1
IN-SITU AND EX-SITU GEOLOGICAL CONSERVATION

Heinz A. Kollmann

Naturhistorisches Museum
Vienna, Austria

SUMMARY

This paper reviews the concept of geological resource conservation practised in Austria. Although many high value geological resources exist, the number of sites protected on the basis of scientific importance remains small. To improve the situation, efforts need to be sustained. Conservation efforts should begin with a public awareness programme on the significance of geosites in the context of the history of the Earth at the national and global levels. Several conservation and resource utilization programmes need to be introduced to the general public in an innovation and friendly manner. Experiences in selected in-situ and ex-situ conservation programmes are disclosed.

2

TOURISM DEVELOPMENT STRATEGY FOR LANGKAWI ISLANDS

Zainal Karib Abd. Rahim

Langkawi Development Authority (LADA)
Pulau Langkawi, Kedah

.

SUMMARY

The construction of the airport at Padang Matsirat, the development of Tanjung Rhu and the announcement of Langkawi as a taxfree island were all drastic steps taken by the Government to make Langkawi as a primary tourist destination in the region. In preparation for this, short and long-term research have been undertaken to determine the strategies for planning and executing programmes that would promote Langkawi as 'Natures Paradise'. Special efforts are now directed at the development of products that would attract tourists, enhance infrastructures, increase facilities for tourists, at beautifying and cleaning, and at the management of natural resources which are part of our primary assets. One of our new strategies is targeted at providing facilities for elite tourists and increasing the number of local residents to balance the lack of tourists outside of the holiday season.

In the tourism sector, Langkawi has to face a great deal of competition with other well-known destinations, hence its promotional strategies must be aggressive at both the international and domestic levels. The hard work put in by many quarters have paid dividends and now the annual total number of tourists who have arrived on the island have exceeded our original target. The establishment of the Langkawi Development Authority (LADA) as a promotional agency has clearly managed to raise Langkawi as a world-class destination.

3
THE CULTURAL AND AESTHETIC VALUE OF NATURAL HERITAGE

Hood Salleh

Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

This paper addresses the issue of perception of natural heritage by different stakeholders and the hazards globalization poses to its conservation. It also emphasizes the important role governance plays in ensuring sustainability of its cultural and aesthetic value.

4

THE LANGKAWI GEOPARK : CONCEPT AND IMPLEMENTATION STRATEGY

Ibrahim Komoo

Institute for Environment and Development (LESTARl)
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Geological and landscape resources could be used as a foundation for building an awareness on the importance of the environment and appreciation of the knowledge and beauty of the ambience that will fulfil the human emotion and consciousness. The Islands of Langkawi, with unique island and karst landscapes and diverse geological features that are appealing and of high heritage value, epitomise an incomparable national treasure that can serve this purpose. However, the attractiveness of Langkawi also lies in its local culture and traditions and some aspects of time that form the basis for economic activities.

In order to conserve the Island's geological uniqueness but at the same time make provisions for the utilization of resources, the GeoPark concept is evoked in the approach toward the development of the Islands that will simultaneously generate benefits for the local community and the nation at large. The concept addresses the development of an extended area that not only envelops a variety of special geological features that are significant, interesting and rare, but vital economic activities as well.

The Islands of Langkawi provide the premise for economic gain through tourism activities predicated on geological and landscape features (geotourism) and crafts based on geological materials (geoproducts). The strong association between geological features with local myths and legends impart the sociological bond between the cultural and scientific perspectives.

An important foundation of the GeoPark concept is ensuring there exists a balance of land use in three purposes of development: protection and conservation; residential and infrastructure; and tourism and recreation. To further the attainment of objectives of the concept, the policy, planning and guidelines pertaining to development are formulated based on the principle of deriving benefits from natural heritage resources (geological, biological and cultural) in a sustainable manner, taking into account the basic needs of the local community and the well-being of the visitors.

To ensure the successful implementation of the concept several strategies are introduced, including establishing a GeoPark management unit within the current administrative system; encouraging R&D in resource utilization for ecotourism; constructing environmentally friendly infrastructure; fostering local culture and traditions to enhance local participation in ecotourism activities; and integrating ecotourism requirements into the Islands' industrial development programme.

