

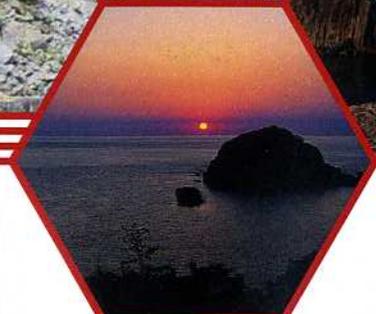


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山陰海岸ジオパーク

GEOPARKS  
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GEOPARKS  
NETWORK

## **The role of IUCN WCPA Geoheritage Specialist Group (GSG) activities for geoparks**

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IUCN Resolutions 4.040 (2008) and 5.048 (2012) both clearly recognize that geodiversity is part of nature and geoheritage is part of natural heritage. Formal recognition of the geodiversity component of protected areas was made in 2008 in the revised IUCN Guidelines for Applying Protected Area Management Categories. All 6 of the IUCN Protected Area Management Categories are applicable to the protection of geoheritage. Although geoparks are not a protected area category as such, and may only include some parts of protected areas as geosites, the UNESCO-supported Global Geoparks Network also provides an international framework to conserve and enhance geoheritage, as does the UNESCO World Heritage List. The IUCN WCPA GSG was established in November 2013 to provide advice and guidance on all aspects of geodiversity and geoheritage for establishment and management of protected areas, the integration of geodiversity into IUCN's programs, and the promotion of better understanding of the links between geodiversity and biodiversity. The future plans for GSG are 1) to develop a Best Practice Guideline on geodiversity, 2) to develop thinking on the link between geodiversity and biodiversity, 3) to develop better guidance under WH Criterion (viii), 4) to increase knowledge of IUCN protected areas categories, 5) to develop guidance on the relationship between UNESCO Geoparks and IUCN Category I-VI and 6) to promote geodiversity within the work of IUCN globally, regionally and thematically. It is hoped that the geopark community will play a significant role for future GSG activities

[http://www.iucn.org/about/work/programmes/gpap\\_home/gpap\\_biodiversity/gpap\\_wcpabiodiv/gpap\\_geoheritage](http://www.iucn.org/about/work/programmes/gpap_home/gpap_biodiversity/gpap_wcpabiodiv/gpap_geoheritage)

## Global geoparks network: from the voluntary network to the international association

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The Global Geoparks Network (GGN) established in 2004, under the umbrella of UNESCO, as an international network, which provides a platform of cooperation among Geoparks. The GGN brings together governmental agencies, local authorities, universities, research institutions, non-governmental organizations, scientists and experts from countries around the world. The GGN consists a unique worldwide partnership including 111 Geoparks in 32 countries working to protect Geological heritage and promote local sustainable development. The GGN mission is to influence, encourage and assist local societies all over the world to conserve the integrity and diversity of abiotic and biotic nature, to ensure that any use of natural resources is equitable and sustainable and to support economic and cultural development of local communities through the valorisation of their unique heritage and identity. In 2014 after one decade of successful operation as a volunteer network the GGN was ready to gain legal personality. The GGN General Assembly during the 6th International Geoparks Conference in Stonehammer Global Geopark, Canada agreed to the new GGN Statutes and the GGN became an international non-profit association, operating under the French law. Thus GGN will be able to participate in the procedures and become partner with UNESCO for the creation of the UNESCO Global Geoparks under the umbrella of the International Geosciences and Geoparks Programme (IGGP). Thus the GGN, since September 2014, is a non-profit association subject to French legislation (the 1901 law on associations) and a non-governmental organisation maintaining formal relations with the United Nations Educational, Scientific and Cultural Organisation (UNESCO).

# **VOLCANIC GEOPARKS WORKING GROUP: A PROPOSAL AT THE AIM OF THE GGN FOR PROMOTION AND NETWORKING AMONG GEOPARKS**

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Worldwide many Global Geoparks are relevant volcanic areas, including those with quaternary and active volcanism, with an impressive footprint on the landscape of volcanic forms and structures such as scoria and tuff cones, maars, composite volcanoes, calderas, dykes, necks, hot springs and lava caves (cf. Wood, 2009).

Spectacular volcanic landscapes in Global Geoparks become dominant figures attracting visitor's interest and basis for geotourism and educational activities as well as promotional tools. In addition, those territories often face similar management challenges, both on social, economical, educational and environmental issues.

In March 2015, among the 111 Global Geoparks (from 32 countries) about 1/3 overall comprise territories with Miocene to Quaternary volcanism. This is a good basis for the establishment of the first inter-regional GGN Working Group including volcanic Global Geoparks from the Asian - Pacific and the European Geopark Networks. Thus, at the aim of the GGN this thematic Working Group will enhance cooperation among the Global Geoparks having such a common characteristic.

The present paper is a first step to achieve such goal, to be followed by a questionnaire to be filled by every Global Geopark.

At the aim of this GGN-WG and through a step-by-step approach it is expected to get reliable data on each territory that allows to build a global database for the "volcanic geoparks", and to achieve a close cooperation among the geoparks staff and communities all over the World, sharing good practices and management policies, namely on social, economical, educational and environmental impact of active volcanism and natural hazards.

Furthermore, it is foreseen the joint promotion of the territories, especially in terms of geotourism and volcano tourism, including the edition of joint leaflets and other adequate communications tools.

## Aiming at a new collaboration of the global ‘peridotite geoparks’

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Mt. Apoi, Hokkaido, Japan, is composed totally of peridotites derived from the Earth’s mantle. The uplifting event of the peridotites has been explained as a westward thrusting of the North American plate on the Eurasian plate during the building stage of the Hidaka Mountains. The Mt. Apoi Geopark demonstrates the main theme ‘A story of gifts from deep inside the Earth connecting land and people together’ with three subthemes on the distinct categories of geology, ecology, and human history. The first subtheme is on peridotite, which is to understand the Earth’s interior and dynamic movement.

The following ‘peridotite geoparks’ are organizing a number of excellent peridotite geosites:

1.

Orogenic lherzolite: Mt. Apoi Geopark (in the Hidaka mountains, Japan), and Secia-Val Grande Geopark (in the Ivrea-Verbano zone, NW Italy).

2.

Ophiolitic peridotite: Geopark Harz Braunschweiger Land Ostfalen (the type locality of ‘harzburgite’, Germany), Lands of Knights Global Geopark (in the European Variscan orogenic belt, Portugal), and the Oman ophiolite geopark (in preparation).

3.

Peridotite xenolith: Jeju Island Geopark (Korea), and Azores Geopark (Portugal). Because of the unique origin of peridotites, all the ‘peridotite geoparks’ have a common subject encouraging visitors to think about the Earth’s interior, such as basaltic magma sources beneath active island-arcs, the global-scale dynamic movement, such as mountain building during plate collisions, and also the specific natural environment, such as alpine flowers in the peridotite mountains. In close communication with other ‘peridotite geoparks’, we aim to establish a new joint program of the global ‘peridotite geoparks’.

## **LINKING AP GEOPARKS WITH ASIAN ECOTOURISM NETWORK ::: SUSTAINABILITY AND MARKETING ADVANTAGES**

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There are many forms of tourism that appreciate the natural elements integrating the communities and conservation efforts yet there seem to be some redundancies in reinventing the wheel. Masaru Takayama, the founding chair of Asian Ecotourism Network and the former vice chair of The International Ecotourism Society walks the audience through the latest trends and developments on ecotourism in Asia and affected regions with emphasis on the importance of working in collaboration with international agencies and associations that promote sustainable tourism. Masaru also shares how geotourism products can effectively penetrate the tourism supply chain as he is an on-site evaluation judge for the Tourism for Tomorrow Awards celebrated by World Travel and Tourism Council and the president of the pioneer ecotravel agency, Spirit of Japan Travel, in the ancient city of Kyoto, Japan. The audience will recognize the importance of delivering the best practices in sustainable tourism within the industry globally, based upon the principles of environmentally friendly operations; support for the protection of cultural and natural heritage; and direct benefits to the social and economic well-being of local people in travel destinations around the world. The insider's introduction of Global Sustainable Tourism Criteria for the hotels, operators, and the destinations are not to be missed.

## **Getting to know the China Geoparks Network and its transferable success factors**

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At present, out of 111 global geoparks in 32 countries, 31 are China. In addition to providing better protection for geosites, China's geoparks are delivering obvious benefits to local communities through ongoing local engagement activities and improvement initiatives.

China has designated 185 national geoparks so far. Rich in geological resources, these geoparks have been developing rapidly under the umbrella of the China Geoparks Network (CGN). To cope with the increasing number of visitors and to meet their expectations, proper geopark management and operations, along with quality visitor services, are key challenges to all CGN members.

This presentation aims to give an overview of the development of the CGN over the last 10 years. We will discuss some of its critical success factors and their application to other geoparks in the Asia Pacific region and in the Global Geoparks Network (GGN). We will also explore opportunities for long-term collaboration between the CGN and other geoparks in the GGN.

## Revision Of The 'Operational Guidelines For National Geoparks of China' And Its Significance

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The concept of Geopark can be traced back to the 1980's in China. The Ministry of Land and Resources (MLR) formally launched the national geoparks programme in 1999, 185 national geoparks have nominated until 2014.

The MLR issued the 'Operational Guidelines for National Geoparks of China' in 2006. The Guidelines introduced the criteria of the national geopark and related basic geosciences. In nearly a decade, the Guidelines have guided the creation and management of geoparks in China, have become important references for geoparks managers at all levels. But with the constant improvement of 'Regulations for National Geoparks', the Guidelines needs revising.

The 'New Guidelines' firstly summarizes the development of geoparks in China, introduces the program of planning, approval and title of the national geoparks, including the qualification, the types and requirements of the application materials, and the construction and acceptance criteria, etc. The second part is the key point, focus on management institution and planning, survey, evaluation and protection of geoheritage, popular science, interpretation, geotourism and promotion, is the editor's practical experience for more than ten years.

Geoparks have played an important role in promoting the geoheritage and environmental conservation, geosciences popularization, employment opportunities, sustainable tourism and civic scientific literacy. The comprehensive benefit is remarkable and geoparks were widely accepted by the local government and the society. Geoparks have become a best way of sustainable utilization of natural resources. The 'New Guidelines' maintain the characteristics of China, which is 'development based on conservation, and conservation in development'.

## Progress report of Taiwan Geoparks Network

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Following the guideline of Global Geopark Networks, the Taiwan Geoparks Network was launched in 2011. The purpose of setting Taiwan Geopark Network is trying to (1) establish a national network for promoting the concept of geopark; (2) exchange the experience of management of the sites; (3) educate visitors to protect the landscape for the purpose of sustainable development during using or visiting the geological/ geomorphological/ ecological and cultural heritage and (4) promote local involvement as well as geotourism.

This presentation is trying to explain the progress of geopark network in Taiwan.

There are eight geoparks in Taiwan on 2015. The concepts of landscape conservation, geotourism, local involvement and environmental education become core value in Taiwan.

Through landscape resource inventory, education program will also involve local community, government, school and other stake holders. The geoparks network involved national scenic area, nature reserve, and national protected area and national park authorities. Seven network meetings were held in the last four years. Supporting from the Forestry Bureau and Tourism Bureau, geoparks network program is a supporting system to all the geoparks in Taiwan. It is hoped that through time, these geoparks can play an important role for environmental education, local ecotourism, and sustainable development.

From this study, some progress of Taiwan Geoparks Network should be stressed as below:

1. Eight geoparks has been designed.
2. Local involvement and local industry will be an important work for geopark activities.
3. Geo-products from each Geopark raised awareness for local people and visitors which is also important for local economics.
4. Supporting from government is very important at the beginning stage of Geopark industry.

