Development and usage of Geosites: new results from research and conservation activities in the Piemonte Region (Italy)

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ABSTRACT. This paper describes a series of activities carried out by public institutions, whose aim is to identify possible ways of acquiring knowledge and of allowing enjoyment of the Piemonte Region's geological heritage. The activities concern the inventory, the evaluation, the storage and the publication of information, both alphanumerical and geographical, in relation to geosites. A database accessible directly from Web and a Web-GIS application has been developed in order to supply valuable and comprehensive instruments for both, representing the results of research and promoting the knowledge of the geological heritage to a large number of people.

Key words: geodiversity, geosite, inventory, Web-GIS, Italy

INTRODUCTION

Among the Italian regions, Piemonte is remarkable because of its variety of landscapes and environments including mountains, hills and plains. Similar to other Italian regions, research and conservation activities for recognizing, describing and popularizing sites of geological and geomorphologic interest also started in Piemonte.

The first initiative was the publication of the "Carta Geomorfologica degli Elementi di Interesse Paesaggistico del Parco Nazionale del Gran Paradiso", accompanied by descriptive cards of selected geosites (Giardino and Mortara, 2001). A remarkable impulse was given by the publication of two popular books concerning the exploitation of geomorphological sites in the Torino Province (Giardino and Mortara, 2004). At the end of 2004 the cooperation between the managing authority of Asti Province Natural Parks and the Department of Earth Science of Torino University, allowed the inventory of 219 geosites located in the Asti Province and the Torino Hill (Biancotti, et al., 2004). More research has been carried out by student thesis and municipality's autonomous initiative in several areas of our region.

In order to gather scattered information concerning the geological heritage of the Piemonte region, an agreement between the University of Torino (Earth Science Department) and the Natural Science Museum of Torino was signed. The aim of this cooperation is to identify possible ways of acquiring knowledge and of allowing enjoyment of the Region's geological heritage. This can be

achieved not only by means of inventory and assessment of the most important sites of geological interest, but also by programs of usage and popularization. The complex earth system terminology has to be translated into a simple language, allowing a knowledgeable approach for a general public and professionals involved in educational activities.

INVENTORY AND EVALUATION OF GEOSITES IN THE PIEMONTE REGION

In order to define the state of the art in geosite studies in the Piemonte Region and to identify the geoconservation projects developed by public or private institutions, a bibliographic research and field data collection was performed. At the end of this reconnaissance phase, more than 300 sites with a geological interest scattered all around the Region were identified. Most of these descriptions are not exhaustive from a scientific point of view, but they inform about location and general characteristics of landforms and processes that could be classified as geosites.

A lot of data coming from different sources were homogenized and organized by means of an inventory card purposely set-up. It holds all the information requested for Geosites by the Italian National Geological Survey, it also includes additional information allowing evaluating geosites from scientific, aesthetic, accessibility, cultural/historical and ecological point of view.

Part 1 of the card deals with the collection of general data, including location, description, essential features

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Fig. 2. a) Hillshade model derived from DEM (10 m resolution); b) Mosaic of aerial photographs obtained using photogrammetry technique; c) 3D bird's eye view obtained combining ortho-mosaic and DEM.

After collection of all the information, it is possible to conceive specific itineraries not only for people involved in the field of geosciences, but also for a general public and teachers. Following the approach proposed by Giardino and Mortara (2004) to each itinerary a card containing pictures and descriptions structured in four main sections, was assigned:

- In the first one, a general outline of the site, with a description of the geomorphologic and geological features in relation to their forming processes, is presented;
- In the second one, there is a set of pictures, stratigraphic sections, 3D views and texts useful to understand the geomorphologic and geological evolution of the geosite;
- In the third section the reader is informed on possible hazards and their potential risks;
- The last section contains curiosities, legends, and cultural or ecological notes concerning the geosite.

WEB-GIS APPLICATION

GIS applications whose functionality is combined with Internet technology, allowing the publication of cartographical data integrated with other information, including images, descriptive cards and virtual bird's-eye views. They can be valuable and comprehensive instruments to represent results of research to the general public. In order to promote the knowledge and the usage of the geosites, to a large number of people, a Web-GIS application, based on MapServer (www.mapserver.org) and PMapper (www.pmapper.net), has been developed (Fig. 3).

Fig. 3. Web-Gis application based on MapServer and PMapper. Hyperlink function present in the attribute table allows to recover many types of information including those stored in MySQL Db.

BIBLIOGRAPHIC DATABASE

Bibliographic data concerning general aspects of geosites have been organized using specific software: EndNote (www.endnote.com), useful to manage references, images and PDFs. Once the data are stored, it is not only possible to make the "usual" queries that are expected to be performed on a computerized library (e.g., by author, year, subject and so on) but also a digital copy of the original work, if available, can be recalled and looked up simply clicking on a link.

These instruments, if periodically updated, allow defining the state of the art concerning several aspects on geosite's studies both at international level and at regional level.

CONCLUSIONS

Preliminary results from these activities can be considered as fundamental steps developing a new awareness of the importance of geosites for a wide public. For this reasons large efforts have been made translating the complex earth system in a simple language, but at the same time preserving scientific methods and approaches. In order to improve results and applications of the research program, the next steps of activities will be:

- A further data collection of new features and updates of previously collected ones;
- Implementation of new functions in the system;

- Completing the descriptive cards with information of geological or geomorphologic aspects;
- Proposal of new itineraries with maps and field guides.

At the moment of this paper the service is just a prototype in a early stage and is not available yet, it should be on-line in a few months at www.geositlab.unito.it. All the activities will be carried out in different parts of the Piemonte Region and will be developed in agreement with local institutions.

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