



**Challenges in the Popularization of the Earth Sciences. Geotourism as a  
New Medium for the Geology Dissemination**  
Desafios da Popularização das Ciências da Terra. Geoturismo como um  
Novo Meio Para a Disseminação da Geologia

Matteo Garofano

*Geotourism Association, Via Beata Chiara 19/3, 16164, Genoa, Italy*

*E-mail: garofano@geoturismo.it - www.geoturismo.it*

Recebido em: 14/09/2011 Aceito em: 12/04/2012

DOI: [http://dx.doi.org/10.11137/2012\\_1\\_34\\_41](http://dx.doi.org/10.11137/2012_1_34_41)

### Abstract

This article contains some remarks made by the Geotourism Association on common problems found in the development of geotourism. The main issues considered are related to the analysis of the methods used in scientific communication, the problems raised by the use of geological language, the delineation of the geotourists' profile, the functioning of museums. The paper also takes into account Italian data that draw out to considerations about the sustainability of a specific form of tourism, the underground geotourism.

**Keywords:** geotourism; thematic tourism; geology popularization; geological sites; Geoparks

### Resumo

Este artigo contém algumas considerações feitas pela Associação de Geoturismo de Gênova, Itália, sobre problemas comumente encontrados no desenvolvimento do geoturismo. Os principais aspectos considerados estão relacionados à análise dos métodos usados em comunicação científica, cujos problemas são potencializados pelo uso de linguagem geológica; a caracterização do perfil do geoturista; e o funcionamento dos museus. Procura, ainda, apresentar dados sobre a Itália, tecendo considerações sobre a sustentabilidade de uma forma específica de turismo, o geoturismo subterrâneo.

**Palavras-Chave:** geoturismo; turismo temático; popularização da geologia; sítios geológicos; Geoparques

## 1 Introduction

In the last decade the Earth Sciences have found new interdisciplinary fields of application. In particular popularization aspects have been the subject of interest by scientists and professionals not directly related to scientific research. One area that has shown to offer positive results, in socio-economic terms, was the geological tourism also known as geotourism. Thanks to it some important aspects of Earth science and conceptual organization of the discipline (Hose, 1995; Garofano, 2003; Dowling, 2006) were highlighted.

For over a decade the Geotourism Association Working Group has analyzed the factors that have hampered the spread of the Earth science to the general public. From this analysis were drawn numerous considerations which have served to identify solutions (methods and approaches) aimed at improving the dissemination of knowledge and enjoyment in “*latu sensu*” of geology through geotourism.

The ultimate goal of the Geotourism Association was to allow a wider public to learn about the geological aspects of the environment.

## 2 Data Collected and Purpose

The data analyzed were collected by members of the Geotourism Association as outcomes of activities, from which feedback was collected. The activities were carried out by daily journeys (walks) to weekly travels (both in Italy and in many destinations outside Italy), courses, exhibitions and thematic films and presentations.

Additional information was collected also during collaborations with institutions like park authorities, municipalities, mountain communities and private companies operating in the tourism sector.

The collection of information took place in various forms, among these the most used were paper and on-line electronic satisfaction questionnaire submitted to the participants of the activities and filled in anonymously, comments released spontaneously or by request of the organizers at the end of the activity.

Further sources of information were the activities carried out in collaboration with some Italian schools of different types and

levels. The results were collected through the teachers’ response.

In some cases, through direct data collection made by interviews with personnel involved in tourism, specific studies have been conducted to understand the status of a specific sector. The data were also compared with existing studies.

## 3 Critical Points Identified

There are some problems which are inherent to science (in general) and to the Earth Sciences.

The specific language of science is a barrier between everyday experience and the understanding of natural phenomena (Carrada, 2005).

The Earth Sciences have peculiar problems that make arduous its comprehension. A major problem is represented by the scales involved in geological phenomena that are often not perceived through the senses by the observers. The time scale in the majority of geological phenomena is of millions of years, therefore not suitable for human perception.

The spatial scale of geological objects is often out of our ability to observe with naked eyes, it ranges from extensions of thousands of miles in plate tectonics and geological structures to microscopic objects typical of the mineralogy and micropaleontology.

To make the task of popularizing geological sciences even more difficult it should be added that geology is a deductive science and therefore geological phenomena are, in most cases, not reproducible.

## 4 The Users of Geotourism

Through the analysis of data, the profile of geotourists (defined as users of geological tourism) and of the activity that they they perform were delineated. It is often a heterogeneous audience for several factors (Parisi, 2010). Among the categories it is possible to distinguish groups sorted by age, level of culture and education, financial resources, time availability, physical ability.

The surveys conducted by the Geotourism Association mainly correspond to the points highlighted by existing studies.