## Geoparks and the Society: A Tale of Two Awarded Buildings in Geoparks of Taiwan

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This paper provides a critique towards two lately (2010-2011) awarded architectures that were built in Geoparks of Taiwan and deciphers the entangled relationship between the geopark and society. Firstly, the building of Lan-Yang Museum, at the Northeastern Coast Geopark, successfully appropriates the landform of *cuesta*, which shapes the fundamental local landscape of the Geopark. Secondly, the establishment of Xiang-Shan Visitor Center and the Administration of the Sun-Moon Lake Scenic Area is designed with an expectation to entrench itself in surrounding landscape, but *de facto* shows its domination over geomorphology with coercion. Two conclusions are derived from the tale of the case studies. First, in the sense, geopark is socially constructed by the society at its epoch; and second, architects and their society are actually hegemonic over geopark landscape rather than as claimed with the rhetorics of 'green architecture' or 'sustainability' which are the goals of developing geoparks.

## Geology And Geoheritage Conservation Within Aspiring Geopark Merangin Jambi, Indonesia

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The Merangin is located of central Sumatera at Merangin river covering an area of about 20.606 square kilometer. These rocky tropical legendary islands are rich in geodiversity, many of which have scientific value of national and regional significant. Kerinci is the high land Geopark the region's most complete volcanic geological history and outstanding beauty of tropical island highland landscape. And Merangin area is The Palaebotany of aspiring Geopark contain among others the oldest strata in the region, complete Palaeozoic succession Early Permian, and best sedimentological and palaeontological evidences affiliating Merangin. Merangin geoheritage sites are mostly protected within the Indonesia Government nature conservation concept of Highland Park and Paleobotany Park where rock conservation is equally treated as biological conservation and other nature conservation components. Each of which highlights a unique geology and geological landscape . Conservation area is another large national park (Kerinci Seblat) that is protected by state and geoheritage protected sites . Although a number of natural heritages and national parks exist on 'geological' bases, geodiversity concepts are less concerned about biodiversity due to a lack of recognition. Recently, geotourism linked to geodiversity has been activated in worldwide and geopark programs have been established in many countries. These precedents offer good chances for the use of geoheritage and preservation of geodiversity. Geopark programs can lead to the preservation of geodiversity and public geoeducation through tour of geosites.

Keywords: geoheritage site, Paleobotany Park, Highland park

**INCREASING COMMUNITY ENVIRONMENTAL AWARENESS  
THROUGH GEODIVERSITY CONSERVATION ACTIVITIES  
IN THE GEOPARK**

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Phenomena in Indonesia about precious stone in which its demand have increased sharply, threatens the environment sustainability. Geopark is one form of sustainable development that implement new paradigm natural resources management, which makes natural resources as a source of economic growth but through tourism development. Geoheritage is geodiversity that have more value as an inheritance, as it became a record of an event on the earth. Significant geological features of scientific, educational value, cultural, and aesthetic. Geological Conservation is an extraordinary geological phenomenon (outstanding) which is the first step to take advantage of geodiversity through a planned program to protect its existence. Three main reasons geodiversity conservation, namely: has the values of science, which is beneficial for human life and ecosystems supporting, non-renewable nature, many forms of geodiversity is very sensitive to disturbance, especially threatened (damaged or destroyed) due to various human activities. Ciletuh region have unique geological diversity and the age of the rocks are amongst the oldest in West Java. The results showed that the level of public awareness of the environment is still low, because they tend to prioritize their livelihood, and have the tendency to exploit natural resources. Therefore, it is needed a strong environmental campaign to raise public awareness that geodiversity needs to be protected.

Key words: Environmental Awareness, Geological Conservation

# PREPARATION TO BECOME NATIONAL GEOPARK & GGN MEMBER: CASE STUDY CILETUH GEOPARK, WEST JAVA, INDONESIA

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The Ciletuh region is located in west coast of West Java Province, Indonesia. This area since last year becomes very popular amongst the traveler of special adventure of nature diversity and geo-tourism. The spectacular geomorphological landscape of the region is representing the giant amphitheater that opens directly to beautiful blue ocean of Ciletuh Bay and supported by several wonder of waterfall. The rocks formation within the area is represent the tectonic fossil of subduction between Eurasian and Indo-Australian plates during the Cretaceous age. This complex has a very unique geological diversity and the oldest rock formation in West Java. The rock formation consist of the ophiolite complex; metamorphic; sedimentary, and volcanic rocks. The Ciletuh region, now is proposing to become first National Geopark site in West Java The total geopark area is about 454 km<sup>2</sup> (45.410 Ha) consist of land and included several small islands in the costal side. Within the area also located Cibanteng Nature Conservation for bufallo and Cikepuh Nature Conservation for green turtle and other flora and fauna. The area is covering almost 13 villages with local communities' population. Several preparations are ongoing conducted by local and provincial government collaboration with Universities and National Company in order to provide document for National Geopark and GGN applications. Several facilities for tourism activity, sign board information about the geosite, leaflet and brochure also prepared. Several tourism events will be conducted within this year to promote the area as National Geopark and become new destination for Geo-tourism in Indonesia.

## TAMBORA NATIONAL PARK TO GEOPARK GLOBAL NETWORK (GGN)

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The eruption of Tambora in 1815 has been drawn much attention because of the large impact around the globe. The dust veil entering the stratosphere, brought over the atmospheric change. In Sumbawa Island, three of the Kingdoms had been perished. A total number of 92 thousand people were dead, caused by the impact of the eruption. The culture and language were also vanished. People in other island west of Sumbawa had been also suffered. Many people died in Lombok and in Bali Island.

The extra-ordinary volcanological phenomenon and the cultural heritage found in Tambora area are very unique and important for scientific studies. The moment of bicentennial commemoration provides the opportunity to proceed with the preposition toward the realization of Tambora Geopark.

The aim of National Park and the Geopark of Tambora is to preserve the flora and fauna as well as the geological conditions. The main objective of the Geopark is to maintain the sustainability of the development of the area. The uniqueness of Tambora is an important pillar for the Geopark development of Tambora itself.

Tambora has been settled as a National Park by the declaration of the President of Indonesia, Joko Widodo on April 11<sup>th</sup>, 2015. In conjunction with the bicentennial Commemoration of the huge disaster of the eruption of Tambora, therefore, all the entirely government officer as well as central and local have been committed to support the Tambora National Park as one of the member of Geopark Global Network (GGN).

Keywords: Tambora National park, eruption of Tambora, geopark.

## THE ROLE OF KELIMUTU NATIONAL PARK TO SUPPORT GEOCONSERVATION AND GEOPARK DEVELOPMENT

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Kelimutu National Park has an important role in conservation natural resources for research, education, and tourism. The site is situated in Flores Island, East Nusa Tenggara as the product of the collision of Eurasian and Australian plates. This setting creates a high geological diversity and provides an opportunity to be developed as geoconservation and geopark.

Geoheritage is a concept to represent the geological phenomena with very high value which relates each other as part of earth dynamics. The development of geoconservation and geopark as an alternative tourism is a new paradigm in Indonesia.

Kelimutu have a unique natural phenomenon-tree different coloured lakes at the peak of Mt. Kelimutu (1690 m asl). The first lake is named Tiwu Ata Mbupu, the second is named Tiwu Nuwa Muri Koo Fai, and the third is tiwu Ata Polo. The colour of the water in each lake is different and the colour change from time to time. Thought to be caused by the volcanic activity of Kelimutu, it has also been suggested that the cangees in colour due to refraction of the sun's rays, microbiota in the water, dissolution of chemical substances and reflection of the colours of the lake walls an bottom.

This effort to this geopark status will supposedly give positive impact as a world site which contributes to assemble education and geotourism value in one protected an conserved area, also local economic growth.

Keywords: Kelimutu National Park, tree lakes, geoconservation, and geopark

## Outstanding geoheritage values of the Hantangang River Geopark in Korea

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Two local governments (Pocheon City and Yeoncheon Gun) in Gyeonggi Province (Korea) developed a strategic plan to develop a national geopark (eventually global geopark) along the Hantangang River.

Hantangang River has been regarded as one of the significant geoheritage sites showing special volcanic landforms in Asia. About 500,000 to 130,000 years ago, basaltic lavas from multiple volcanic activities were erupted from Orisan (Ori Mountain) near Pyeongyang area in North Korea. These lavas flowed down for over 110 km crossing a large plain making a broad lava plateau (Cheolwonpyeongya Plain) and continued to flow along the river valley with incised gorge in Pocheon-Yeoncheon regions with various types of volcanic landforms with beautiful landscapes along the river valley. Along the river, geological features such as multiple lava flow units, basaltic columnar joints, columnar joint-produced waterfall, pillow lavas, paleo-fluvial deposits and paleosols can be found, which were produced by a combination of volcanic activities and river erosion processes. The presence of pillow lavas which are larger than 1 meter in diameter along the valley provides significant geoheritage values because it is not common to find such a large amount of pillow lavas on land. Precambrian metamorphic rocks together with Mesozoic granite add geodiversity values.

The Hantangang River Basalt Gorge has very significant geological and geoheritage values to understand the volcanic activities during the Quaternary Period near convergent plate boundary and the special landforms produced by river erosion in central part of the Korean Peninsula. This type of lava flow is known to be very unique and rare in the world, geological and geoheritage values in this area are of international significance. This area also includes one of the most important archaeological sites (Paleolithic remains of the Acheulean culture) along the river.

Local governments started to develop a geopark program along the river with geotourism and sustainable socio-economic development by strong involvement of local residents. Various geodiverse features in this area together with numerous archaeological, ecological, historical and cultural elements provide a great potential of this area for a national and global geopark in the future.

## **Donghaean as a Geopark: Heritages of the Area and Major Reasons to Be a Geopark**

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Donghaean is located in eastern coast of 4 cities (Pohang, Kyeongju, Yeongdeok, and Uljin), Korea. These cities, typical of tourism city of Korea, have an outstanding natural, ecological, archaeological, and cultural heritage as the tourism infrastructure. A lot of tourists visit these cities every year but they are less than expecting of potential tourism infrastructure the cities have. Tourism is a key sector in relatively underdeveloped rural areas of these cities' economy. Therefore, the need for the development of integrated tourism programs has been raised in order to maximize the utilization of the potential held by the local tourism infrastructure. The integrated tourism development program we want is the Geopark program and we want to promote the conservation and sustainable use of the excellent natural heritage held by Donghaean through the Geopark program.

Donghaean has a distribution of igneous, metamorphic and sedimentary rocks covering times from the Precambrian to the Cenozoic era, and offers the findings of geodiversity created by characteristics of diverse rocks. Especially, Yangnam columnar joint site in Donghaean is the most representative geosite of Korea, so is used as motive of Korea Geopark Network logo. The site comprised of various type of columnar joints such as vertical, horizontal, circular shape. Among the types, the circular type has special scientific importance, rarity internationally.

Donghaean is making various efforts to make comprehensive, eco-friendly use of its ecological, historical, and cultural heritages based on its excellent geological heritages, also proving itself to become one of the model geopark.

## Aspiring Global Geopark : Cheongsong National Geopark (Korea)

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Cheongsong National Geopark is located southeast of Korea, Northeast Asia. Its total land area is about 845km<sup>2</sup>, a typical mountainous rural area with forests covering 80% of the total area. The population of cheongsong-gun is about 26,732, which is quite small for the total area. Ever since Cheongsong National Geopark proclaimed its beginning as a geopark, Cheongsong National Geopark successfully performed its role as a geopark, joining the Korean National Geoparks Network (KGN) on April 11, 2014 and preparing to join the Global Geoparks Network at the moment.

The geological features of the Cheongsong National Geopark mainly consist of Precambrian metamorphic rocks, Mesozoic sedimentary rocks and volcanic rocks, and Cenozoic acidic intrusive rocks and recent sediments. In the Mesozoic era, trench was located southeast of the Korean Peninsula. The southeast part of the Korean Peninsula, which includes the Cheongsong area, had experienced active volcanic activity of subduction zone. For that, large quantity of lava and pyroclastic materials from the activity are found in the area along with Mesozoic sedimentary rocks. Numerous geoheritages with outstanding landscape and high scientific value such as the Flower stone, fantastic rock, river terrain, columnar joints, dinosaur footprints, and carbonated mineral water springs that ground from excellent geodiversity are found in the Cheongsong area. The spherulitic texture of spherulitic rhyolite formed in Cenozoic Rhyolite intrusive dike is globally acknowledged for its morphological· aesthetic excellence and the developmental characteristic and uniqueness of water quality of the natural mineral water springs throughout the area are superb.

