

Conservation Geology: A Multidisciplinary Approach in Utilization of Earth Resources Without Destruction

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Abstract

The new field of conservation geology requires the input of the entire traditional fields of geology. A successful research and development programme for the advancement of this field requires expertise from other disciplines such as planning, law, tourism and management. Geologists should lead the development efforts and multidisciplinary networking in order to ensure that geology contributes to the aspirations of sustainable development.

Geologi Pemuliharaan: Pendekatan Multibidang Dalam Utilisasi Sumber Bumi Secara Tanpa Musnah

Abstrak

Bidang baru geologi pemuliharaan memerlukan input maklumat dari semua bidang tradisional geologi. Dalam program penyelidikan dan pembangunan, bidang lain seperti perancangan, perundangan, pelancongan dan pengurusan mempunyai peranan penting untuk kejayaannya. Ahli geologi perlu menerajui pembangunan dan menjaring rangkaian multibidang bagi memastikan bidang ini menyumbang dalam mencapai hasrat pembangunan mampan.

INTRODUCTION

Conservation geology is a new field in the Earth Sciences, which was introduced to effectuate a paradigm shift in the geological community towards the utilization of geological resources without destruction. It follows on from a need to see that the part of geological resources containing heritage values is connected to human civilization in the context of education, history and culture. This kind of resource needs to be developed and managed based on the conservation concept that takes into account the preservation of resources for the benefit of the present society and future generations.

To ensure success, this conservation effort requires to be integrated in the national conservation scenario. The conservation movement in Malaysia which began more than 50 years ago is now well entrenched under an administrative and legal infrastructure that takes the form of the Department of Wildlife and National Parks (PERHILITAN) at the federal level, the Forest Departments at both the federal and state levels, and the Parks Trustees at the state level. In the past 50 years, conservation efforts focussed mainly on biological resources, which meant that geological conservation arose purely accidentally if the geological or landscape heritage site just happened to be located in one of the protected areas. This situation is now changing and augurs well for conservation geology.

The basic construction of conservation geology lies on a multidisciplinary foundation consisting of earth science, planning, law and management. Almost all fields of

traditional geology such as petrology, sedimentology, paleontology, structural geology, geomorphology, and historical geology are needed to build the framework for a geological resource with heritage value. An insight into planning and law will allow the formulation of strategies and plans for the development of these resources in an integrated land use planning effort. Management skills will allow the resources to be developed, protected, rehabilitated and managed in a sound manner and in a long-term perspective.

THE THEORETICAL FRAMEWORK

The concept of *conservation geology* was first introduced to provide the theoretical and systematic framework for the characterization, classification, assessment and ranking of geological heritage sites.

It should be noted that conservation geology should be differentiated from the concept of conservation of geological heritage that has long been used in various parts of the world. The conservation of geological heritage sites begins from a heritage resource that is known, already recognized by the public and that is already being conserved either for preserving the beauty of the Earth or for recreation. The philosophy embodied in the World Nature Heritage Sites is based on this approach. Conservation geology, however, begins with a school of thought on the potential heritage resources that are yet to be identified. It begins with research to determine the intrinsic value of geological features and to assess their heritage value. It ends with the presentation

of a particular resource to the general public (not the geological fraternity) as a heritage site, including the promotion and management aspects of the site.

Geological heritage resources need to be seen from the aspect of *geological diversity*. Characteristics of the diversity include the composition, mineralisation, texture, structure, fossilization, origins and the process of birth of the feature. Hence, the need for across the board expertise in geology. The diversity can also be gleaned from the variations in landscape formation, scientific records, ecological functions and the relationships with the culture of the local community. Therefore, the diversity may be explored based on two different aspects: one, the differences in characteristics as outlined above and two, on variations based on historical evolution of the Earth.

The *geotope* terminology was coined based on an idea in conservation biology that describes an object of unique and outstanding appearance of biological assemblage in contrary to the surroundings as a biotope. Strum (1994) began to introduce the term geotope in Europe as a distinct part of the geosphere of outstanding geological and geomorphological interest. Because of the close relationship and interdependence between a geotope and a biotope, Hofmann (1997) introduced the notion of geobiotope and biogeotope. Ibrahim Komoo (1998) introduced the same concept in Malaysia and differentiated it by using the term *geosite*, which is more general in nature and encompasses any site that contains significant geological diversity.

A geosite can thus be described as a rock exposure or landscape that indicates a clearly high heritage value. There may be several of the features at a particular site, region or nation but they are in general hard to find elsewhere. A geotope on the other hand is a geosite that is unique and has outstanding value. There may be one or several of the features at one site but they are not found anywhere else.

