**

By definition, heritage is what is inherited from past generations, maintained in the present, and bestowed to future generations due to its values. In this context, geological heritage (or geoheritage) is a selection of the most representative natural elements of geological nature that are worthy of preservation for present and future generations (Brilha, 2019). This includes the set of geological features that best represent the history of planet Earth and that are the foundation of life-support systems essential to humankind and to biodiversity. Geological heritage includes all types of non-living natural elements, namely minerals, rocks, soils, fossils, landforms and landscapes, together with the diversity of natural processes that produce them.

Geoheritage may have distinct types of values (scientific, educational, scenic, cultural, etc.) and of different significance (international, national, and local). Whatever the perspective, geoheritage is a non-renewable natural resource that should be properly managed by the different countries in order to support sustainable scientific, educational, and touristic uses through conservation strategies and activities – geoconservation (Reynard and Brilha, 2018).

---

1- This short paper intends to present updated and concise information about geological heritage and geoparks, with some insights about the present status of geoconservation in Morocco.



**Figure 1 : Geoconservation should be applied to all geodiversity elements that have a superlative value which justify their preservation (Brilha, 2018).**

Geoheritage may be affected by several types of threats that may cause its decay or even total destruction. While natural processes, such as weathering and erosion, may degrade or destroy geological sites, such natural processes can also be responsible for the development of new rock exposures and even the formation of new landforms.

By contrast, anthropogenic threats are much more serious and may irreversibly affect geoheritage. Total or partial destruction of geological sites may happen due to (Brilha, 2019):

- (i) urban development and construction of infrastructures (roads, dams, etc.);
- (ii) mining of geological resources;
- (iii) absence of legislation;
- (iv) ineffective implementation of protective policy by public agencies responsible for land-use planning and nature conservation;
- (v) vandalism, illegal collecting, and smuggling of geological specimens;
- (vi) mass tourism;
- (vii) general social unawareness of the value of geoheritage.

All these threats contribute to the loss of geoheritage, which is the most obvious justification for the need to implement geoconservation strategies. Therefore, each country should include clear measures to protect and manage its geoheritage. Effective legislation and public agencies with trained staff on geoconservation are absolutely vital to conserve this heritage for future generations. In general, European countries have been developing geoconservation for longer time (Wimbleton and Smith-Meyer, 2012). The first efforts to make a systematic geoheritage inventory have started in mid 20<sup>th</sup> century in the United Kingdom. However, the absence of international conventions or agreements on geoheritage is a clear sign that this topic is still misunderstood by politicians, administrators and the general society.

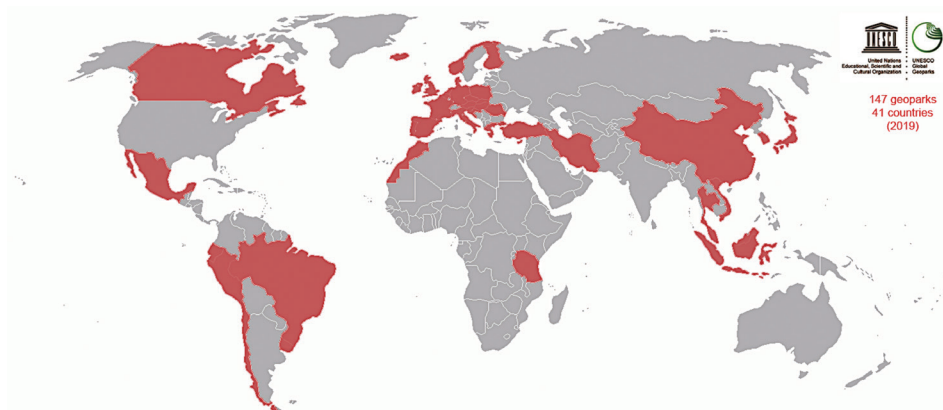
For many decades that the national and international geoscientific community is well-aware of the high scientific relevance of geodiversity in Morocco. The quality and abundance of rock exposures and the variety of rock formations representing almost entirely the whole chronostratigraphical table are just two of the reasons to consider Morocco a geologists' paradise! In recent years, the number of scientific researches on the Moroccan geoheritage has greatly increased (for instance: Malaki, 2006; Wartiti et al., 2009; Tahiri et al., 2010; El Hadi et al., 2011; Errami et al, 2013, 2015; Nahraoui, 2016; Bouzekraoui, 2017; Arrad, 2018; Aoulad-Sidi-Mhend, 2019; Beraaouz, 2019; Berred, 2019; Baadi et al., 2020; Mehdioui et al, 2020). Many of these works were developed under the scope of PhD and master theses, which is an encouraging sign of the development of a young generation of geoscientists in Morocco with expertise on geoconservation.