The Cheongsong area is surrounded with high terrains and its nearby road networks are undeveloped. This delayed the industrialization and development of the area compared to the other parts of the Korean Peninsula. Such characteristic preserved the clean natural environment of the area and diverse organisms including endangered and protected species inhabit the area, while outstanding cultural heritages, boasting its long history and tradition, are located in the area as well. For that, there are various experiences and education programs that utilize such environment.

The Cheongsong National Geopark has continued different activities such as installing various guidance and explanation boards, training geopark guides, developing educational tour programs, and advertising the geopark to vitalize geotourism.

The objectives of Cheongsong National Geopark in joining the Global Geoparks Network are as follows:

Firstly, to have a chance to share the value of diverse and outstanding geoheritages of Cheongsong National Geopark to the local residents and people around the world.

Secondly, to advertise the excellence of Cheongsong National Geopark which seeks for education & experience based geotourism, Lastly, to seek for a sustainable eco-friendly economic development for the relatively underdeveloped area of Cheongsong through geotourism vitalization.

## **Geoheritage Database and the Evaluation Project Conducted by National Geoparks Secretariat of Korea**

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Geological heritage is one of the essential part of a geopark. Geological heritage sites within a geopark must be legally protected and a geopark should be used as leverage for promoting the protection of geological heritage locally and nationally, as described in the guidelines of UNESCO Global Geoparks. Importance of geological heritage is a significant measure for UNESCO Global Geoparks, so geosites databases and their maps are required for geoparks. The National Geoparks Secretariat of Korea have been conducting a national project named “Geoheritage Database and the Evaluation” for the purpose of protection and management for geological heritage and its utilization for geoparks. The first part of the project has been conducted in ‘Sudokwon area’, Seoul and its suburban area, having started in September 2014 and finished in April 2015, and the second part will start in May 2015 for ‘Chungcheong area’, west and mid South Korea. This national funding project (ca. \$130,000 USD annually) will continue primarily until 5 total regions of Korea will be covered on the annual basis and the further research will go on. This project examines known and unknown geological heritage, puts it into national database and also proposes its assessment tools, which consists of 5 levels followed by qualitative and quantitative analyses. This project is aimed at not only building a national geological heritage database, but also helping both National and Global Geoparks to protect and manage geological heritage in an effective way as well as aspiring National or Global Geoparks to prepare for the application in time- and cost-efficient way.

## Hanon Volcanic Crater: A New Potential Geosite of Jeju Island Geopark, Korea

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The Hanon volcano on the southern coast of Jeju Island, Korea, has an unusual maar-type crater with the largest caliber in the island, where a phreatomagmatic eruption took place ca. 34 kyr BP as a result of the explosive interaction of rising magma with groundwater. The crater is surrounded by thin (ca. 40 m thick) and gently outward-dipping rim beds of a tuff ring and is filled with lacustrine or wetland sediments as thick as 15 m in topographic lows. In sediment cores from the crater-lake deposit, the paleo-climatic proxy records (TOC and MS) obviously reflect the rapid climate change at the Pleistocene-Holocene boundary. However, the anthropogenic modification and destruction of topography and ecosystem have continued in the Hanon area since the crater lake was artificially drained for farming a thousand years ago, and the area has been exposed to serious threats from attempts to construct sports and entertainment facilities. Fortunately, the municipal government and civil organizations recently realize that the Hanon crater deserves one of the outstanding natural heritages because of its topographic scarcity (i.e., a maar-type crater) and the climatic, ecological and environmental values of crater-lake deposits (i.e., a time capsule of the Earth's environment). As a result, various efforts are being undertaken to establish a comprehensive plan for restoration and conservation of the crater, and to operate environment-friendly utilization programs. One of the practical actions is to designate the Hanon volcano as a new geosite of the Jeju Island Geopark.

## Secular change of geosites and geoconservation activities in Toya-Usu Global Geopark

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Geosites of the Toya Caldera and Usu Volcano Geopark are comprised of the geologic heritage of the Volcanoes, the beautiful natural heritage of the area, and the historic heritage including ruins of the Jomon period. Especially the sites related to “Mt. Usu eruption” are very important in our Geopark featuring "co-existing with the volcano". These sites are changing under the influence of vegetation recovery and the weather with lapse of time.

It is very difficult to preserve these geosites, because it is demanded that they can be left to natural transitions as a part of the changing Earth and that can be maintained with the smallest amount of intervention possible. We are working on conservation of the geosites in cooperation with regional societies such as the Toyako visitor center and some local guide groups. When carrying out protection and conservation activities, the council's academic staffs participate in surveys and discussions, supervising from a scientific viewpoint.

Now, we consider that the removal of the vegetation is necessary in certain geosites showing eruption disaster to learn what happened by eruption. We hope that disaster prevention education in Mount Usu is substantial by such an activity.

In this presentation, we report that the present conditions of some geosites and the conservation activities we did. And we suggest the latter as one of ways for the conservation activity of the future geosites.

## **New findings in the Petrified Forest of Lesvos Global Geopark:**

### **Geoconservation and public awareness**

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The project "Construction - upgrade of the Kalloni-Sigri Road on Lesvos Island" is funded by the Operational Programme "Improvement of Accessibility" NSRF 2007 - 2013, and involves the upgrading of the existing Kalloni-Sigri road which is 48.5 km long. This new road will limit the geographical isolation of western Lesvos. The Kalloni - Sigri road runs through the protected area of the Petrified Forest of Lesvos.

The area is well known for its fossiliferous sites, as indicated by the number of fossils visible on the surface. In the frames of the main construction project, a sub-project was approved dealing with the research and fossil excavation that has been implemented by the Natural History Museum of the Lesvos Petrified Forest in the frames of the Memorandum of Understanding signed between the Museum and the Ministry of Infrastructure, Transport and Networks. During the road construction works, dozens of fossilized tree trunks were discovered, standing or decumbent and in an excellent state of preservation. Horizons of leaves, branches and tree root systems were also identified. Fossils found in the path of the roadway were transported carefully to the Museum after cleaning and taking the necessary protective measures. In other places there are clusters of standing petrified trunks. Efforts have been made to preserve these fossils in their original positions. There is no doubt that this rescue excavation of fossils is the largest of its kind so far in Greece, both in terms of surface area and of number of findings.

## **Geo-conservation on the Silk Road Economic Belt , Dunhuang Geopark of China**

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Located in the western part of Gansu province, China, Dunhuang was not only the source of “Dunhuangology” because of Mogao Caves, but also the convergent site of different segments on the Ancient Silk Road, which has made the city an attraction to the world for such a long time. The establishment of Dunhuang Geopark will provide a new way for ecological civilization construction and will promote geo-conservation on the Silk Road Economic Belt.

Dunhuang has spared no effort to declare to be a member of GGN, during when it has had geoheritage investigated (including the distributions, contributing factors, environment of geoheritage et al.), statistics, and some preliminary protection measures done. For example, it has set up fences and monitoring system to separate geoheritage with the tourists and monitor if there is something wrong in the geopark, not to ensure the safety but to protect the environment. Besides, to build the interpretation systematically will also help to raise protection consciousness. Also, as a typical landform both at home and abroad, the yardang landform’s protection will promote geo-conservation greatly in the geopark.

All in all, geo-conservation in Dunhuang Geopark, which is of great importance on the construction of the Silk Road Economic Belt, plays an important role in promoting exchange of Chinese and Western culture, integrating tourism economy and natural resources conservation, and realizing harmonious development of human and nature.

## Innovative Interpretation of Geoheritage in Tianzhushan Global Geopark

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The interpretation of geoheritage is considered the art of explaining the meaning and significance of geosites to the visitors. Well-done interpretation of geoparks can improve the quality image of the geopark and enhance the visitor experience. It may also strengthen the relationship between the geosite and those who live around it. Therefore, providing effective means for geoscience education and broader environmental issues to the public is a must for a geopark to be qualified under UNESCO's network. Currently, the problems that arise around Chinese geoparks are mainly from miscommunication or inefficient interpretation, and Tianzhushan Global Geopark was no exception. This paper demonstrates the results of an international project coordinated by the China University of Geosciences in Beijing that has been developed by Tianzhushan Global Geopark. The aim of the project was to refresh the interpretation of the remarkable geoheritage of Tianzhushan, from the Palaeocene fossil sites, the amazing granite landform scenic areas, to the didactical UHP metamorphic routes. The team had multidisciplinary members, such as geologists, geomorphologists, designers, illustrators, Chinese and English editors, using new ideas, in keeping with the saying, "Think like a wise man, but communicate in the language of the people". New methods including QR codes with links to information about geosites and cultural heritage, mascots to tell geological stories, cartoons of geosites and illustration to show how geosites form were used. The effectiveness is monitored by feedback from visitors through the post-travel surveys or activities. It shows that Tianzhushan Geopark is an example for geoparks to provide a better interpretation of geoheritage with a new perspective.

## **The Foundation of a Geopark's Development - Sustainable Conservation in a Scientific Way**

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Shennongjia Geopark was established in September 2005 and admitted into the Global Geoparks Network in September 2013. During the 10 years since its establishment the Geopark has gone through three stages in respect of nature conservation: from "passive static protection" to "initiative dynamic protection" then to "sustainable scientific conservation", and found that "conservation means development, green means treasure, and culture means advantage". With the Geopark's experience and measures in nature conservation as an example, this presentation explains the purpose and significance of nature conservation by analyzing its objects, subjects and specific methods, and proposes an approach to sustainable conservation of geoheritage and natural resources that is based on in-depth science research and guaranteed by geo-tourism. By sharing these experiences the authors wish to inspire all geoparks to achieve sustainable development with their own characteristics by holding to the fundamental concept of geopark, following universally agreed values, presenting their local culture and adopt innovative ways of thinking.

## **Progress on scientific research and science-popularization activities in Zhangjiajie Global Geopark of China**

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The picturesque landscape in Zhangjiajie Global Geopark of China caught the attention of Wu Guanzhong, a master of Chinese paintings, in 1979 and since then it has attracted worldwide attention. In 1992 and 2004, it was declared as a World Natural Heritage site and a founding member of Global Geopark Network, respectively. The number of visitors from home and abroad to the geopark has been increasing in an exponential form, reaching over 10 million yearly nowadays.

Although the geologically and geomorphically distinct site has very important scientific, ecological and tourism values, difficulties remain in carrying out science-popularization activities due to the lack of detailed scientific studies.

Particularly, it has not been made clear what kind of scientific story the landscape in Zhangjiajie Global Geopark tells and how to effectively protect the distinct site with more and more tourists coming to appreciate the beautiful landscape. To provide a convincing scientific explanation about the formation of the landscape in Zhangjiajie Global Geopark and to promote the application of the geologic/geomorphic knowledge in managing the geopark, several research projects have been undertaken and their findings have been applied in science-popularization activities recently. This presentation introduces the major achievements of these research projects, typically on the evolutionary process and causes behind the development of the landscape.

Furthermore, it details how the science-popularization activities are pursued in light of the geologic/geomorphic knowledge within the context of geoheritage conservation and sustainable tourism development.

