

## Indonesian Experience in Developing National Geopark\*

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### Abstract

Indonesia is located in the junction of three geotectonic megaplates, namely Eurasian, Indian Ocean and Pacific plates. Those three plates collided in Indonesian region. The geological condition in Indonesia is therefore very unique. This region can be considered as the embryo of the development of the earth crust. However the intensive physical developments presently have threatened such unique geological phenomena. In general those developments have not adequately taken geological information into their accounts.

The rare geological evidences sometimes have been over shadowed by the importance of the physical development. The unique geological evidence might for instance, be inundated by the water body of the constructed dam. This situation remains in progress although necessary steps have been taken by the government. In this regards more communication to the government with the support and participation of international community's perhaps is recommended. The concept of Geopark therefore needs to be socialized particularly to the government and in Indonesia particularly to the local governments.

The Geoparks concept in conservation of an area based on geological aspect is something new for Indonesia. However, quite similar concept had been applied to the "Karangsambung" a most famous geological heritage in Central Java. Because of its unique geological condition, the Local Government had already promulgated the Act of Karangsambung Reserved Area. In November 2006, this geological reservation was officially inaugurated by the President of Indonesia. The event was a very important landmark identifying the government's strong support on the development of the Reservation based purely on the geological consideration. This area is used for research, education, geotourism with applying the sustainable development plan.

The local government regulation or act is at present the higher legal foundation for the protection of the natural resources. However in the field of the regulation on reservation area the existing laws have not been synchronized with this new system effective since 2000. The Laws No. 41/1999 for instance regulates the reservation on the flora and fauna bases. It is therefore from as many as 519 units of 28,166,580 Ha reservation areas in Indonesia nowadays, almost all of them promulgated under the Law on Forestry managed by Ministry of Forestry. Some participation came from Ministry of Environment and Ministry of Culture and Tourism.

The unique geological phenomena which have been protected under the Forest Reservations are among others the Tangkuban Parahu Crater, Ciater hot spring resort and Gedeh-Pangrango volcano in West Java and the Tengger Caldera in East Java. The other phenomena fall under the cultural inheritance namely the site of early man *Pithecanthropus erectus* in East Java.

The handicap that faced by the local government is the law in the protection of geological assets and inheritance is the absence of the national law concerning this matter. The Draft of the Geological Act however is being prepared by the Government. The Association of Geologists had earlier proposed the thought on the importance of the Act on Geological Inheritance.

**Keywords:** Geoparks, Conservation, Karangsambung, National Park

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## Introduction

Indonesia is located in the junction of three geotectonic megaplates namely Eurasian, Indian Ocean, and Pacific Plates. Those three plates collided in Indonesian region. The geological condition in Indonesia is therefore very unique. The country comprises of more than 15,000 of islands stretching from the west to the east for about 5,000 km. The Indonesian island is the biggest archipelagoes in the world. Van Bemmelen (1954) mentioned that mountain building is taking place in Indonesia. This phenomenon is very rare and only one across the world. The geological condition of western, centre and eastern part of the country are also very different, as each part is built up from different plate collision. The country is well known as part of “The Ring of Fire” where more than 13% of world active volcanoes are lie across of the Indonesia islands.

There are many geological inheritances spreading across the country, such as: the locality of the pithecanthropus erectus fossils; key fossil such ammonite in limestone; outcrops of mélange of oldest rocks; karsts morphology; type locality of rock formation; grand canyon; atoll; hot spring; geyser; oil seepage; mud volcano, waterfall, permanent tropical snow, natural torch, etc. However the intensive physical developments presently have threatened such unique geological phenomena. In general those developments have not adequately taken geological information into their accounts.

The rare geological evidences sometimes have been over shadowed by the importance of the physical development. The unique geological evidence might for instance, be inundated by the water body of the constructed dam. This situation remains in progress although necessary steps have been taken by the government. In this regards more communication to the government with the support and participation of international communities perhaps is recommended. The concept of Geopark, promoted by the UNESCO, therefore needs to be socialized particularly to the government and in Indonesia particularly to the local governments. The Geoparks is a national protected area containing a number of geological inheritances. The geopark is an integrated concept of protection, education and sustainable development.

## The Regional Policy of Nature and Geological Conservation

In Indonesia the nature conservation areas are purely consider based on its characteristics of specific ecosystem that containing rarity in population of flora and fauna or its landscape natural beauty. The conservation areas are mainly promulgated under the Law issued by Ministry of Forestry. Some participation came from Ministry of Environment and Ministry of Culture and Tourism.