## UNESCO Global Geoparks

The geopark concept was born in Europe and the first international initiative regarding this innovative approach was made in 2000 with the establishment of the European Geoparks Network joining together four geoparks in four countries (Henriques and Brilha, 2017).

Fifteen years later, in 2015, the *International Geoscience and Geoparks Programme* was established by UNESCO. *UNESCO Global Geoparks* (UGGp) are “the mechanism of international cooperation by which areas of geological heritage of international value, through a bottom-up approach to conserving that heritage, support each other to engage with local communities to promote awareness of that heritage and adopt a sustainable approach to the development of the area” (UNESCO, 2015). With the launch of this programme, UNESCO reinforce its role in the recognition of geoheritage at the international level. In fact, since the establishment of the *Convention Concerning the Protection of the World Cultural and Natural Heritage* in 1972 that UNESCO selects and promotes geoheritage with *Outstanding Universal Value*. As today, there are 93 properties (the formal designation of UNESCO for these sites) with top-class geoheritage in 51 countries.

Similarly, there are today 147 UGGp in 41 countries around the world, which taking into account the recent character of this programme, represents a remarkable acceptance of the geopark idea (Figure 2). All geoparks are based on the conservation of geological heritage, promotion of education and attraction of visitors fostering the development of local communities and maintenance of the natural and cultural identity of these territories (Henriques and Brilha, 2017).



**Figure 2 : Countries with UGGp (in red). China is the country with the higher number of geoparks (39), followed by Spain (13), Italy (10), and Japan (9). Data as of June 2020**

The geopark concept is still under represented in Africa. With only two geoparks (M'Goun UGGp in Morocco and Ngorongoro Lengai UGGp in Tanzania), Africa has a huge potential to develop new geopark projects. Firstly, because the geological heritage in many African countries is highly relevant (Errami et al., 2015). Secondly because the sustainable development that is expected as an outcome of any geopark strategy could really make a difference for some deprived communities.

In Morocco, the top-class geoheritage, its rich cultural heritage, and the need to develop innovative actions to support the sustainable development of local communities, make geoparks a good option that should be supported by the public administration. With the support of a young generation of Moroccan geoscientists with expertise on geoconservation, the growth of the number of geoparks in Morocco could generate several positive effects:

- (i) Raise of awareness of local people about the importance of their own geological and cultural heritage, that increase their self-esteem and direct engagement in the protection of this heritage;
- (ii) Jobs creation for young people in rural areas, decreasing the internal migration tendency towards the big cities;
- (iii) Development of alternative activities (for instance, production of fossil replicas) that could decrease the pressure caused by the illegal collecting of fossils and meteorites in some areas of Morocco;
- (iv) Promotion of a new tourism offer that could attract international and national visitors to areas of the country where this is not yet happening contributing, indirectly, to their development (for instance with the building of essential infrastructures);

- (v) Contribution for the recovery of local material and immaterial cultural heritage that has a tendency to disappear in depopulated and deprived rural communities;
- (vi) The establishment of a successful network of UGGp in Morocco would certainly stimulate the internal sustainable tourism, contributing to the increase of the national sense of pride by the Moroccan society.

The experience of the last 20 years has shown that although a certain territory might have geoheritage of international significance and some acceptance of the idea by the local people, the political support by local or national authorities is absolutely vital. At the least during the first years of the project, the availability of public funding and logistic support makes all the difference in setting up an aspiring geopark with high potential to be well succeeding. Considering the environmental and social benefits produced by geoparks, the use of public resources to trigger the launch of more aspiring geoparks following international standards should definitely be considered by Moroccan authorities. The impact of geoparks is measurable at the medium-long term but this is very important when we consider the establishment of sustainable living conditions for future generations.