## **An Introduction to Yanchao Badland Geopark, Taiwan**

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The mudstone badlands and mud volcanos mark the unique landscape in southwestern Taiwan. The major features of badlands include sparse vegetation or steep slopes with scant massive erosion gullies and surface erosion, collapse and sharp ridge as well. Mud volcanos are pseudo-volcanos, which continuously, periodically or abruptly emit mud, flammable gas and often create miniature landforms similar to volcano. Five different shapes of mud volcano are found in this area, including mud cones, mud shields, mud holes, mud marr, and mud basins. Typical mud cones, mud marr, and periodic eruption mud holes can be found in Wushanding Mud Volcano Nature Reserve, and mud shields and mud basins are found nearby. The mud volcano and surrounding badland hill have been designated as Yanchao Badland Geopark, and jointed Taiwan Geoparks Network. The visitors of Wushading Mud Volcano Nature Reserve can be more than 50,000 annually. Therefore, it could be prone to the disturbance of visitors, and the monitoring techniques and management strategies become the major issues for the balance of conservation of landscape and promotion of environment education and geotourism. The local community and NGOs are in cooperation with government, they undertake the works of interpreting the landscape for the visitors, regulating their behaviors and tidying the whole area. At present, we keep working on the landform monitoring in mud volcanos, the studying of local history, culture and the mode of production-life-ecosystem, and the co-development of Nature Reserve and community are progressing smoothly.

## Concept and content of geoheritage diversity and its significance

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Geodiversity was proposed by Sharples, refers to all the geologic phenomenon in earth sciences system, which contains geoheritage, soil, climate and landscape etc., it is connected and interacted with natural environment and social and culture. Geoheritage diversity is a new field, an expansion of earth sciences. The significance of Geoheritage diversity is realized gradually in the process of exploring nature. Its research can provide guidance for the planning, education and protection, thus promote the sustainable development of geological relics resources. It is necessary to define the conception and content of Geoheritage diversity. Geoheritage diversity is the diversified features of the geological elements and the relationship among them, including strata, tectonics, bedrocks, palaeobios, geohazard and landscape. It is reflected in the scale and distribution, the geological background, the type, quantity and grade, primarily the diversity of geologic and geomorphic features, their formation process and relationship. We should establish the content system of Geoheritage diversity based on the following aspects: 1. Geoheritage diversity is based on the composition of the following elements, strata, tectonics, bedrocks, palaeobios, geohazard and landscape features. 2. Geoheritage diversity consist of the scale and distribution, the geological background and type, the quantity and grade, the protection and utilization, which are the indicators system of the Geoheritage diversity. We should establish an evaluation system relate to the elements to evaluate the diversity index. 3. Promote the evaluation of Geoheritage diversity quantitatively, applying mathematics and statistics methods to describe the properties and variability of the geological relics.

## Grassland Conservation Activity within Aso Geopark

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Aso's vast grassland is one of symbolic geosites within Aso Geopark area. Its formation is deeply related to climatic reason and continuous activity of Aso volcano. The land thrives in the landscape created by pyroclastic flow and volcanic ash from past repeated eruptions.

Not only the grassland gives such breathtaking feel to us, but also it has important role for grazing, agriculture, rich biodiversity, water resource, land management and tourism to sustain regional natural, social and economic environment. It is believed to be maintained at least a millennia by human's activities such as grazing, grass harvesting and a cycle of Noyaki, burning the field as well as volcano related reason.

However, while the grassland having such important role; its conservation is at risk at the present due to decrease of farmers, aging or lack of workload to maintain the grassland.

To tackle the issue, Aso Grassland Regeneration Committee which MOE take its administrative role, was built in 2005 under Act for the Promotion of Nature Restoration. By sharing common aim to regenerate the grassland, there are five main departments which including pastures management, biodiversity, education, grass resource and tourism within in the committee. Each department research in their special field, carry various programs and operate effectively to contribute to the entire conservation activity. The strong collaboration is a key for the sustainable grassland management. Aso Geopark promotion council is also working in the committee especially in the tourism and education departments to raise awareness of value of the grassland.

## LANDSCAPE APPRECIATION OF MOUNTAIN GEOSITES AT MACHINCHANG CAMBRIAN GEOFOREST PARK, LANGKAWI GLOBAL GEOPARK

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Mount Machinchang is a well-known hogback geological landscape in Malaysia mostly made up of sandstone. The hogback geomorphic features offer limited flat areas at the peak of this mountain range. Thus a very specific and systematic geotourism product is important for better appreciation of this mountain range. Previously, modern structures (i.e cable car and hanging bridge) have been the main attraction to this area and the real natural beauty became almost insignificant. Being a conservation area within the geopark the task to create education on nature is vital for the long term conservation and appreciation of the area. This study explores five types of appreciation through landscape approach that have been established as observation spots along the geotrail in the area. The landscape approach looks mostly at the connection among the scientific knowledge of geology, landscape and biology. The established trail and the observation spots are cable car trail, stunted forest of Machinchang trail, Landscape of Langkawi, Machinchang Peak and seascape of the Andaman. These trail and observation spots play vital roles in better appreciation by general public towards natural heritage and highlighted the role of geology in shaping the earth surround human.

## **Geopark Intensive Summer Course for Elementary & Junior High Students**

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Since 2013, Tottori Prefecture has been holding an intensive course utilizing San'in Kaigan Global Geopark's tour guides. This course is named "San'in Kaigan Global Geopark Summer Vacation Assignment Rally" and it began as a course helping elementary and junior high school students embark on their summer vacation assignments (independent research), covering themes such as Tottori Sand Dunes and Uradomekaigan Coast's natural surroundings, topography, geological features, living organisms and local specialty products. In 2013, 11 lectures took place; and in 2014, two extra lectures were given in Shinonsen Town, Hyogo Prefecture, with a total of 15 lectures organized extensively within and outside of Tottori City. Although outdoor lectures were suspended in 2014 due to bad weather, approximately 250 elementary and junior high school students took part in the period of two years.

At these organized lectures, students were able to collect data and materials to complete their summer vacation assignments. The lectures became very popular among students and parents who attended, some strongly requesting continued running of these lectures. Accordingly, we are planning to continue this work in the future as we make further improvements to lecture content and management methods.

Through this course, we are also expecting people, including geopark guides, to actively make efforts and organize lectures as they gain expert knowledge in lecture management. There are already an increasing number of opportunities and cases of active engagement where people have taken part in school classes. There have also been lectures organized by a tour guide group.

## **Education programme for school children in Dongvan Geopark: Success and shortcomings**

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Dong Van Geopark was recognized in 2010 (and re-evaluated in 2014). One of the best successful aspect that the evaluators highly appreciated is the education program for school children. In this presentation, the following points will be discussed: 1. Education program for school children in Dongvan Geopark in general: Objects, methods, materials, resources, etc. 2. Success: Changes in local resident awareness and action. The geosites and cultural heritage are reserved better. 3. Shortcoming: Local resident still lack of knowledge on running small bussiness in tourism industry. 4. What we learned from these success and shortcoming. Future program: focus more on tourist and local resident who are working on tourism field.

## **Development of a systematic education program utilizing the geopark in schools in the Oki Islands**

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The Oki Islands Geopark became a member of the Global Geoparks Network in September 2013. For the Geopark Promotion Committee this signified many new opportunities to further regional development activities. Working closely with a wide variety of organizations, the geopark has developed a strategy to achieve sustainable regional development which focusses on geopark education in local schools and promoting economic development through geotourism. Until now, geopark education within schools has been conducted by staff members of the geopark committee who conduct lessons in the place of the regular school teacher. Aside from this, in 2014 the prefectural school in the region adopted a new subject “geopark studies” as part of the formal curriculum. However, these methods have fostered a passive stance among school teachers toward teaching about the geopark in their classrooms. In addition, the need for a program that systematically links geopark-related study from elementary up to secondary school has become apparent. In this presentation, we will introduce the progress of a systematic geopark education program that is being developed by the Oki Islands Geopark Promotion Committee in close cooperation with the Ministry of the Environment, and various boards of education in the Oki Region.

## **Incorporating elements of the geopark into the formal school curriculum in the Oki Islands Global Geopark, Japan**

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The Oki Islands Global Geopark area contains four inhabited islands and over 180 uninhabited small islets with a population of around 21,000. The isolated geographical setting and small population size of the islands means that the islands do not have any facilities for tertiary education. Around 98 percent of senior high school graduates leave the islands to continue their studies or seek employment. Previously, prior to leaving the islands the majority of these students have not had any opportunity to learn about the Oki Islands. As a result, they are unable to talk about and have little pride or attachment to their hometown. Spurred by the origin of the Oki Islands Geopark in 2009, attempts were made to incorporate geopark themes into educational initiatives. However, these attempts were sporadic and lacked of a systematic approach. Following the inclusion of the Oki Islands Geopark into the Global Geoparks Network in 2013, the students of Oki Senior High School began learning about the precious heritage of the geopark, including the geological heritage, nature and culture throughout the year. These activities aim to enable students to understand about their home soil as well as foster pride and love toward the region. This presentation will use examples from Oki Senior High School to highlight methods of incorporating elements of the geopark into the school curriculum.

## **Graduate School Education in the San'in Kaigan Global Geopark: Current Status and Issues**

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The Graduate School of Regional Resources Management, the University of Hyogo at Toyooka city, Hyogo prefecture, Japan is located in the San'in Kaigan Global Geopark area and was established in 2014. The aim of the school is to study the geological, ecological, and/or social/cultural notable resources that characterize the region. Wise use of these resources will lead to better management of the region. The aim of the school is similar to the philosophy of the geopark.

The graduate school comprises geo, eco, and socio groups. The main field of the geo-group is earth science such as geophysics, petrology, sedimentology, and geologic education. Six graduate students have been performing research in various fields of earth science, for example, a geologic survey has been undertaken to obtain a more precise scientific description of the geopark area. The results will improve geological explanation for residents and visitors in the form of information boards and guides at geosites. The research theme of another student is both geology and related matters, e.g., the study of the relationship between topographic features, including their geology, and agricultural products will lead to branding of local agricultural products. Furthermore, some of the scientific research by students of the graduate school will be contributed to regional development by improving teaching materials for school education, disaster prevention using geological consideration, and web analysis of the trends in and needs of visitors to the geopark. Each work is being conducted in association with local residents, geopark guides, and geopark institutions. From positive interactions, local residents, students, and staff of the graduate school can improve their ability to perform activities in the geopark. Graduate school staff have held public lectures on the geology of the region, made guide maps including geological explanation with local residents, and supported the San'in Kaigan Geopark Promotion Council academically. The educational effect of the graduate school is considered to be high, because the graduate school is located in the geopark. Some issues, however, certainly exist, and one of them is knowledge of geology. Some students had not been educated in earth science as undergraduates and, in some cases, not at even high school. Students must first understand geology and then learn about the value of georesources for regional management. Guides and residents involved with the geopark must know about geology; otherwise, they cannot explain the exact value of the regional resources to visitors. One solution to this issue is setting up educational programs and successive improvement with inspection of the programs. In this way, both the graduate school and the San'in Kaigan Geopark will improve.

## **Science Research and Popularization Program of China Fangshan Global Geopark**

Zhi xing JING

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In recent years, Fangshan Global Geopark of China, the first Global Geopark in the capital city in the world, has taken effective measures to boost scientific research and popularization activity, which was comparatively weak point of the Geopark in the past. Through a wide variety of science popularization materials and activities, developing multi-functional popularization site, information system, perfecting geo-science explanation panels, and renovating college study base, Fangshan Global Geopark has further improved its visibility and reputation, and also got appreciation of GGN. In the presentation, the author will report what Fangshan Geopark did in last 4 years.

## **From Indigeneous Community Values To Geopark Education for Sustaining Heritage at Batur Global Geopark**

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Batur Global Geopark region is a place that has a variety of heritage, not only natural and cultural heritage but also an unique cultural landscape heritage. All heritage should be maintained and conserved for the next generation. Although, Batur Geopark was recognised as a member of Global Geoparks Network but the conservation awareness of the indigeneous community around Batur Global Geopark still needs to be increased. Furthermore, the traditional values which are inherited from the past and related to the nature conservation will be investigated and researched. And after that, some traditional conservation values which still have played an important role in everyday life of the indigeneous community will be reviewed to support the education criteria of geopark. Recently in Bangli Regency, the geopark substance has been included in some school subjects of the educational unit level curriculum which are started from primary to secondary level. Derived from the indigeneous community values to geopark education actions that are expected to raise awareness of young generations in sustaining heritage. Based on qualitative descriptive method some references or notes of the indigeneous community values and geopark educational activities will be explored and presented. As the final result, an education as one of geopark criteria might be used in achieving the dream of the Batur revival as one of the geopark feild school and the best tourist destinations in Bali and Indonesia in particular and the world in general.