Both geosites and geotopes can be assigned a heritage value. Heritage value is defined as pertaining to the following values: *scientific* (important for the geological records or history of the development of the Earth); *aesthetic* (landscape which is breathtaking or unusual); *recreational* (suitable for various nature recreations); and *cultural* (usually associated with utilisation, local beliefs, and historic and archaeological value) (Ibrahim Komoo and Mohd Shafeea Leman, 1999). Thus, in prescribing the heritage value of a site a multidisciplinary team encompassing the cultural, historical, archeological and tourism sectors need to be involved.

DEVELOPMENT STEPS TOWARDS CONSERVATION GEOLOGY

Because of the uncertainties involved, conservation efforts are normally met with initial resistance. Therefore, the easiest first step to take in order to implement the conservation concept is to promote geological sites in already existing parks. The Kinabalu Park in Sabah and the National Park in Peninsular Malaysia are two existing

parks that contain geological heritage sites. Using this strategy, efforts to establish Mount Kinabalu and the National Park as geological heritage sites have already been successful (Ibrahim Komoo *et al.*, 1997). Similar efforts in other parks are now underway, while greater effort needs to be invested in areas that have not been designated as parks. One example of the latter is the Langkawi Islands, which can be regarded as an important geological field museum.

Even though laws for protecting national parks exist, the legal framework and management system specifically for conservation of geological heritage are not yet in place. Several indirect approaches for protection of geological sites are available, i.e. the Wildlife and National Parks Act 1972, the Museum and Antiquities Act 1976 and the National Land Code 1965. But they are severely limited within the existing management system. For this reason, up to now not a single geological heritage resource is conserved in its own right. The geological community therefore needs to engage the legal bodies to push forward the necessary instruments for legal protection.

In July 1998 Malaysia, together with UNESCO, organised a seminar on "The Nomination of Cultural and Natural Heritage of Malaysia to the World Heritage List" in Penang. Since then the authorities of the Kinabalu Park in Sabah, the Gunung Mulu National Park in Sarawak and the National Park in Peninsular Malaysia have laid down the groundwork to enable such a listing to be achieved. As the uniqueness of both the Kinabalu Park and the Mulu National Park is intimately related to their geological features, it is hoped that this effort will also galvanise the authorities into expediently incorporating provisions that are necessary for geotope conservation in all legal and administrative frameworks (Lamri 1998; Gill *et al.* 1998; and Jasmi Abdul, 1998).

As another step toward building awareness and to sustain research activities, in June 1999 the Conservation Geology Group of Malaysia organised the first National Conference on Geological Heritage of Malaysia, followed by the establishment of the National Core Group on Geological Heritage of Malaysia for endorsement of the proposed geosite and geotope. In an effort to build capacity in the implementing agencies, a training course for geological heritage mapping was conducted in March 2000.

To inform the public, regular public lectures have been carried out and media reports on a few heritage sites have been published. To bridge the knowledge gap existing among geologists, other scientists, planners, implementers etc., the group also publishes a regular newsletter 'Warisan Geologi', and has published two books in the 'Warisan Geologi Malaysia' series.

THE MULTIDISCIPLINARY APPROACH

The situation in Malaysia is encouraging as networking and cooperation have been established between researchers of geological heritage resources and the policy makers in

the government agencies at both the federal and state levels, focussing on the importance of a convergent approach towards the development and management of such resources. The linkages between the various partners in research and development activities are shown in Table 1.

The Table shows that the geologist's work in inventory and characterisation must be followed up by an evaluation for heritage value and status. This stage requires inputs from all disciplines of geology. To effect conservation, development must include policy making and planning for the establishment of proposed sites or parks which then need to be managed and financed. The major players range from the researcher at the research level to the ranger in the park. The media also plays an important role in publishing the findings and creating public awareness. The effort involves organisations ranging from the R&D centres to policy making bodies to implementing agencies.

From the legal perspective the final work is entrusted to the Department of Minerals and Geoscience, the Department of Museum and Antiquities and PERHILITAN. The introduction of the concept of conservation of geological heritage sites in the form of Geological Parks, Geological Monuments, Protected Sites and Aesthetic Landscapes to these agencies is beginning to gain acceptance. State governments are now receptive to the need for such parks.

RESEARCH AND DEVELOPMENT EFFORTS

The government of Malaysia recognises the importance of conducting R&D to develop and manage Geological Heritage Resources. Two research projects have been approved for funding under the Intensification of Research in Priority Areas (IRPA) mechanism. The titles of the two projects are as follows:

- Geological Resources in Nature Parks for Tourism Development (1996-1999).
- Development of Geological and Landscape Resources for Conservation and Ecotourism (2000-2001).