## References

- Aoulad-Sidi-Mhend A., Maaté A., Amri I., Hlila R., Chakiri S., Maaté S. & Martin-Martin M. (2019) – The geological heritage of the Talassemtane National Park and the Ghomara coast natural area (NW of Morocco). *Geoheritage* 11(3): 1005–1025
- Arrad T.Y. (2018) – Patrimoine géologique et géomorphologique de la Province d'Essaouira. PhD Thesis University Chouaib Doukkali, pp. 240.
- Baadi K., Sabaoui A., Tekiout B. (2020) – Methodological Proposal for Assessment Geosites: its Application in Bou-Iblane Region (Middle Atlas, Morocco). *Geoheritage*, 12:55. <https://doi.org/10.1007/s12371-020-00476-1>
- Beraaouz M., Macadam J., Bouchaou L., Ikenne M., Ernst R., Tagma T., Masrour M. (2019) – An inventory of geoheritage sites in the Draa Valley (Morocco): a contribution to promotion of Geotourism and sustainable development. *Geoheritage* 11(2): 241–255.
- Berred S., Fadli D., El Wartiti M., Zahraoui M., Berred K.H., Sadki R. (2019) – Geomorphosites of the semi-arid Tata region: valorization of an unknown geoheritage for geotourism sustainable development (Anti-Atlas, South Morocco). *Geoheritage* 11: 1989–2004.
- Bouzekraoui H., Barakat A., Touhami F., Mouaddine A., El Youssi M. (2017) – Inventory and assessment of geomorphosites for geotourism development: a case study of Ait Bou Oulli valley (central High-Atlas, Morocco). *Area*, 50(4): 331–343
- Brilha J. (2018) – Geoheritage: inventories and evaluation. In: Reynard E. & Brilha J. (Edts.), *Geoheritage: assessment, protection and management*, Elsevier, 69–85.
- Brilha J. (2019) – Geoheritage. Reference Module in Earth Systems and Environmental Sciences (Encyclopedia of Geology, 2<sup>nd</sup> edition edited by Scott Elias and David Alderton) Elsevier, <https://doi.org/10.1016/B978-0-12-409548-9.12106-2>

- El Hadi H., Tahiri A., Simancas J.F., Gonzalez-Lodeiro F., Azor A., Martinez- Poyatos D. (2011) – Geoheritage in Morocco: the Neoproterozoic Ophiolite of Bou Azzer Central Anti-Atlas. *Geoheritage* 3:89–96.
- Errami E., Brocx M., Semeniuk V. (Eds) (2015) – From Geoheritage to Geoparks: case studies from Africa and beyond. Springer Verlag, 269p.
- Errami E., Ennih N., Brocx M., Semeniuk V., Otmane K. (2013) – Geoheritage, Geoconservation and aspiring Geoparks in Morocco: the Zenaga inlier. *Società Geologica Italiana*, Roma 18:49
- Henriques M.H. & Brilha J. (2017) – UNESCO Global Geoparks: a strategy towards global understanding and sustainability. *Episodes*, 40(4), 349-355.
- Malaki A. (2006) – Geosites: Interet Scientifique, Patrimoine Culturel et Visées Socio-Economiques, au Niveau d'Ifrane, Azrou, AïnLeuh et el Hajeb (Causse Moyen Atlasique). Thèse de Doctorat, Faculté des Sciences de Rabat, Maroc
- Mehdioui S., El Hadi H., Tahiri A., Brilha J., El Haïbi H., Tahiri M. (2020) – Inventory and quantitative assessment of geosites in Rabat-Tiflet Region (North Western Morocco): Preliminary study to evaluate the potential of the area to become a geopark. *Geoheritage*, v. 12, n° 35, <https://doi.org/10.1007/s12371-020-00456-5>
- Naharoui F. (2016) – Le patrimoine géologique du massif central marocain: atouts pour un géotourisme intégré. Thèse de doctorat «Sciences de la Terre». Faculté des sciences-Rabat, Maroc
- Reynard E. & Brilha J. (Eds.) (2018) – Geoheritage: assessment, protection and management. Elsevier, Amsterdam, 450p.
- Tahiri A., El Hassani A. & El Hadi H. (2010) – Le patrimoine géologique du Maroc: l'exemple de la géodiversité paléozoïque de la région de Rabat Salé Zemmours Zaers. *Géol Fr* 1:79–88
- UNESCO (2015) – Statutes of the International Geoscience and Geoparks Programme and Operational Guidelines for UNESCO Global Geoparks: Paris, UNESCO, 6 p.
- El Wartiti M. Malaki A., Zahraoui M., Di-Gregorio F., De-Waele J. (2009) – Geosites And Touristic Development Of The Northwestern Tabular Middle Atlas Of Morocco. In: Marini A., Talbi M. (eds) *Desertification and Risk Analysis Using High and Medium Resolution Satellite Data*. NATO Science for Peace and Security Series C: Environmental Security. Springer, Dordrecht, 143–156
- Wimbledon W.A. & Smith-Meyer S. (eds.) (2012) – Geoheritage in Europe and its conservation. Oslo: ProGEO.