## Experience of Promotion and Development Geoscience Network for Taiwan

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### Introduction

Taiwan's rich geological landscape features, special complex geological structure, geological tourism has great potential. For the complex geologic structures and dense population in Taiwan, the frequency of multidiscipline disasters has increased due to global environmental change in recent years. The needs of geological knowledge for publics obviously has become more important.

In Taiwan, "Geology Act" came into force at 2011, which not only emphasized the survey of fundamental geology and geologically sensitive areas, but also initiated the promotion and development project of geoscience network. Using information and communication technologies and geological learning activities in this project, the professional geological knowledge has been translating and conveying to relatively simple interpretation for the publics. Until August 2014, more than 95 percent of public satisfaction to show that all these efforts up to a new status on Taiwan's geological and environmental education.

### 1. Geological Expert Advisory Services

Professional consulting services solve many geological problems from the people. All case profiles will provide database for the expert systems. In order to reach the aim of value-added services and professional consultancies, geological workshops and forums for different ethnics or professional groups are proposed.

### 2. Virtual-Actual Geological Services

The geological knowledge website connect with a series of people, culture, land, industry, landscape resources in areas related to the fields of tourism, local economics, environment, disaster prevention system etc., providing various services for people to learn geological knowledge.

### 3. Creative and Innovative Geological Services

This project has been producing many creative and innovative products such as illustrations, posters, models, animation, videos, systems, books, virtual characters, propaganda gifts, e-books, etc. And all these products described the geological knowledge were applied to the integrated visual- actual geological services.

## How to tell the history about the strangest volcano ever – when the volcano is not there anymore?

Kristin RANGNES

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The theory of volcanoes producing carbonate rich lavas was published in 1921. This publication by W.C. Brøgger caused a huge scientific debate. Most geologists argued that magmatic limestones is impossible, however the rocks described from the Fen Volcanic Complex were later proven to be of magmatic origin. Brøgger described a suite of magmatic carbonate rich rocks, named after local places. Some rock names and the process fenitization are still officially recognized names, from Fen in Gea Norvegica Global Geopark.

The theory of formation of the carbonatites was not proven until early 1960s, when the African volcano Oldoinyo Lengai erupted. The lava was a carbonate rich volcanic rock – soevite, named after the farm Søve.

The geology at Fen is complex with a variety of deep magmatic rocks. 580 million years of erosion has left only a deep transect of the main vent. The *results* of the volcanism still have a great impact on the local society: limestones suitable for building material since medieval times, iron ores brought wealth and work, and today prospecting for thorium and rare earth elements is ongoing.

The once so great Fen volcano itself is not visible anymore. So how can a geopark use a unique locality with high scientific value as an attractive place to visit? The answer is about storytelling on unique development history of the area regarding rich soils, medieval churches, iron works, mines, wealth, wars, workers and rich landowners, and how this history is related to the strange volcano and its unique rocks resulting from geological processes deep beneath the Earth crust.

## **Tianzhushan Global Geopark Makes Comprehensive Improvements Based On Assessment And Recommendations**

Wen HUANG

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In the last four years, Tianzhushan Global Geopark has made comprehensive improvements, based on the eight recommendations put forward by experts of GGN after the assessment in 2011. Firstly, Tianzhushan Global Geopark attached great importance to the science popularization and carried out a series of effective measures: redesigned the interpretation boards and websites, upgraded the geo-museum and science popularization galleries, compiled different popular science readings, trained tour-guides, sponsored colorful activities for science popularization at schools; secondly, the geopark strengthened relations and signed cooperation agreements with local enterprises, internet media companies, TV stations, exploited tour routes with various geotourism programmes and jointly designed, developed, promoted and sold tourist souvenirs with local manufacturers; thirdly, the geopark integrated tea cultivation and local tea culture into geotourism through financial support, technical training, brand promotion and festival activities; fourthly, the geopark enhanced the cooperation with Family-run Inns, providing services such as sightseeing, recreation, entertainment, catering, accommodation and shopping for tourists; fifthly, the geopark encouraged and promoted local handicraft industry through organizing the handicrafts enterprises to participate in investigation, training and discussion and providing exhibition space, marketing, publicity on websites as well as establishing fixed shopping spots for handicrafts; sixthly, the geopark established the tourist carrying capacity monitoring system, which can help the managers better regulate and control visitor volume for promoting environment sustainability, tourist satisfaction and intelligent management.

## Zigong Geopark of China: An Established Geotourism Destination

Li SUN

Zigong Global Geopark, China

Zigong is located in the southern part of Sichuan Province, P.R.China. It is a city originated from the well-salt industry. As early as about 2,000 years ago (the East Han Dynasty, China), Zigong began its well-salt production, a lot of precious drilling, pircking-up brine, decocting salt tools have been created and completely preserved, as well as numerous well-salt production fields and sites, old towns, guildhalls and stockaded castles remained.

In 1915, Prof. Geoge D. Louderback from United States found a dinosaur tooth and thighbone in the side of Xushui River, Rongxian County, which opened the door of Zigong dinosaur lagerstätte. Up until now, about 200 vertebrate fossil sites have been discovered in Zigong area, 26 dinosaur species belonging to 21 genera have been described. Besides, the colorful lantern of Zigong, one of essential part in the well-salt industry culture with a history of over 800 years, assembles the bests of Chinese lantern culture, which is noted as the first lantern in the world. With its global significant unique geoheritages and specific culture and history, Zigong has been accepted as GGN member in Feb, 2008. The establishment of Zigong Geopark provides an important tourist destination here, hence, the tourism in the geopark become a key supporting industry for local social and economic sustainable development.

Since 2008, Zigong Geopark paid more attention to the construction for geotourism destination, local funds have been to build express ways and freeways, special bus routes have been set up for tourists. There are 22 traffic guide boards on the main crossroad leading to the geoheritage sites and also well advertise for the geopark. Three world-class distinct museums (Zigong Dinosaur Museum, Zigong Museum of Well-salt Industry History and China Colourful Lantern Museum) have been renovated, including four geopark visitor centers in the geopark. Cooperated with travel agencies, local hotels and restaurants, the geopark design several geotourism routes for visitors, and design questionnaire on visitors' satisfaction levels in order to analyze related information and made corresponding changes according to their suggestions. During the past years, the visitor number and tourism income of Zigong Geopark have been rapidly increased, the geopark has stimulated the optimization and upgrade of the local industry structure, and realized the rapid increase of economic, environmental and social benefits, as strongly promoted the social and economic development.

## **Stone Heritage - A Resource Worth Highlighting In The Existing And Aspiring Geoparks Of Vietnam**

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The geology of Vietnam, comprising fragments of different tectonic plates including ancient continental crust, records a long history of geological evolution resulting in complex geological features with various rock types and minerals. The rocks, ranging from very ancient (2,500 million years old) to recent, were variously derived from either magmatic, metamorphic or sedimentary origins. Broadly speaking, though northern Vietnam displays a rich diversity of rock types, limestone predominates there and constitutes some 35-40 percent of the mainland. Central Vietnam is characterized by paleo-metamorphic rocks of the Kontum uplifted massif, a part of the ancient supercontinent Gondwana, bordered around with polymictic Paleozoic rock formations. To the south is a territory of intrusive igneous rocks dating from Mesozoic times up to the present. At Vietnam's southern tip lies the Mekong Delta that is composed mainly of modern riverine - marine sediments with a few scattered exposures of late Paleozoic - Mesozoic igneous and sedimentary rocks. In the meantime, archaeological evidence suggests that human culture in Vietnam appeared earliest in northern Vietnam, at least 33,000 years ago, and resulted in the first manifestations of Vietnam's "stone heritage". Since such an ancient time, pre-historic and later people have traditionally used stone, especially limestone, for many different purposes. This paper on Vietnam's Stone Heritage, therefore, gives an overview of limestone and some of its applications in Vietnam's cultural history up to the present day. Its second part similarly reviews the use of other types of stone and the last section discusses the possible use of Stone Heritage in Vietnam's existing and aspiring geoparks.

## **A Model of Combination of Geology and Culture: the Mogao Grottoes, Dunhuang Geopark, China**

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Dunhuang geopark is located on west of the ancient Silk Road, Dunhuang city, Gansu Province, China. Dunhuang geopark is composed of Yardang Geoarea, Mount Mingshashan and Crescent Moon-shaped Spring Geoarea, Natural Landscape Tourism Area and Cultural Heritage Tourism Area, covering an area of 2067.2 square kilometers. The Mogao Grottoes, a UNESCO World Heritage Site, as the main part of Cultural Heritage Tourism Area, is situated on the cliff in the east of Mount Mingshashan. The Mogao Grottoes is the world famous Buddhist art treasure due to its abundant, largest scale and best preserved murals and sculptures, with its precious historical, artistic and scientific value. The stratum the Mogao Grottoes cut is geologically called Jiuquan Formation, composed of the calcareous and argillaceous sand and gravel layers formed by fluvial and proluvial processes about 77-0.13 million years ago. It is the most feasible layer for caves excavation since its nearly horizontal strata with dense structure, and is named as "Cave Formation". Besides the geological setting, the Mogao Grottoes are affected by the other geological factors, such as cracks, pores, and attitude of strata. According to the Geoparks Management and Action Plan, it is very important to enhance the natural and cultural heritage, especially in which where they meet. The Mogao Grottoes is certainly a model of combination of geology and culture. With the China-proposed Belt and Road Initiative, the World Heritage Site and Geopark will complement each other in the future especially when Global Geoparks update to UNESCO Global Geoparks.

## **Mt. Apoi Geopark of Samani and Ainu cultural heritage**

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Mt. Apoi is a mountain in Samani Town of Hokkaido, Japan. It is famous for its unique flora and geological features.

The name of the mountain comes from the original name given by Ainu people, the indigenous people of the northern part of Japan including Hokkaido. "Apoi" comes from "Ape-o-i", meaning "place where fire exists". They believe fire is a goddess which is important for the life of human. They believe[BS1] that the mountain itself is a goddess and sacred. There is a legend that in ancient times Ainu people had a fire ceremony at the top of the mountain praying for deer, which they believed to be gifts from gods and were part of an important diet for them. Not only the name of the mountain, but also most of the place names of Hokkaido, such as Samani, Sapporo, Niseko and Toya, come from Ainu place names. Samani was inhabited by Ainu people before immigrants from the Japanese mainland.

The Ainu culture and language, much like other indigenous cultures and languages around the world, were repressed as a result of the colonization of Hokkaido and the Government's assimilation policies. But Ainu people in Samani created an organization, in cooperation with the town office, to maintain their culture and language and have been trying to pass them down to the next generation. Not only Ainu people, but also non-Ainu Japanese people are now becoming more interested in Ainu culture, understanding that it is an important part of the heritage of their community.

## **Volcano meister's themes and our future. We have our own history and wisdom by living on changing earth.**

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Our main contribution to the society is not only nature guiding but also being the leader in disaster prevention, BOSAI. Volcano meisters teach in schools and universities, and we talk in local gatherings. We take people to the mountains in order to defend themselves against volcanic disasters. Going closer to the volcano is the good way to know about the danger of eruption and also the small change of the condition of mountain.

We tell them that the Volcano has both faces, good and bad sides. Knowing about the volcanic character of Mt.Usu is very important to live near the active volcano. Many earthquakes occurred before the eruption at Mt.Usu. The escalation of seismicity is the obvious sign from the mountain.

We experienced 4 eruptions in these 100 years. Through those experiences, many wisdoms and ideas are gotten to protect our business, lives and cultures.