The philosophy and objectives of the Langkawi Development Authority are already in with the GeoPark concept, hence it is anticipated that an integration of the two approaches can be readily achieved.

5
MINERAL AND ROCKS DIVERSITY

Che Aziz A1i

Faculty of Science and Technology
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Mineral and rock form the basic component of the Earth crust. Various types of mineral and rock form various mineral suites which have given rise to rock diversity. A wide ranging, mineral and rock diversities in a specific area may be difficult to find, but if we look into it from an internal diversity perspective we may find that the diversities are unlimited. Infact, mineral and rock diversities have lead to other diversities such as diversity in community values, diversity of ecological systems and anthropogenic diversity. The mineral and rock diversities must be preserved for the benefit of our future generations.

6

FOSSIL DIVERSITY AND ITS CONSERVATION SIGNIFICANCE

Mohd Shafeea Leman

Faculty of Science and Technology
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Fossils which are naturally preserved in sedimentary rocks are very highly diversified in term of their taxonomic position, morphology, size as well as material and the type of preservation. These, mostly extinct ancient life forms have high heritage values both scientifically and aesthetically. Fossils are vulnerable to destruction by natural processes and human activities, and thus need urgent conservation efforts in the forms of in-situ or ex-situ conservation. Malaysian fossils are in great need of a National Natural History Museum as their final destination.

7
DIVERSITY OF THE GEOLOGICAL STRUCTURES

Tajul Anuar Jamaluddin

Geology Department
Universiti Malaya, Kuala Lumpur

SUMMARY

Geological features can be simply defined as important physical characteristics (form or shape) in the field of earth sciences. There are vast numbers of geological features in nature and thus they are usually specifically discussed under several subfields of geology. For examples, landscape, mountains, hills, plateau, caves, karst landform features (geomorphology) flora and fauna fossils features (palaeontology); and crystals and minerals features (mineralogy). This paper attempts to present diversity of structural geological features which forms the main subject in the field of structural, geology diversity of geological structures is attributed mainly to the following factors: a) genesis of the rock and structures, b) scale, c) quality of exposures and d) heritage values of the structures. Rock genesis results in various type of primary structures. Once the rocks are firmed, tectonic forces give rise to various type of secondary or tectonic structures. (e.g. folds, lineations, filiations, faults, shears, etc). Those structures can be found either on regional (mega) macro- or micro-scales. Depending on quality of the exposures, the structural features may be complete or incomplete, weathered or fresh, distinct or indistinct. Heritage values in possession of the structures) such as intrinsic (scientific, knowledge) aesthetic, uniqueness, distinctive or recreational values, enhance the degree of diversity of the geological structures. For geologists) the study of the structural diversity seems to be endless. Each and every components of the structural diversity has its own significance in the quest for the Earth's history and evolution. Whereas for the public, perhaps the aesthetic values (beauty, uniqueness, recreational) be of prime concerned.

8

A LEGAL BASIS FOR GEOLOGICAL HERITAGE CONSERVATION IN PENINSULAR MALAYSIA

Sarah Aziz
Ibrahim Komoo

Institute of Environment and Development (LESTARl)
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Conservation efforts would be ineffective if it lacks a legal basis. To date in Malaysia, emphasis has been made on the conservation of biological diversity, but there are efforts being made towards the conservation of geological heritage. This paper will focus on the different aspects of geological heritage conservation and the different laws that can be linked to it. It will also look at the roles of various government authorities (based on such legal basis) that have and may have jurisdiction and responsibility. Discussions will also be made on the validity for a stand alone legal regime for geological heritage conservation, and the need for its integration as part of cultural and natural heritage conservation as a whole to best serve the interest of a sustainable development.

9

DEVELOPMENT OF DIGITAL MAP FOR GEOLOGICAL HERITAGE RESOURCE OF SELANGOR AND FEDERAL TERRITORY

Saim Suratman

Department of Minerals and Geoscience
Kuala Lumpur

Zamila Abd. Rahman

Institute of Environment and Development (LESTARl)
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

A digital map of the geological heritage resources of the state of Selangor dan Federal Teritory has been produced using the GIS methodology. The preparation of this digital map was carried out by combining two key maps, namely topographical and geological maps, and using the basic database on geosites. This map is suitable to be used as a reference for the management of natural resources and also for land use planning.