The Act 5 of 1990 concerning “The Conservation of Living Resources and Their Ecosystems” and Act 41 of 1999 concerning “Forestry” are basic of national legislations to define policies and programs of Directorate General of Forest Protection and Nature Conservation (DITJEN PHKA, 2007) of Ministry of Forestry to state several areas becomes a Conservation areas in Indonesia inform of:

- **National Park (Taman Nasional):** is a natural conservation area (land or marine) with an original ecosystem managed under zoning system for scientific, education, support of plant propagation and animal breeding, tourism, and recreational purposes.
- **Nature Recreation Park (Taman Wisata Alam):** is a nature conservation (land or marine) area mainly for the benefit of ecotourism and recreational site.

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- **Grand Forest Park (Taman Hutan Raya):** is nature conservation specifically dedicated for collection of animal and plant species, both indigenous and exotic for research, scientific, support for plant and or animal breeding, culture, tourism, and recreational purposes.
- **Strict Nature Reserve (Cagar Alam):** is a forest with specific characteristic with its function to sustain plant species and their ecosystem and serve as an area that serves as life supporting system area.
- **Wildlife Sanctuary (Suaka Margasatwa):** is a forest with specific characteristic with its function to sustain wildlife species and their ecosystem and serve as an area that serves as life supporting system area.
- **Hunting Park (Taman Buru):** is forest area allotted for game hunting recreation.

Nowadays, Indonesia has as many as 519 areas of around 28,166,580 Ha (Table 1) conservation area in the forms of above mentioned conservation types. Some of those protected area is also declared by UNESCO as Biosphere Site, World Heritage Site and Ramsar Site.

**Table 1. Types and Numbers of conservation area in Indonesia (Ditjen PHKA, 2007)**

No	CONSERVATION TYPES	NUMBER OF UNIT	AREA ( HA)
1	<b>STRICT NATURE RESERVE</b>		
	a. Land	228	4,456,488.59
	b. Marine	9	274,215.45
	<b>Total</b>	<b>237</b>	<b>4,730,704.04</b>
2	<b>WILDLIFE SANCTUARY</b>		
	c. Land	70	5,083,704.54
	a. Marine	7	339,218.25
	<b>Total</b>	<b>77</b>	<b>5,422,922.79</b>
3	<b>NATIONAL PARK</b>		
	d. Land	42	12,165,845.14
	a. Marine	8	4,218,349.00
	<b>Total</b>	<b>50</b>	<b>16,384,194.14</b>
4	<b>NATURE RECREATION PARK</b>		
	e. Land	101	300,411.73
	a. Marine	18	765,500.70
	<b>Total</b>	<b>119</b>	<b>1,065,912.43</b>
5	<b>GRAND FOREST PARKS</b>	21	343,454.41
6	<b>HUNTING PARKS</b>	15	219,392.49
TOTAL LAND CONSERVATION AREAS		477	22,569,296.90
TOTAL MARINE CONSERVATION AREAS		42	5,597,283.30
<b>TOTAL CONSERVATION REGION</b>		<b>519</b>	<b>28,166,580.30</b>

The current governmental (Decentralization Autonomy, OTDA) system of Indonesia laid the emphasis on the autonomy where the local governments are given the authorities among others to manage their own resources both from exploitation and protection or reservation sides. In this regards the authoritative body to manage the protection of geological inheritance is the local government. The local

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government regulation or act is at present the higher legal foundation for the protection of the natural resources (Sudradjat, 2003). However in the field of the regulation on reservation area the existing laws have not been synchronized with this new system effective since 2000.

In the field of geology, the protection was based heavily on the authority of the local government. The karts morphology has been assigned by the Ministry of Energy and Mineral Resources to be classified reserved or subject for exploitation. Based on this ministerial regulation, local governments among others West Java government already issued the Local Government Act on Karts Morphology of Pawon Cave, in Citatah – Padalarang a few kilometers distant from Bandung, the capital of West Java Province. The protection was deemed necessary because of the intensive exploitation of the limestone's in this area. Pawon cave not only contains the karts cavities but also the artifacts of the early populations of this area.

However, the improvements was not followed by the main involves of geological institution and Indonesian Association of Geologist and related institution. They have not classified at the beginning the area to protect due to its geological heritage sites. It seems the inventarization for such geological heritage site was too late. There are many geological sites across the country have been inventoried by geological institution (Badan Geologi) under the Ministry of Mines and Energy or Education Institution (University), but mostly are for used of natural resources information; exploration and exploitation of energy and mineral resources; natural hazard mitigation such as earth quake, volcanoes eruption, landslide, tsunami and floodplain. In contrast, the inventarization for preserve geological sites mostly untouched, except for groundwater conservation. Karts morphology in Citatah, is one of an example. The authorities have not classified the karts morphology trough out Indonesia. So far, the classification should be based on the importance of the karts in view of economy, such as to maintain ground water and in view of geological inheritance covering among others the speleology and the archeology.