Now we have 35 volcano meisters of 27 males and 8 females. All the members are living around Mt.Usu. They have their own history in which they coexisted with the volcano so that they can talk their original stories about it. We always collaborate with schools, universities, citizen and scientists. "Communication" is an important key word for every scenes in disaster prevention.

We volcano meisters are creating original culture in order to protect people. The scientists and volcano meisters meet and discuss frequently in workshops and together walk around the geosites, aiming at the sustainable development of Toya-Usu global geopark.

## Active information from the geopark faced to natural hazards

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Mass media tend to favor the news as sensational as possible in case of natural hazards or disasters. When a tourist area like geopark met a hazard or disaster, bad impression from the media news decreases visitors. Due to this reason, local people tend to dislike using their area name, when it is identical to the name of volcano. While people usually receive benefits from a volcano, it is very strange what they dislike the volcano and want to keep away it when the volcano becomes active. Such the timing is one of scarce and good opportunities for people to learn the real nature of volcano; that is, to know the Planet Earth on which they live. An good example is a recent eruption at Aso volcano. After a volcano in the Aso Global Geopark started its eruption in late 2014, visitors naturally decreased. The geopark organized a special symposium by inviting the manager of the Sakurajima Volcano Museum and sharing their experience, and the special exhibition on the eruption in the geopark museum.

One of solutions is to send active message and information from the geoparks to visitors, which overcome the impact from media's news. Moreover, we should request the media to stop reporting sensational news and to report the correct and positive news. Of course, friendship with the mass media on a daily basis and their understanding about geopark are essential.

## Aspiring Arxan National Geopark

Zhi LIU

Arxan National Geopark < E-mail: 83745054@qq.com >

Arxan Geopark is located in Arxan City, Xing'an League, Inner Mongolia Autonomous Region, People's Republic of China, the Asia-Pacific Region. Its geographic coordinate is between 46°39'~47°39'N and 119°28'~121°23'E, covering an area of 7408.7 km<sup>2</sup> with an average elevation of 1100 m. Arxan Geopark was accredited as a national geopark in 2004 for its unique geoheritage resources and scientific values. On the 2014 CGN Meeting for Global Geopark Candidate Recommendation, Arxan National Geopark successfully became one of two Chinese candidates to apply in 2016 for the membership of Global Geoparks Network. Sustainable development in the past years has laid a solid foundation for the geopark management, protection, tourism, as well as scientific popularization. For a better development of Arxan Geopark based on our current foundation and protection system, we are interesting to promoting its geoheritage to the world by becoming a member of the Global Geoparks Network.

Arxan is located on the middle section of hilly Daxing'anling Ranges, northeast Inner Mongolia, where boasts numerous volcanoes, thermal springs and other various geoheritages and unique geomorphologic landscapes. Arxan Geopark is an ideal place for geological investigation, cultural tour, expedition, and relaxation.

## Aspiring Geopark of Gunung Sewu, Indonesia

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Gunung Sewu is the name of the karst region in southern part of Java, known through its prominent tropic conical hills landscapes. Thousands of conical or hemispherical limestone hills, hundreds of caves, solutional-depressions (doline, uvala, polje), dry-valley, blind-valley, coastal and river terraces decorate an area of 120 x 40 square km.

Since 2010, based on Geopark concept, this karstic region crossing 3 districts and 3 province boundaries, has built and developed an object for conservation, education and growth of local economy through geotourism and geoproducts. In 2014 Gunung Sewu aspiring geopark applied for membership in GGN, at the moment the application is pending.

Gunung Sewu Geopark developed to identify the relationship between components of abiotic (geology), biotic (flora, fauna) and culture. The local culture is not limited to tangible and intangible culture of the present, but also the past life. Paleolithic stone culture of prehistoric man, known as Pacitanian Culture, well known in Southeast Asia. Some names of caves and lakes in Gunung Sewu indicate that vertebrates such as rhinos, hippos and elephants once lived in this karst region. At least, now extinct animals coexisted with prehistoric man during the end of the Quaternary.

## Gangwon Paleozoic Geopark: An Ideal Place To Experience The Paleozoic World In Korea

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Four local governments (Jeongseon County, Pyeongchang County, Taebaek City and Yeongwol County) in Gangwon Province are pursuing a national geopark in Korea, 'Gangwon Paleozoic Geopark'. Diverse geological features such as Paleozoic sedimentary rocks, numerous limestone caves and karst landforms, and a meandering fluvial system (Donggang River) are distributed in the Gangwon Paleozoic Geopark. One of the main geological features is the Paleozoic sedimentary rocks which are composed of the Lower Paleozoic (Cambrian to Ordovician) Joseon Supergroup and the Carboniferous to Triassic Pyeongan Supergroup with coal beds. There are numerous type localities with well-preserved sedimentary structures, and invertebrate and plant fossils throughout the sequence. They also provided significant information on tectonic evolution of the East Asian region. Within the park, four different groups of sedimentary strata have been described because they show different lithofacies and sedimentary settings despite the same age within the geopark. This area has been famous for various types of mining in the past and its contribution to the Korean economy has been significant. The other features in the geopark are numerous limestone caves, various karst landforms and entrenched type of a meandering river system (Donggang River, about 57km long). Magnificent scenic views as well as numerous significant plants and animals, and cultural heritages add geopark values in this region.

## **Our march toward the creation of a Geopark in the Incheon Area.**

Soojae LEE

Korea Environment Institute

The Baekryeong island, including other small islands is one of the aspiring candidates underway their march toward the Korea Geoparks Network (KGN) having six members of national geoparks so far.

It has numerous interesting geological features evaluated as top rankings on the national assessment systems. Other natural and cultural aspects are ample enough to be an excellent background for the geopark. Though five natural monuments, such as kaleidoscopic colored beautiful rounded gravels and one breathtaking National Scenic Site are enough to have the qualification as a national geopark, there are much more stories to be mentioned.

As the island is now seeking the way of pursuing the sustainable development goal, the Mayor of the Incheon Metropolitan City (IMC) announced the plan of creating the geopark a couple years ago. As the IMC harbors the Incheon International Airport, the national entrance gateway to Korea, we want our land to be in a front line in the activities of the geopark.

We want to share the experience of overcoming the access handicaps of four hours long trip to the island. Although we have just started their journey to go for the sustainable development using the geological heritages, our quest will be rewarded by the increased visitors and local sustainable development.

## **Kunibiki Geopark Plan: Networking of nature, history and culture in the Kunibiki region**

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The area of Kunibiki Geopark Plan is the "ground of Kunibiki myth", surrounded by the Shimane Peninsula, Mt. Daisen, and Mt. Sanbe. The Kunibiki myth is described in Izumo-no-kuni Fudoki, completed in 733 AD. The story of the Kunibiki myth is that the god pulled the countries of the Korean Peninsula and then formed the Shimane Peninsula by using them. The area of Kunibiki Geopark Plan has traced the history of i) part of the continent, ii) detached from the continent, iii) the creation of the Sea of Japan, iv) volcanism in the Japan Islands, and v) the creation of alluvial plain and brackish lakes. These geological histories are in common with the Kunibiki myth. So, we promote Kunibiki Geopark Plan as merging mythology and geology.

Currently, Kunibiki Geopark Plan is promoted at the initiative of Kunibiki Geopark Project Center of Shimane University. The main purpose of our center is to make a plan of national and international Geopark for the Kunibiki region in order to re-discover new culture and resources for tourism of Kunibiki region together with local people. We have carried out various activities, such as geotours and symposiums for local people, lectures of Geopark for university students, field learning support for elementary school students, and establishment support of "Association for Promotion of Kunibiki Geopark Plan". We will introduce activities and issues of our center.

## The characteristics of the geoheritage in Dali global geopark

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Dali is located in the south part of Hengduan Mountains, southeastern margin of the Tibetan Plateau. Dali experienced complex geological history, with rich diversity in paleontology, rocks, tectonic movements, metamorphic mechanism and topography. The geological resources are abundant in this park, mainly Quaternary glacier remains, Cangshan metamorphic rocks, tectonic movement remains.

Dali is the birthplace of Dali Glaciation, which is synonyms with the Last Glaciation in China. Glacial landform are mainly distributed above 3600m asl., mainly arêtes, horns, cirques, cirque lakes, glacial depressions, U-shaped valleys, and glacial depositional landforms. The peaks which above 3800m are mainly horns. There are three cirque lakes named Ximatan, Huanglongtan and Shuanglongtan. Glacial depositional landforms are mainly distributed between 3200-3800m asl.

Diancang Mountain is composed of metamorphic rocks, in the central and east flank of the mountain there are deeply and moderately metamorphic rocks, in the west and south part of the mountain there are Mesozoic metamorphic rocks, on the north part there are Paleozoic sedimentary rocks and granite. The mountain has experienced several metamorphism and deformation. The most famous is Dali rock, also known as marble.

Tectonic remains in Dali geopark. Diancang Mountain is located in the bordering part of the Tibetan Plateau and the Yungui Plateau, in this area there developed several shear zones, deep faults, metamorphic belt, high mountains, deep valleys, plateaus, planation surface. The forming of Diancang mountain and Erhai basin is the result of Himalayan tectonic movement, making the uplift of Diancang Mountain and relative subsidence of Erhai Basin.

## **Geological Heritage Development Characteristic and Significance of Guizhou Zhijindong Cave Geopark**

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Since Late Triassic, under the influence of several intense tectonic movements, the bulge throughout the whole territory of Guizhou province has made it become the land and has gradually raised upwards to form the inland plateau. After that, the regional crust was raised upwards for several times, many dispersive and independent underground rivers and surface rivers have captured and diverted constantly, thus constituting three independent multilayer geomorphic units, namely, Zhijindong Cave, Qijiehe River and Dongfenghu Lake. At the same time many beautiful and precious karst landforms of different shapes and types have been formed. Among which, the caves, gorges, natural bridges and tiankengs are typical representatives and outstanding sceneries in the world geological heritages of the same kind. The elevations of these three geomorphic units reduce successively, with developmental modes transforming from subsurface karst to surface karst gradually, systemically recording the evolution process of karst landform of Guizhou Plateau.

## Conservation Plan in Oita Himeshima Geopark

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Oita Himeshima Geopark is an area of 14 km from east to west and 6 km from north to south including sea centered by a Himeshima island, located about 6 km off the coast of northern part of Kunisaki Peninsula in Oita Prefecture, southwest Japan. Oita Himeshima Geopark was approved as Japan Geopark in 2013. Our geopark is a compact geopark, where geosites are closely located, characterized by Pleistocene sediments and seven monogenetic volcanoes.

Most part of Himeshima has been designated as the Setonaikai National Park in 1950. In addition, there are several Natural Monuments in Himeshima. Thus, some of local resources in Himeshima are governed by rules and regulations, such as the Natural Parks Law and Law for the Protection of Cultural Properties. However, under the current situation, it is difficult to manage sustainably for other valuable local resources, such as folkloric heritage and local landscape of Himeshima, because there are no rules and regulations for preservation and conservation.

Thus, currently we have attempted to make system to conserve these valuable local resources sustainably, by landscape planning and preservation plan of cultural landscape. Enactment of landscape ordinance and regulation for conservation of cultural landscape is necessary in order to control exploitation and disordered construction. In addition, we can recognize and rediscover the value of region through this attempt.

In summary, the certain conservation system of local resources is necessary for sustainable use in geopark. In this presentation, we introduce our conservation plan of local resources in Oita Himeshima Geopark.