The statistical data collected on a sample of 390,801 people shows the type of users. In terms of major categories, it can be described as school students 38%, outdoor adults (trekking and hiking) 28%, environmental education (and educational) 29 %, summer trips 5% (Camerlenghi, 2006).

The geological component added to the tourism offer is a selection factor that acts on a pool of users, the tourists. Geotourist potential users can be considered a subset of the tourists.

Tourists have needs and characteristics that should be taken into account. Some of the most important, as highlighted by some authors (Crompton, 1979, Dowling & Newsome, 2006, Robinson & Roots, 2008) are the socio-psychological factors that are considered “push” factor, while the cultural motivations, the services and infrastructures are considered attractive or “pull” factors (Prayaga & Ryanb, 2010).

There are many reported poor success cases of tourism projects based on geotourism, because of lack of understanding of the users’ profile.

### 5 Problems of Interaction Between Tourism and Geology

Through the questions asked to geotourism users it has been inferred that a number of tourism products are not considered satisfactory. It is believed that the causes can be identified in a not clear distinction of aims and methods operated by geology and tourism.

Geology is a scientific discipline that uses objective criteria, meanwhile tourism is a recreational activity that takes subjective and aesthetic criteria. Geology and tourism are, therefore, very different disciplines that can co-exist and be practiced in a synthesis called geotourism. For good efficiency key aspects of each one should not overlooked. The scientific aspect is essential to maintain the rigor and not trivialize the subjects. Considering the popularization and tourism aspects is a priority to pursue the playful aspect implemented through active participation and perception.

The data collected also shows that the places selection, both in the construction of trips and tourism enhancing projects, is often not suitable for a profitable use by the general public.

From these initial observations (Figure 1) arises that not all areas of research investigated by

geology, in its broadest sense, are suitable to be the subject of geotourism (Picco, 2008).

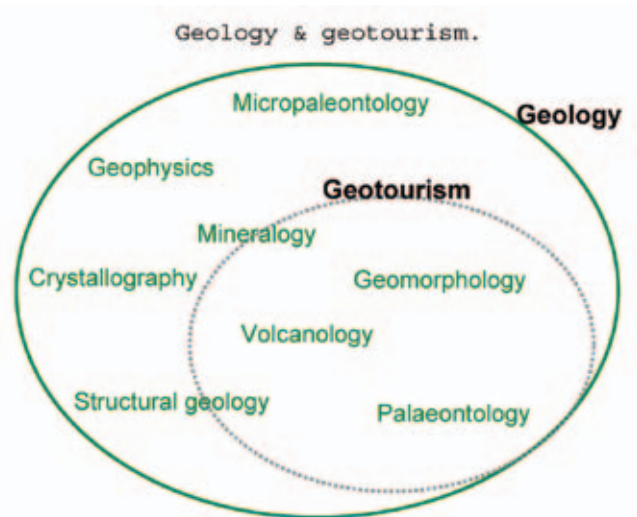


Figure 1 Area of interest of geology and geotourism.

### 6 Scientific and Popular Publications

Currently there is a copious dissemination of scientific works proposed as geotourism essays. Some topics on geotourism risk to alienate the audience from geology due to a bad selection of places, themes, languages, communication methods.

Two examples of geotourism communication not reworked to non-specialists are listed below, they were taken from posters realized for geotourism projects. Sometimes the uneasy readability of these messages shows that they were not tested for understanding and / or satisfaction on an unskilled audience (Figure 2 and Figure 3).

#### 6.1 Example 1

“The area is characterized by folds and thrust faults. Schematically, from a geological point of view, two areas are distinguishable, a more internal, characterized by silicoclastic sequences and a more external units with Mesozoic-Paleogene umbromarchigiane carbonate outcrops. The structural setting of the two areas is characterized by a large syncline on which emerge silicoclastic deposits, and anticlinal structures emerge of carbonate deposits. The most western outcrop are the carbonate units.”



Figure 2 Communication panel about geology.

## 6.2 Example 2



Figure 3 Communication panel about geology.

“From the standpoint of the oldest geological units observed in this area are represented by Schlier chalk-sulphurous formations present at the core of the anticline structure of the coastal outcrops of Punta Sciavi and Casteldimezzo. On the top emerges more fully arenaceous-pelitic of San Donato formation, on top of this is placed the Colombacci Formation. Structurally, the backbone of the San Bartolo is made up of a syncline-anticline pair NE bounded by a thrust front located at sea, and a complex system back-thrusts to SW.”

The problems highlighted by the users of these messages are generally tied to the language for specialist, poor readability, text length and excessive complexity of the information who wish to summarize a large number of geological events in a single description.

Often it is also assumed a user profile only partially corresponding to actual users, it is assumed a medium-high or high level of knowledge and a typology of users with a solid scientific knowledge.