As a consequence of these project activities the following have now taken place or are currently being carried out:

- A Geological Heritage Group was established in 1996 to carry out basic and applied research on a continuing basis to ensure that major geotopes and geosites are properly identified in order to propose the correct conservation mechanisms and appropriate geotourism development activities.
- Focus has been given to detailed conservation studies on the Langkawi Islands, an international tourist destination and a haven to the geologists in terms of heritage value.
- Potential geosites and geotopes in Kinabalu Park, Sabah and the National Park, Pahang are currently being investigated and described.

- Geosites in other states are being identified and a specific map on the geological heritage sites of Malaysia is being prepared.
- A National Core Group on Geological Heritage of Malaysia was formed to formalise and endorse the identification and establishment of conservation sites. This National Core Group also serves to advise the federal or state governments regarding the appropriate conservation strategies to be implemented.
- The first National Conference on Geological Heritage of Malaysia was organized and saw the participation of many researchers and policy-makers from local universities and government agencies.
- The proposal to establish the Klang Gates Quartz Ridge as a geological monument is currently being studied by the Selangor State Government.

GEOSITES AS AN ECONOMIC RESOURCE

Conservation of geological heritage sites should not automatically exclude them from the mainstream of development. Without financial support conservation cannot be sustained. One way of overcoming the financial burden is to plan the sites as *geotourism* destinations. This concept has been introduced by Ibrahim Komoo and Hamzah Mohamad (1993), Kadderi Md Desa (1995) and Ibrahim Komoo and Kadderi Md Desa (1997).

As such, the planning and management of these sites for the layman to enjoy need to be fully developed as in other tourism activities. Heritage sites with cultural, recreational and aesthetic values are well suited for geotourism purposes. Hence, the geologists' effort to identify and establish these sites may well represent the first step in the funding of conservation of geological sites in general, including those having extremely high scientific value to the earth scientists (which in all likelihood will have to remain protected and inaccessible to the public).

THE ROAD TO SUCCESS

Why have the biologists been more successful than the geologists in establishing parks? The first reason lies in history. The parks existing today were established by the British administration who recognized the importance of the preservation of biological resources. Secondly, globally the conservation movement has been led by biologists and therefore local biologists were able to accept and advocate the conservation concept. As a consequence the economic, social and political awareness of biological resources is high.

What can we do as geologists? Firstly, we must build up our inventory and database of geosites and geotopes. Secondly, we must actively advocate conservation geology. We need to publicise findings, talk to groups with similar interests and convince local authorities to see that geological

Table 1: Linkages between the various parties in research and development activities related to conservation geology. EPU-Economic Planning unit, DMG-Department of Minerals & Geoscience, DMA-Department of Museum & Antiquities, PERHILITAN-Department of Wildlife & National Parks, TCPD-Town & Country Planning Department, and NGO-Non Governmental Organization.

| | RESEARCH | | | | DEVELOPMENT | | | |
|----------------|---|--------------------------------------|--|---|--|--|---|--|
| | INVENTORY | CHARACTERIZATION | EVALUATION | COMPARATIVE STUDIES | POLICY MAKING | PLANNING | ESTABLISHMENT | MANAGEMENT |
| OBJECTIVE | Identification of geosites and geotopes | Description of geology and landscape | Geological Heritage Value -Scientific -Aesthetic -Recreational -Cultural | Heritage Status -Local -State -National -World | Policy on Nature Heritage Conservation | Urban & Regional Landuse -Conservation -Control -Special function | Conservation & Development -Protected Sites -Monuments -Nature Parks | Management & Financial System -Public -Private Public Awareness |
| MAJOR PLAYERS | Researchers | Researchers | Researchers | Researches Policy-makers Planners Media | Policy-makers Researchers Planners Implementers | Planners Policy-makers Implementers Researchers | Implementers Planners Media | Implementers Private sector NGO Media |
| MAJOR AGENCIES | R&D Centres | R&D Centres | R&D Centres | TCPD R&D Centres Federal & State Economic Planning Units | EPU R&D Centres TCPD DMG PERHILITAN DMA Legal departments | TCPD EPU R&D Centres DMG PERHILITAN DMA | DMG PERHILITAN DMA TCPD Private | DMG PERHILITAN DMA Private Sector NGO |

heritage is of equal importance to biological heritage. We must seek strategic alliances with planning and implementing agencies at all levels of government by providing information that is easily understandable in the context of heritage value.

CONCLUDING REMARKS

The field of conservation geology requires the input and commitment of all disciplines of geology. The other building blocks of the field are interdisciplinary and include planning, law, tourism and management.

We have up to now recorded some success. No doubt if we geologists pool our efforts it will not be long before conservation geology becomes an integral part of the nature conservation movement in Malaysia.

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