## Application of GIS for geopark activity in Muroto Global Geopark

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Geoparks and its significances are widely known to geological and geographical societies, but still unfamiliar to non-specialist people in Japan. Some visitors to Muroto Global Geopark Center seem to expect a geopark to be the facility like amusement park or zoological park. The Muroto Geopark covers whole administrative area of Muroto city, and the “geopark center” is no more than a hub facility for geopark activities, including exhibition, education, scientific research, and administration. Geopark has a geographical space with a certain area and its whole image can be best illustrated by maps. Such geographical information of the geopark must be shared with geopark staffs, exhibited to the public, and always updated. It is presumably well managed with the GIS technique. In Muroto Global Geopark, the author conducts researches on coastal geomorphology, environment of wild animal habitat, tourism development, and geopark management. Field survey results will be plotted on the map together with topography, vegetation, and other National Land Numerical Information, using the GIS techniques. The GIS allows analyzing, sharing, and publishing geographical information quickly and efficiently at the every aspect of geopark activity.

## **Debris control significance on marine terrace formation along the northern parts of Tango Peninsular**

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Marine terraces along the northern parts of Tango Peninsular, west Japan, were classified into MIS 5e (Ota, 2001) and affected by tectonic movement (Uemura, 1981). Our question was why marine terraces are developed widely only in this region in the San'in Kaigan Geo Park. Tectonic movement hypothesis was proposed by Uemura (1981). Here we propose another hypothesis: debris control.

Wider marine terraces were sometimes composed of gravel layer with hard andesitic clast as terrace deposits covering softer Miocene pumice-flow deposits as base rock. This indicates that wider abrasion platform was built under shallow marine conditions with hard andesite gravel particles as effective grinders to soft pumice-flow rock by wave actions. Then tectonic movement during glacial period uplifted abrasion platforms to higher level to be marine terraces. In this period, gravel layer played another important role as armor-coats to prevent gully erosion of soft pumice-flow rock. In this sense, different rock types transported from other places are significant for forming marine terraces, that is "Debris Control Geomorphology Concept".

We measured hardness of various type base rock and marine terrace gravel particles using EQUOTIP hardness tester (L-value) in the field and considered correlation strength between terrace widths and L-values of base-rock or ratio index of L-values (L gravel / L base-rock). The result showed higher determination coefficient ( $r^2=0.81$ ) between terrace widths and L-value ratio indexes than one ( $r^2=0.24$ ) between terrace widths and L-values of base rock. This means that debris control is significant to terrace formation.

This research gives a new image to formation processes of marine terraces and indicates an answer why marine terraces are developed widely only in northern parts of Tango Peninsular in the San'in Kaigan Geo Park. In conservational points of view, marine terrace deposits are important to prevent gully erosion on marine terraces. We must preserve marine terrace deposits to conserve marine terrace scenery.

## **Cultivating A Lifelong Team Of Popular - Science - Volunteers**

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### **Success Example Of Danxiashan Popular-Science-Volunteers Training Camp**

1. Mt.Danxia is the namesake of Danxia landform, a base for international Danxia landform research, and is entrusted with the great mission to display and popularize geosciences.

2. Founding the popular-science-volunteers training camp and recruiting 30 popular science volunteers.

Danxiashan founded the training camp in a local resident building in 2014. Every year the park will recruits from all over China 30 popular science volunteers possessing knowledge in geology, tourism, biology, media, etc. In a week, the campers learn about the geoscience value of Danxiashan through field investigation, popular science workshop, culture sharing and communicating with the local people.

Danxiashan has built an online communication platform to support the volunteers' science popularization. The volunteers write and publish their works about Danxiashan in newspapers and magazines, and also push the messages through social media network. They also organize workshops and report meetings to share their experience and knowledge about Danxiashan. These campers from different places have become lifelong volunteers of Danxiashan Geopark.

## The easy Geo-tour by subway - Geobackpacker in Taipei

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Taiwan located in the plate collision zone has suffered various geological processes. Taipei metropolis in the north end of Taiwan is the most populated and advanced area. Even though the city is impressed by high buildings and heavy traffic, there are still a large amount of geosites just beside.

The “Promotion and Development Project of Geoscience Network for Taiwan” held by Central Geological Survey, MOEA was made great efforts for introducing the geoscientific knowledge to the public by Geo-tour. For the convenience of mass rapid transit system in Taipei, we have tried to link the geosites by the subway stations, and proposed trips that can be easily done just by subway.

The “Geobackpacker” city Geo-tour is consist of hiking trails, landscapes, attractions, outcrops, archaeological sites and museums, which can be linked to the geoscientific knowledge like rocktype, volcano, hot spring, landform evolution, geo-hazard, and human life. The tour guide is created on the Google map. Geosites beside the subway station will be pointed out, and we will attach the photos with simple words to explain the geological phenomenon. These tour guides will be published as hyperlinks on the internet, and also be transferred to QR codes that can be easily scanned by smart phone.

Although Taipei is not a Geopark, the abundant geoscientific educational resources make it as a big geological museum. For the convenience of subway system and popular of internet, “Geobackpacker” could be a new fashion for the geoscientific knowledge promotion.

## 17 Years of Children's "Geotour"

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The Seismological Society of Japan and the Volcanological Society of Japan have been hosting a SchoolChildren's Summers School on Earthquake and Volcano in various locations related to earthquakes and volcanoes throughout Japan almost every year since 1999. Since 2011, the Geological Society of Japan joined the hosting group of the Summer School. We held this program at 16 area including 11 geoparks ,Izu peninsular(1999,2013), Toya-usu(2000), Izu oshima(2001), Kirishima(2005), Hakone(2007), Muroto(2010), Bandaisan(2011), Itoigawa(2012), Unzen(2014), Minamialps(2015).It is designed for experts on the frontlines of research and practice to have opportunities to communicate directly with children regarding the mechanisms and true nature of earthquakes and volcanoes together with the blessings of nature that are inseparably related to disasters.

The course consists of games, experiments and communication that arouse children's curiosity. It looks like geotour for children, which so far has been attended by a total of 537 children from ages 10 to 18.We will report on seismology and volcanology education as an attempt to nurture a next generation who are aware of the affluence and scientific interest brought by volcanoes and earthquakes as well as their terrifying aspects.

## **Design concept in establishing interpretation system for geoscience popularization in global geopark**

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A geopark is primarily set up for protecting valuable geological heritage, popularising geoscience and promoting sustainable tourism and economic development. As geoscience popularisation is an essential component, each geopark has to come up with a plan and design for its interpretation system to facilitate effective dissemination of information and messages. This study uses Yandangshan Global Geopark as an example to review the concepts of geopark interpretation. It outlines the four design principles of interpretive boards and panels which comprise consistency, visualisation, generalisation and accessibility. It also discusses in detail the establishment of indoor and outdoor interpretation such as museum, media and publication, interpretive guides, science popularization programmes and activities. The visual art design challenges of Yandangshan Global Geopark are presented particularly in identifying design theme, setting up plan, distribution of panels, uses of format, words and production. This enables practical knowledge and experiences to be shared with both national and other geoparks around the world.

Keywords: geopark, science popularization, design, Yandangshan

## What is wanted for learning about Geopark from school? : Suggestion from Toya-Utsu Global Geopark

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We made some text for school trip. These texts were made along two concepts. One is the text include learning contents of the subject along the course of study, and the other is the text include information for teachers to lead their students.

Now, many school carry out a school trip in Geoparks. The school trip is handled as school events mainly. So these learning become often transient. In some case teachers leave a program to a guide, and the school does nothing. We think that these problems are caused by Japanese education system.

In Japan, all school education is provided along a course of study that the government decided. The subject to learn "Geopark" is not set in a course of study. And most teachers cannot teach about Geopark. That is why, in many schools, the learning of Geopark is not carried out positively.

However, the learning material in Geopark is excellent as science and social learning material. Students can learn about the local history and regional industry too. Such learning is made much of in the guidelines on Global Geoparks Network. It is more necessary for us to tell the true value of Geopark to school.

So we discuss what we can do for school learning about Geopark in Japanese education system. We describe contents of the text we made. And we describe the point that we devised. We wish this example spread through Geoparks of Japan. And we wish many school deepen learning in Geopark.

## Development in Collaboration of Museums and Schools in Aso Region

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Since 2000, periods of integrated study which enhance student's spontaneity for their self-study has been delivered to schools which Ministry's curriculum guidelines apply in Japanese education systems. The study field is varied in International Understanding, Information, Environment, Welfare and Health, and is suggested to utilize social education facilities. Therefore effective way to collaborate between social education facilities and schools has been in development. On the other hand, an issue of decline in academic standards lead cut of integrated study time and make shift the time to general subjects. For that reason, way of collaboration between museums and schools tends to change.

Although compared to other regions, the collaboration has been relatively well in Aso, it is hard to say that the activity has been fruitful in cross-sectional and organizational way. To enhance more the collaboration, a planning meeting has been held with curators and education related people within Aso Geopark area while Aso Volcano Museum as a center since 2015. We actively work on strengthening its network of human resource of people involved in social education as well as establishing strong relationship with people in school education by utilizing the human and regional geological resources.

Thus we contribute and boost future education through the unique style of collaboration between museums and schools.

## ENJOYING Geopark Studies in Early Childhood Education in the Itoigawa Global Geopark

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Itoigawa City's Unified Education Policy for Children Aged 0-18 includes "Geopark Studies," creating an excellent opportunity for the Itoigawa Geopark to reach children and families living within the region. Previous programs had been effective in engaging elder children, but overlooked younger children. Newly introduced programs engage directly with children aged 3-5, who are too young to participate in school-based Geostudies.

New Geopark English Flash Cards use resources within the Geopark to teach English. For example, the color green is taught using local green-colored jade, as the Itoigawa Geopark is the birthplace of the world's oldest jade culture. These cards have proven effective in getting children excited about learning English while increasing awareness of the Geopark.

The Itoigawa Geo Drawing Exhibition, a display in the new Itoigawa GeoStation GeoPal Information Center, provides a venue where local preschool children can display drawings of what they like about the Itoigawa Geopark. Every local preschool has submitted drawings and participating children enjoy drawing about their hometown while thinking about what their Geopark means to them.

A new Mt. Myojo-themed slide and climbing wall, also in Itoigawa GeoStation GeoPal, gives small children and their parents a fun new way to experience and learn about important features of the Itoigawa Geopark. The city previously had few indoor play facilities, so this play area has been welcomed by children and parents.

These programs teach children about their Geopark from an early age while also involving parents and families who may have not known much about the Geopark.

## School Networking and Education for Promoting Matsu Geopark, Taiwan

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The four core values of geopark are landscape conservation, geo-tour, environmental education and community participation, but all are centered on the factor of human agency. The population of the entire Matsu Archipelago is slightly more than 10,000. With such limited population and great diversity in social organization, it is quite unlikely to form a new society or social group that could focus on geopark and its promotion. Thus, the promotion of geopark has to find alternatives socially.

This research ascertains that Matsu's primary schools and middle schools are in fact the focal point for social interaction and social learning. Schools also possess certain facilities and human resources that are useful and significant for promoting local natural and human assets, including natural landscapes and landscape created in the local natural setting but with human and cultural significance. Thus, we develop a strategy in promoting geopark through primary and middle schools.

We comply geological and geographical knowledge suitable for understanding local natural environment and human socio-cultural development to advance a series of environmental education for geopark. The educational materials are used as material to train student interpreters for geopark. Students' interpretation skills and competence are improved through various practicing and hosting visitors of school age from the main island of Taiwan and Hong Kong. With time and practice, the student interpreter's skill and competence are enhanced. But more importantly, with the students' participation in geopark promotion, their parents become involved in geopark or become more understanding of geopark. It is hoped that the educational materials for geopark promotion could be mainstreamed into the archipelago's school curriculum and geopark activities could become activities of the villages and schools as well. Such development will become important for the archipelago both in landscape conservation and in its vital economy of tourism.

Keywords: school networking, school curriculum, interpretation skill and competence, geopark promotion, Matsu Geopark.