The unique geological phenomena which have been protected under the Forest Protection are among others the Kelimutu National Parks in Flores, famous for its three crater lake of different color; Kerinci Seblat National Parks in Bengkulu, for an active Sumatera Fault Zone phenomena; Bunaken National Marine Parks in North Sulawesi, for its coral reef and marine habitat; Tangkuban Perahu National Parks, in West Java, for its three active calderas and an Active Lembang Fault Zone; Tengger Caldera in East Java, for its caldera. The other phenomena fall under the cultural inheritance namely the site of early man *Pithecanthropus erectus* in East Java. The fossil of early man was dated back to 700,000 years ago and was considered to be one of the “missing links” in Charles Darwin's evolution theories.

Meanwhile, the Local and Regional Government attention to the conservation of geological inheritance site is more intense. The oldest rocks in Indonesia cover Permian to Jurassic age however the Tertiary rocks dominated the area. The earth's crust is very unstable. Because of the megaplates collision the region is intensively faulted that originated the earthquake and active volcanoes. The geological events are depicted in such phenomena. The crushed rocks called *mélange* identifying the margin of the ancient plates of Eocene age are very readily identifiable in Karangsambung area. This type of rocks distribute in a very limited area exposed from the thick covers of the Tertiary rocks of Java Island. Because of its unique geological condition, the Local Government had already promulgated the Act of Karangsambung Reserved Area. In November 2006, this geological reservation was officially inaugurated by the President of Indonesia. The event was a very important landmark identifying the government's strong support on the development of the Reservation based purely on the geological consideration.

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The other geological phenomena that need to be reserved are among others the permanent tropical snow in Papua, the oil seepages and natural torch in East Java, the Kintamani caldera and Batur lava flows in Bali, the grand canyon miniature of thick ash flow deposits in Lembah Anai, West Sumatera and the Ciletuh Bay in Sukabumi area, southern part of West Java. Concerning Ciletuh Bay it is being intensively investigated and soon to be proposed to the government for the site of geological reservation (Rosana et al, 2007). This area has already been assigned by the government as the reservation area based on the unique flora and faunal elements. However it needs to be extended to cover the amphitheater topography and the Eocene mélange.

The handicap that faced by the local government is the law in the protection of geological assets and inheritance is the absence of the national law concerning this matter. The Draft of the Geological Act however is being prepared by the Government. The Association of Geologists had earlier proposed the thought on the importance of the Act on Geological Inheritance.

### **Geology Nature Reserve of Karangsambung (“Karangsambung Geopark”)**

The conservation in term of Geopark concept is new concept and not yet applies in Indonesia. A Geopark is a nationally protected area containing a number of geological heritage sites of particular importance, rarity or aesthetic appeal. It is part of an integrated concept of protection, education and tourism linking with sustainable development. In Indonesia, similar concept is applied to conserve a geological heritage sites in term of “Nature Geology Reserve (Cagar Alam Geologi)” or “Karangsambung Geopark”. This model is an integrated between protection, education and geotourism to sustained development of the region. The first Indonesian Geopark named “Cagar Alam Geologi Karangsambung” was launched in November 2006 by the President of Republic Indonesia.

Karangsambung Geopark lies between 109°35’-109°41’longitude and 7°25’- 7°36’latitude for more than 210 km<sup>2</sup> that included within three administrative district of Kebumen, Wonosobo and Banjarnegara of Central Java Province. The Park is accesable until the main building of the Park office by car for about 19 km from the city of Kebumen. The Park is manage by Operational Technical Unit (UPT) under the Deputi of Geotechnology of Indonesian Institute of Sciences (LIPI).

The geological heritages obejcts of the Karangsambung Geopark are outcrops of melange complex of Pre-Tertiary (120~64 Ma) ages and its belived as tectonic fossil resulted from the subduction of the Indian Ocean Plate beneath the Eurasian Plate. The topographic of the Park is also unique it shows an amphitheatre likes morphology indicating the specific tectonic setting. The Park becomes the best place to study plate tectonic concepts. The variety of litology and morphology of the plate tectonic products are spreading within the Karangsambung Geopark as the proven of the New Global Tectonic Theory.