10
DEVELOPMENT AND CONSERVATION OF GEOLOGICAL AND LANDSCAPE HERITAGE

Ibrahim Komoo

Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia, Bangi

H.D.Tjia

Petronas Carigali, Petronas Twin Towers KLCC
Kuala Lumpur

SUMMARY

This paper outlines the formation of landscape from the view of geological processes. It also highlights the potential heritage value based on their geological significance and expounds a detailed case study on Langkawi Islands as a potential geopark.

11

GRAVITY INVESTIGATION OF A SUSPECT METED RITE IMPACT CRATER IN LANGKAWI ISLAND, MALAYSIA

Abdul Rahim Samsudin
Umar Hamzah
Lim Cheng Han

Faculty of Science & Technology
Universiti Kebangsaan Malaysia, Bangi

Tjia H.D.

Petronas Carigali, Petronas Twin Tower KLCC,
Kuala Lumpur, Malaysia

SUMMARY

A detailed gravity survey was carried out to investigate the subsurface features of the suspected impact crater known as Mahsuri Ring in Langkawi Island, Malaysia. The gravity measurements were made at about 100 stations using a La Coste & Romberg gravity meter with distances between stations ranging from 200 to 500metres. In general, the gravity values are lower in the central portion of the impact structure and are relatively higher along the rim. The residual gravity anomalies along the E-W and NESW profiles were interpreted to obtain the depth and subsurface structure of the impact crater. The E-W profile shows two basin-like structures with the first one having a maximum depth of depression of about 107m and 2km in diameter. Another basin is found about O.5km to the west with depth of about 45m and 2.5km in diameter. These basins are mostly covered with Quaternary alluvium. The profile along the NE-SW direction across the impact crater also shows a depression structure with maximum depth of about 103m and 1.8km in diameter.

12

RADIOLARIAN FROM THE KUBANG PASU FORMATION AND KODIANG LIMESTONE: A KEDAH NATURAL HERITAGE

Basir Jasin
Zaiton Harun

Faculty of Science and Technology
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Chert is exposed at many localities in Kedah especially in the Kubang Pasu, Semanggol and Kodiang Formations. An assemblage of radiolaria was found from a chert sequence exposed at Bukit Binjal, Kedah. Eight radiolarian taxa were identified. The assemblage indicates an age of 347-354 million years (Tournaisian, late Early Carboniferous). The chert was deposited in an isolated basin of a passive continental margin during the high siliceous productivity. Clastic and radiolarian chert sequence exposed at the base of Bukit Kechil is the only clastic sequence in the Kodiang Limestone. The sequence distinguishes it from the Chuping Formation. Eleven radiolarian taxa were identified. The assemblage indicates an age of 241-243 million years (Spathian, late Early Triassic). The sequence was deposited in a relatively deeper environment compared to the limestone. The Kodiang Limestone was deposited in an unstable shelf environment.
The assemblage indicates an age of 241-243 million years (Spathian, late Early Triassic). The sequence was deposited in a relatively deeper environment compared to the limestone. The Kodiang Limestone was deposited in an unstable shelf environment.

13
UNIQUENESS OF SOME GEOSITES IN SABAH

Che Ibrahim Mat Saman

Department of Minerals and Geoscience
Kota Kinabalu, Sabah

SUMMARY

The origin and tectonic history of Sabah are different from other states in Malaysia, producing: different geological and structural features which are rare and unique. Amongst them are volcanic rocks that form the columnar joints at Sungai Balung, the ancient volcanic cone; Bukit Tiger, the hot spring in Sungai Aps, the Andrassy Hill pyroclastic conglomerate columns at Ladang Begahak, rock outcrops of the Chert-Spilite Formation at Tanjung Bangau, and the mud volcano at Ladang Jeroco.