Historical and cultural issues and communication geology dissemination methods at school

The school programs and their relations with earth sciences were surveyed and analysis, some considerations followed. The survey highlighted issues relating to the method adopted for the description of the Earth sciences, which is mainly aimed at the classification of objects and not focused to the description and comprehension of processes.

There is also a lack of integration between scientific disciplines and liberal arts, it is not

investigated the relationship between biology and geology, human history and environmental history, landscape and men.

In Italian schools, in addition, only few teachers are skilled in Earth sciences; most of them have a curriculum related to a different scientific area, therefore they have little experience in geology.

The general approach in schools is still oriented to teaching and is not pursued the disclosure (Carrada, 2005).

The majority of schools lack of laboratories therefore practical experimentation activities are precluded or severely limited.

Only few outdoor activities are performed thus preventing direct contact to the geology discover in its best conditions (*in situ*). The causes of those issues reported by school administrators are diverse and mainly generated from economic factors.

## 7 Museum System

One of the best places for the Earth science dissemination is in museums. Even in this area data about museums visitors and their interest were analyzed and compared. In many cases the results are not very encouraging.

The major causes of the unpleasant result reside in the organization adopted by many museums. They are still linked to their original purpose, which figure such structures as a useful collection of samples for scientific research. This organization is not suitable for the public because recreational and aesthetic factors are needed. The mere exposure of labelled samples with explanatory names just does not stimulate the visitor to the observation and understanding (Figure 4).



Figure 4 Geological museum exposition.

## 8 Tourism Culture

Tourism has greatly developed in Italy in the last decades. Only recently it also has developed an offer diversification, following a process called “segmentation”. For this reason, some types of tourism (recreational, cultural, artistic, relaxation, religious, etc.) experienced a strong distribution and are widely recognized in the population and in the tourism industry.

Some types of tourism are not well known so they have a small customer number. Generally, they are forms of specialized tourism for which there is, however, a demand and an offer (food and wine, environmental, sports). The ability to aggregate demand through the use of new interactive communication media has recently allowed to reach economically interesting numbers for the market (Stobbione, 2010). The geotourism, being a recent development of tourism, is an unfamiliar subject and few people understand its peculiarities.

## 9 Types of Tourism and Peculiarities

On some occasions the realization of geotouristic projects with operations in the territory that do not get the expected results was investigated. In retrospect it was possible to identify the problems, the target analysis was lacking, the existing “tourism system” (infrastructure, services, operators) was not properly taken into account, there was lack or absence of specific economic, sustainability and development evaluations.

Two geotourism offer forms were compared, tourist caves and tourist mines (Amorini & Bartelletti, 2004; Cavazza, 2008; Govoni, 2007). They apparently have similar type of offer for tourists, but a more detailed analysis reveal significant differences in terms of economic sustainability. Both have as subject the underground visit and both have a dominant science and geology themes.

The Italian tourist mines considered are 20 over a total of 35 existing (Tables 1 and 2) and have very different investment costs, management staff and number of visitors. The caves evaluated from which were drawn estimations on underground geotourism show a high number of visitors and lack of public investment measures (Figure 5).

Investigating the main differences between the two types of tourism is evident that the plant operation and maintenance costs of tourist mines

are much higher than those related to tourist caves; in Italy there is no tourism mines legislation. The professionals involved in mines management is of high profile and have high costs, in addition, in Italy, these skills are hard to find (Govoni, 2007).

Caves: Toscana Underground Project (2003)	Mines: 35 Sites Reclaimed, 20 Accessible (2006)
<ul style="list-style-type: none"> <li>• Apuanes' Apuan Caves</li> <li>• 3 caves, Antro del Corchia, Buca di Equi, Grotta del Vento</li> <li>• More than 100.000 visitors each year</li> </ul>	<ul style="list-style-type: none"> <li>• Investments from 18 K€ up to 16.000 K€</li> <li>• Management 10 sites private, 10 sites public</li> <li>• Most visited tourist mine 46.000 visitor per year, less visited 1.000 perh year</li> </ul>
Low maintenance costs	Only 2 tourist mines over 20 are economically sustainable

Table 1 Mining tourist sites.

Region	Tourist Mines
Sardegna	11
Toscana	7
Trentino-Alto Adige	5
Lombardia	4
Piemonte	4
Liguria	1
Marche	1
Sicilia	1
Veneto	1
<b>TOTAL</b>	<b>35</b>

Table 2 Tourism mines in Italy.



Figure 5 Tourist cave or show cave “Nettuno’s Cave”, Sardinia, Italy.

### 10 The Methods Used to Overcome Problems

To remedy the problems identified and described above the Geotourism Association adopted guidelines in its project. These policies have taken

into strong consideration the following factors and criteria.