It was a long history process before the Karangsambung is declared as Geopark. The first geologist who studied the geology of Karangsambung region was young Dutch geologist Verbeek (1891) in Asikin (1974). Followed by Harlof (1933) in Asikin (1974), who mapped the Karangsambung geology in more detail. After that, Sukendar Asikin the Indonesian geologist (now, former Rector of STTNAS Yogyakarta) in 1958 began to research in the Karangsambung region and he plan to establish the area as a ”Campuss of Field Geology”. The plan was then realized in 1964 by the support from Deputi of Geotechnology LIPI and Departement of National Research (DURENAS). Summer 1965, the Field Geology Campuss of Karangsambung was firstly used to traine the candidate of young geologist from several higher education institution of ITB, UGM, PTPN Veteran and AGKP Pertamina. The programs

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were continue within the minimum facilities of the Campuss. In order to improve the program and the accomodation of the campuss facilities, in 1987 LIPI has improved the management of the campus under new name: "Operational Technical Unit of Laboratory Karangsambung (UPT-LAGK)". The UPT responsible to establish the relationship with the local community and socialized and traine all about geology of the regions and its utilization to the Public.

The development of campuss facilities are more intense from 1993 ~ 1995, such as dormitory, class rooms, library, museum, main office and workshop for rocks preparation, have been built. In 2002, the management of the UPT is upgrded and become directly under the deputi with the new name "UPT Balai Informasi and Konservasi Kebumian (UPT-information centre and geology conservation). The UPT staffs are mostly geologist of undergraduate until doctorate level. The November 14, 2006 is the historical moment for the UPT, the Government officially inaugurated the UPT-Karangsambung to be the first Nature Geology Reserve area named: **"Cagar Alam Geologi Karangsambung (Karangsambung Geopark)"**.

The main function of the Karangsambung Geopark is conservation for geology heritage sites within the area, eduation and geology information services. The Karangsambung geopark is intensively used for research about geology by geologist from many different institutions; socialization of geohazard mitigation and teaching all aspects of geology for non geologist community. Besides those functions, the park is opened for geotourism. The geotourism objects are mainly the variety of rocks outcrops starting from conglomeratic sandstone, nummulites and Discolyclina limestone, fillow lava, schist, gneiss, marble, serpentinite-peridotite, chert, scallyclay, gabbro, diorite, eclogite and gemstone formations. The amphitheatre landscape, Krakal hot spring, geological museum and stone workshop are amongs others intersting site.

The Karangsambung Geopark is accomodated with good facilities. The Dormitory is enough to accomodate for 200 unit bedrooms; 5 guest houses with 10 unit bedrooms that all equiped by TV channel, air conditioner, bathroom, and toilet. The main Hall (Aula) can accomodate for 400 people, several class rooms, museum, that equiped by air conditioner, fan and sound system, CD/VCD/DVD player, LCD, overhad projection and slide projector; and workshop for gemstone, and souvenir shop. The sport facilities of badminton and footbal field and jogging track are available.

## Conclusion

The Indonesian geological condition is very unique due to its located in the junction of three geotectonic megaplates that collided in Indonesian region. However the intensive physical development presently have threatened such unique geological phenomena.

In Indonesia, conservation areas are mainly on the bases of forest protection and nature conservation comprise the efforts to protect the existence of forest area and its reseources; to implement regional conservation and biodiversity; and development of ecotourism and environmental services. Mostly the reservation areas are promulgated under the Act 5 of 1990 concerning "The Conservation of Living Resources and Their Ecosystems" and Act 41 of 1999 concerning "Forestry" of the Ministry of Forestry. Some conservation areas are promulgated under the Law of the Ministry of Environment and the Ministry of Culture and Tourism.

In the field of geology, the local government regulation or act is the higher legal foundation for protection of the natural resources. However, several unique geological phenomena have been protected

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under the Forest Reservation. There are many others geological phenomena that need to be reserved, the handicap faced by the local government is the law in the protection of geological assets and inheritance is the absence on the national law concerning the matter. The Draft of the Geological Act however is being prepared by the Government. The Association of Geologists had earlier proposed the thought on the importance of the Act on Geological Inheritance.

The Geopark, an integrated concept of protection, education and sustainable development is new approach in Indonesia that concerning reservation area, which containing numbers of geological inheritances. Therefore needs to be socialized particularly to the government and in Indonesia particularly to the local governments. The Cagar Alam Geologi Karangsambung (Karangsambung Geopark) is the first conservation area that the development of the reservation based purely on the geological consideration. The development model of the park is quite similar with the geopark concept of UNESCO.

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