14

ESR DATING OF SOME STALACTITES FROM THE KINTA AND LENGGONG VALLEYS IN PERAK, PENINSULAR MALAYSIA

D. Yoshida
A. Tani,
M. Ikeya

Graduate School of Science
Osaka UniversityOsaka, Japan

Ros Fatihah Muhamad

Geology Department, University of Malaya,
Kuala Lumpur, Malaysia

Mohd Shafeea Leman

School of Environmental Science and Natural Resources
Universiti Kebangsaan Malaysia, Bangi, Selangor, Malaysia

H. D. Tjia

Petronas Carigali, Petronas Twin Towers KLCC
Kuala Lumpur, Malaysia

SUMMARY

The stalactite samples from two caves, the Gua Naga Mas and Gua Gunung Runtuh, and from multilevel notches at Gunung Rapat in Perak, Peninsular Malaysia have been dated using the electron spin resonance (ESR) method. Copper ion (CU^{2+}) in copper sulphate penta-hydrate ($CUSO_4 \bullet 5H_2O$) having an intense wide ESR signal aroundg = 2.27-2.08 were used as a marker for calibration of the ESR signal intensity because conventional marker of MgO(Mn) was useless due to the impurity in Mn^{2+} content in the carbonate sample. Isotropic SO_2 axial SO_3 related with impurity and isotropic CO_2^-used for ESR dating were observed with those of Mn^{2+}. The external annual dose at the site of each sample was measured with thermoluminescence dosimeter (TLD) and the internal annual dose was determined from the content of uranium using inductively coupled plasma mass spectrometer (ICP-MS). Uranium-thorium disequilibrium of ^{238}U series was considered. Estimated ages were from 8.64 ± 0.26 ka to 139 ± 12 ka, which were identified to oxygen isotope stage 1 to 6.

15
GEOSITES OF PULAU LABUAN

Felix Tongkul

School of Science and Technology
Universiti Malaysia Sabah,

SUMMARY

Labuan Island, which consists of two major sedimentary rock units, Setap Formation, Belait Formation exhibits a variety of interesting sedimentary structures, sedimentary facies, depositional processes and depositional environments. This study has identified and characterized one geosite for Setap Formation and two geosites for Belait Formation. At Tanjung Punei, the Setap Formation is characterised by two sedimentary facies, namely disturbed sandstone-mudstone facies. These sedimentary facies shows slumping process on continental and turbidite depositional process in deep-water environment, respectively. At Tanjung Layangan and Tanjung Kubong the Belait Formation is characterised by three sedimentary facies, namely mudstone facies, mudstone-thin sandstone facies and pebbly sandstone facies. The sedimentary facies shows depositional processes on shelf, tidal delta and fluvial envirollmenls. Based on the depositional processes and environments of the two sedimentary rock units here, a history model of Labuan Island is produced.

16
THE MAHSURI RINGS IN LANGKAWI

H.D. Tjia

Petronas Carigali
Petronas Twin Towers KLCC, Kuala Lumpur
Wilayah Persekutuan

SUMMARY

An east-west elongated elliptical ridge structure on Langkawi main island is clearly visible on satellite imagery. A closer inspection and a gravity survey reveal two partially superimposed ring structures, each 2.4 km across and whose centres in 280° - 110° are 600 metres apart. The partial superposition indicates the eastern ring to have formed early, but it is further interpreted that both developed almost simultaneously by impacting extraterrestria1 projectiles some 10 million years ago. The structures are henceforth referred to as Mahsuri Rings. The regional north-northeasterly strikes of the Singa Formation shows disturbance in the vicinity of the rings, and may represent the influence of impact The most convincing evidences of shock metamorphism are planar deformation features in vein quartz that form dykes and sills in the Singa Formation at Sungai Batu Asah, 2 km east of the eastern Mahsuri Ring. Extinction mosaicism also exists in the quartz.

17
THE KUNDASANG ACTIVE LANDSLIDE LANDSCAPE, SABAH

Lim Choun Sian
Ibrahim Komoo

Institute for Environment and Develoment (LESTARI)
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

Landscape value is an assemblage of aesthetic and intrinsic component. Aesthetic value is the visual description of picturesqueness, endemic and uniqueness. While the intrinsic value or the hidden beauty of a landscape is the record or knowledge embedded within an object. Large-scale landslide is a very rare natural phenomenon in Malaysia. There are five units of large landslides in Kundasang. Infrastructure and settlement built on them sustained movements and failures. This geological active landscape is driven fry internal and external stimuli such as geology, groundwater condition and human activities. The adaptation of the local community towards the landsliding is a very unique phenomenon. Kundasang is a natural laboratory that needs further study and should be established as educational and research site for understanding natural phenomenon.