The choice of the localities where to develop geotourism activities was made following a few basic

criteria such as the high visual impact (aesthetics geotourism) of the places where the geological phenomena occur, the potential to arouse attention and curiosity, “geological clearness” (visibility and comprehensibility) (Picco, 2008).

Another key criterion was the adoption of the pertinent language in all forms of geotourism communication, as much as possible appropriate to the audience without sacrificing scientific accuracy.

The method adopted as often as possible was that of “direct contact” meaning to proceed in the observation of geological phenomena in the place where it is situated or “*in situ*”.

To better prepare geotourism trips it is considered necessary to analyze the characteristics of final users and, after the verification, the trip organization is in relation to the traveller profile.

## 11 Conclusions

From the analysis carried out either directly or through the study of documents and data collected by other researchers it was possible to show how the spread of geology to the general public presents several challenges. Being geotourism a new discipline it exposes to several potential problems related to the uneasy interaction between geology and tourism. The data show that, in this context a number of projects and initiatives may have limited success. Many mistakes and design flaws, if properly made public, may become a common heritage and help in the identification of future strategies to be adopted to achieve better results in geotourism and geological heritage fields.

Since many public and private companies are willing to promote their region and their geological heritage through geotourism, in this regard it is believed that the above considerations, even if they are based on a small number of cases and data, may be useful for future projects.

## 12 References

- Amorini, A. & Bartelletti, A. 2004. Il sistema delle Grotte turistiche delle Alpi Apuane. Toscana Underground, p. 1-5.
- Camerlenghi, F. 2006. Dispense al III Corso di Geoturismo. Ass. Geoturismo, Genova, p. 8-9.
- Carrada, G. 2005. Comunicare la scienza, kit di sopravvivenza per ricercatori. I quaderni del Mestiere di scrivere, 129 p. (available at <http://www.mestierediscrivere.com/>, accessed on 12 June 2011)
- Crompton, J.L. 1979. Motivations for pleasure vacation. *Annals of Tourism Research*, 6(4): 408-424.
- Dowling R. & Newsome D. 2006. Geotourism. Elsevier, 260 p.
- Garofano, M. 2003. Geoturismo, scoprire le bellezze della terra viaggiando. Geoturismo Edizioni, 179 p.
- Garofano, M. 2010. Geotourism. The geological attractions of Italy for tourists. Geoturismo Edizioni, 3rd Ed., 176 p.
- Garofano, M. 2010. Retaggi culturali e di metodo nelle scienze della terra. Il geoturismo come mezzo per la diffusione e la rivisitazione della geologia. *Atti Conv. Nat. Patrimonio Geologico, Geologia dell’Ambiente, SIGEA ISSN 1591-5352*, p. 420-427.
- Govoni, D. 2007. Miniere visitabili in Italia: una risorsa geoturistica da capire. Dispense al III Corso di Geoturismo, Ass. Geoturismo, Genova, p. 14-18.
- Gray, M. 2004. Geodiversity, Valuing and conserving abiotic nature. John Wiley & Sons, 434p.
- Hose, T.A. 1995. Selling the Story of Britain’s Stone. *Environmental Interpretation*, 10 (2): 16-17.
- Lavazza, S. 2008. Miniere al Sole. AM&D, sotto l’egida di Parco Geominerario Storico Ambientale della Sardegna, 128 p.
- Mariani, S. 2006. La valorizzazione del patrimonio geologico. Un’esperienza di ricerca sui geositi tra Emilia-Romagna e Baviera. Tesi di dottorato, Università di Bologna, 199 p.
- Parisi, A. 2010. Il geoturismo: salvaguardia e valorizzazione del patrimonio geologico. Geoturismo Edizioni, 49 p.
- Picco, M. 2008. Conoscere ideare progettare. Le linee guida per lo sviluppo di un progetto geo-turistico. Dispense al IV Corso di Geoturismo, Ass. Geoturismo, Genova, p. 8-10.
- Prayaga, G. & Ryanb, C. 2010. The relationship between the ‘push’ and ‘pull’ factors of a tourist destination: the role of nationality - an analytical qualitative research approach. *Current Issues in Tourism*, 14(2), 121-143.
- Robinson, A.M. & Roots, D. 2008. Marketing tourism sustainably. In: Dowling, R.K. & Newsome, D. eds. Geotourism. Proceedings of the Inaugural Global Geotourism Conference, ‘Discover the Earth Beneath our Feet’, Fremantle, Western Australia, 17-20 August. Promaco Conventions Pty, Ltd, 303-317.
- Stobbione, E. A. 2010. Marketing Turistico”. Dispense VI corso Geoturismo, Ass. Geoturismo, Genova, p. 10-17.