18
NATIONAL PARK, MIRI, SARAWAK

Mohd Shafeea Leman

Faculty of Science & Technology
Universiti Kebangsaan Malaysia, Bangi

Ibrahim Komoo

Institute of Environment & Development (LESTARI)
Universiti Kebangsaan Malaysia, Bangi

Dana Badang

Department of Minerals and Geoscience Malaysia
Kuching, Sarawak

SUMMARY

The Lambir National Park in North Sarawak is famous for its prominent hill ridges with fascinating landscapes of waterfalls and rapids nestling under thick canopy of lush green primary tropical rain forest. The river bed is occasionally full with potholes. Geologically, the entire park is made up of alternating sandstone and shale constituting part of the Middle Miocene (10-15 m.a.) Lambir Formation. Rich shelly fossil fauna and trace fossils are found in particular horizons of the formation. The Lambir Formation was deposited in a shallow marine environment. The development of the Lambir National Park landscape is a manifestation of continuous weathering and erosional processes which began some 5 million years ago (Pliocene age), after the uplifting of the North Sarawak.

19

POTENTIAL CONSERVATION ON SOME IMPORTANT KARST SITES IN KINTA VALLEY AND LENGGONG: A PRELIMINARY STUDY

Ros Fatihah Muhammad
Yeap Ee Beng

Department of Geology
Universiti Malaya, Kuala Lumpur

SUMMARY

In Kinta Valley, a number of isolated hills and in the form of cockpit karst outcropping in an area of about 200 km2and about 6 km2 in Lenggong area. The role of the wet and humid tropical climate has always been considered the main factor in forming the advancing stages in tropical karst. Beside being appreciated for its aesthetic value, the karstic terrain in the area is more appreciated for its richness in alluvial tin in the 70's and potential for marble quarrying. Poor management on the quarrying activities and lack of knowlegde of the importance of the karstic features among the public has done some degree of damage to the landscape. More recently, a few karstic sites in the Kinta and Lenggong Valleys have been recognised as worth preserving due to their importance in various fields. A few sites in G. Rapat, G. Terendum and G. Lanno show multilevel notches from a few meters below the ground up to about 21 meters above.

20

THE BEACH HERITAGE OF LANGKAWI : A CASE STUDY OF PASIR TENGKORAK AND TELUK BARU

Syafrina Ismail
Ibrahim Komoo
Joy J. Pereira

Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia

SUMMARY

Beaches are the most important landscape assets for mainstream tourism in Langkawi. The beach stores a diversity of geological and landform with heritage values. Beach landforms can be categorised into units of sandy, rocky, pebbly and muddy beaches. Two specific beaches, Pantai Pasir Tengkorak and Pantai Teluk Baru were selected in highlighting the heritage values based on their scientific aspects. Geological and landscape diversity that exists offers an intrinsic geological heritage which is suitable to be developed within the context of 'educational tourism' in enhancing the knowledge of the people who come for recreation and excursion on the beach.

21

THE DIVERSITY OF GEOMORPHOLOGICAL FEATURES OF STONG MIGMATITE COMPLEX, KELANTAN

Tanot Unjah
Ibrahim Komoo

Insitute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia, Bangi

Hamzah Mohamad

Faculty of Science and Technology
Universiti Kebangsaan Malaysia, Bangi

SUMMARY

The Stong Migmatite Complex represents a cluster of rocks that are unique and rarely found in Malaysia. In Kelantan, these rocks are exposed to form mountain landscapes that are interpreted as young stage geomorphology based on the presence of several waterfalls and rapids at the steep-sloped drainage areas. This study focuses on the characterization of the heritage value of a waterfall and two rapids. Based on the scientific (the historical record of rock origin) and recreational values, the Jelawang Waterfall is proposed as a Scenic Site, while the Lata Chenai and Jeram Renyok are proposed for conservation as Protected Sites.