## **Study of geological popularization by means of fairy tale show in Leye-Fengshan Global Geopark**

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Fairy tale show is vivid, intuitive, entertaining and funny to satisfy children's intellectual curiosity depending on the different roles of language, action, props and scenes. It is an innovative attempt in Leye-Fengshan Geopark popularization. Leye-Fengshan Geopark in China features numerous karst geosites including subterranean rivers, fengcong, tiankengs, karst windows, springs, natural bridges, caves; it also features faults, folds, panda fossils, as well as funny tiankeng animals like fly cat, cave fish, bat, birds and so on. In the fairy tale, a scientific adventure students group start an adventure trip in the geopark; on the way to the geopark, they discovered limestone, fossils, karst, trees, birds..., and a tiankeng, a great doline. They met tiankeng animals, a fly cat, a bat and a cave fish, and a panda (an ancient fossil, a great innovative idea of turning the panda fossil into a live panda). And in the show, kids act as animals, trees, a panda to guide the adventure group to travel around tiankeng, underground river and karst windows, caves, and tell them stories of how many tiankengs distributed, how underground river and caves enlarged, how trees and animals at the bottom of tiankeng and inside caves survived . In this fairy tale, both the roles and geosites are blended into the multilayers needed to make an attractive show, which is an edutainment way and a real geological interpretation which links the knowledge and emotion, and draws students' attention to learn and love the geology of the place where they live.

## **School of Geopark : Langkawi Global Geopark**

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Geopark is not just about rocks but education on rocks of Langkawi and its earth history is the most important matter in understanding Langkawi Global Geopark. Since the establishment of Langkawi Global Geopark, words like Palaeozoic, geology, fossil, karst, Cambrian and others jargon words were becoming more familiar to the people in Langkawi. Langkawi Global Geopark had brought opportunity for the people to start knowing the history of Langkawi since 550 million years ago when Langkawi land was formed. Langkawi Geopark has been actively organizing several programs with the school children in Langkawi and also other schools outside Langkawi District. Langkawi Global Geopark has established several program under Geopark School program such as Geopark Camp, Geopark Goes To School, School Goes To Geopark, GeoExpo and GeoXPDC. This program was made possible with the cooperation from the Langkawi District Education Department, Langkawi Research Center and Malaysia Nature Society's Langkawi Chapter. Teachers in Langkawi also have been involved with the Geopark's training program under Geopark Teacher program. Geopark Club also been established as new club for school in Langkawi where this club plays the role to disseminate information and program on the Langkawi Global Geopark. With the Langkawi Research Center establishment under Universiti Kebangsaan Malaysia, Langkawi Global Geopark technical partner, the local community has been involved with the research indirectly. We are hoping that community in Langkawi will be getting benefit from the research done and be able to help improve their livelihood and embrace the geopark concept in their live.

## **Role of museum and university for the earth science education in the San'in Kaigan Geopark**

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Geopark is expected as a place of lifelong education of earth sciences. In many geoparks, lifelong education is often propelled by museums or universities. The aims of establishment of museums have changed with the times. Recently, most of museums do not provide only exhibition but they have various educational programs. In addition to educational programs inside a museum, many museums promote some out-reach programs in surrounding area. Furthermore, they take a role as the think tank about protection, conservation and utilization of natural environments.

About 12 facilities, in which explanations of the geopark are exhibited, are scattered in the San'in Kaigan Geopark. It is difficult that these facilities promote sufficient education, out-reach activities and think tank activities independently all over the San'in Kaigan Geopark, because most of facilities are small scale and are operated by a few number of staffs.

Some teaching staffs of Graduate School of Regional Resource Management, University of Hyogo (RRM) participate in the administration of the San'in Kaigan geopark as academic staff and are closely cooperated Museum of Nature and Human Activities, Hyogo (MNH) situated out of the geopark. Organizing exhibitions, open seminars and informal gathering for discussion, RRM and MNH develop out-reach activities in the geopark related facilities. These out-reach programs are organized and performed by the cooperation among the staffs of facilities, local activity groups, administrative organ, MNHA and RRM.

Function of modern museums emphasizes outreach activities and the role of think tank is beneficial to the education and networking in geopark.

## Geo-education in Muroto Global Geopark

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In Muroto Global Geopark, we are promoting cooperation with educational institutions such as local schools. We include a wide range of knowledge and experiences as well as geology in our educational program. School children and local residents can learn earth sciences by understanding what occur and is going on in the area they live in. For instance, when they learn and understand how the land has been formed in Muroto, they learn tectonics. Also, they can find scientific connections and reasons as to why certain kinds of agricultural products or industries have been developed successfully in the area.

In Muroto city, schools have a policy of community study programs. Muroto Geopark Promotion Committee has been supporting school teachers with those programs. When one of the elementary classes studied 'Local Production and Local Consumption,' we organized their field study to visit some members of the local community for discussion. Some students in the Muroto High School are working on a designing of geo-tourism and we have provided some information and ideas to the teachers and students. They interview and communicate with local citizens such as geo-guide, primary producer or proprietor of the local stores.

The Muroto Geopark Promotion Committee is working on the geo-education for the local children cooperatively with school and local residents.

## Special education program of Geopark for high school students

### - In case of San' in Kaigan Geopark -

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Recently, a practicing education program is necessary in a high school education. The Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) proposed that it was important to cooperate with a research institute and university in a high school education by education guidelines. But a university and research institute doesn' t have a special educational program for high school, and it is difficult to cooperate with a university and research institute for high school. The other hand, a school education is one of important programs in geopark activities. Geopark can offer various educational programs and act as an intermediary between high school and university.

In San' in Kaigan Geopark, we offer various educational programs by cooperating with a university and local research institutes. University of Hyogo cooperates with Toyooka high school in SSH from 2010. We utilized San' in Kaigan Geopark, Itoigawa Geopark, Muroto Geopark, Jeju Geopark and Lesvos Geopark for high school educations.

Keywords: geopark, high school education, Super Science High School, SSH, San'in Kaigan Geopark

## Education and study of the Geopark

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We at Kasumi High School, located in Hyogo prefecture, take many actions around Sanin Kaigan Geopark to preserve its valuable nature. We check what is happening at the geo site, how many species are living there, breeding activity, and try to protect the environment. We feel that the Geopark provides us with many benefits in our daily lives.

We want to keep protecting the Geopark while using it as a place for students to study the environment. Even though each of our actions might be small and may not have much influence, we would like to pass down the knowledge we got from our elders to the younger generations.

We want to continue being conscious of the fact that we live near a very valuable source of environmental study and we want to learn more about it for our future.

## **Research based on the relation between the characteristics of the geological structure and everyday human life**

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We performed this research as a part of our school curriculum's Super Science High school Research Project.

A regions inhabitant's occupations ,and way of life, have many different effects on the area in which they live.

Mankind has, for centuries, reaped the rewards and endured the hardships of the land, all while using natural resources to build vast civilisations.

However, the body of research focusing on the relation between earth and humanitarian sciences is very limited and this relationship is as yet not well understood.

We focused our research in Niigata, which is close to the Sea Of Japan, to try and shed some light on this relationship.

## **San'in Kaigan Geopark educational field trip plan by and for high school students.**

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The San'in Kaigan Geopark Promotion Council provides many wonderful hiking courses and driving maps for individual visitors who want to experience the park's dynamic geological and cultural features. However, very little information and resources are available for group visitors, especially junior and senior high school students, who want to use the Geopark for educational purposes. Also, the lack of an education system using the Geopark was apparent. We saw this as a problem since one of the most important reasons Geoparks exist was for geotourism and education. So the five of us high school students planned an educational field trip to be carried out at our school, in cooperation with the San'in Kaigan Geopark Promotion Council. Our plan consisted of group field works, and activities with the local high school and university covering both geological and cultural materials. Our goal was to create a highly versatile field trip plan which could be provided to other schools to be used as a model. Although we could not make the trip plan come true, we will present the plan in the hope of future use.

## **San'in Kaigan Geopark and people's lives throughout history**

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San'in Kaigan Geopark, which is the work of the harsh nature of Shin'onsen-cho, has cradled various living beings and enriched the daily lives of those who receive benefits from them. However This doesn't mean that forerunners were always depending on nature. They understood nature, fought with nature, and finally constructed ways to live in this area. We researched this area and gained further understanding about the environment made by the Geopark, and focused on the forerunners' success and hardships. Now, we are going to report what Hamasaka high school is doing in order to make a future for San'in Kaigan Geopark, and show one of our plans to make this area more active.

## **Regional Enlivenment Project by Muraoka High School**

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Muraoka High School, which is located in the south of Kami-town, Hyougo Prefecture, has been developing educational programs involving the region, aiming to “learn about the region, cooperate with the region and make an essential school for the region”. Our activities in cooperation with the region are very distinctive. We have subjects such as “Exploring the Region / Introduction to Regional Science” and “Regional Enlivenment Project by Muraoka High School”. For example, in “Exploring the Region / Introduction to Regional Science” we investigate waterside insects with elementary school children in regional rivulets, being lectured by a specialist, which is well familiar with the subject. In addition, in “Regional Enlivenment Project by Muraoka High School”, students are divided into six teams, each group working on its own subject. Some of these include “Forest Health Checkup”, wherein students inspect a planted forest in Muraoka ward with regional participants, and “Rice-planting at Rice Terraces”, which is conservation activities with rice terraces in Ojiro ward. Also, all students participate as volunteers in the marathon races which are held in the San'in Kaigan Global Geopark.

## Lushan-The Sacred Mountain

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Lushan Global Geopark is located in the north part of Jiangxi Province. It is located south of Yangtze River and to the east of Poyang Lake. It covers an area of 500 k m<sup>2</sup>. The population in the core zone is about 10,000. The average elevation on the top of the mountain is around 1200m above sea level. In 1996 Lushan was admitted into the UNESCO World Heritage list as the 1st World Cultural Landscape in China. In 2004 Lushan became one of the 1st global geoparks in the Global Geopark Network.

Lushan is a famous mountain for its unique multi-genetic complexed landforms. It has typical mountain quaternary glaciations in the east of China, horst fault-blocking mountain and metamorphic core complex structures. Its landforms are intergraded with botany, culture and history. The landscape is dense with forest, running brooks, valleys, mountain peaks and waterfalls. Foreign villas in different styles and multiple religions abound. The deep culture connotation, the history and the continued western and Chinese cultural development have led to this place being called "the Sacred Mountain".

## **Holy Water Festival and Volcanoes in Wudalianchi Global Geopark**

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Abstract: Holy Water Festival, a custom to worship God for granting mineral spring in Wudalianchi, has been accredited as National Intangible Cultural Heritage in 2010. Local community hold ritual ceremony and cultural performance to express their admiration for magic mineral springs during the Dragon Boat Festival every year, so that the unique cultural heritage with local feature comes into being. Abundant fine mineral springs formed by the special volcanic geo-environment raise several generations. The thesis tells the internal relations between Holy Water Festival and volcanic geological background in Wudalianchi Global Geopark.

Keywords: Wudalianchi; Holy Water Festival; Mineral springs; Volcanoes

## Cultural heritage of people residing in Qeshm Geopark

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Cultural heritage and ancient background of people living in a territory are the signs to show the civilization in the area. Qeshm Geopark with regional and strategic location includes cultural and indigenous diversities. Customs, handicrafts and local architecture are valuable privileges of Qeshm Geopark those show rich legacy of culture and art ancients. Some of the customs in this area are special ceremonies in different occasions, such as Rezif (rɛzi:f) or Azvaa (æzwɒ) and Mowlody (mɔwlu:dɪ) in weddings and also the ceremony to launch Dhow (local name: Lenj). Meanwhile, diversity of foods especially seafood and cooking several types of traditional breads and sweets show their roots in culture and customs of local people. Special and unique dresses for local women those embroidered by Golabetoon (gɔlbɛtu:n), Shak (ʃæk) and Khoos are representing richness of handicrafts in this area. Also, making types of mats, baskets and sweepers by using palm trees and making kinds of ornamental accessories of marine mussels are other examples for handicrafts in this island. Specific architecture of houses with famous windward of this area, intelligent design of mosques, influence of water importance in design of pond and etc. are representing the historical background of art architecture in Qeshm Geopark. In this article has been tried to introduce some details about tradition and culture of local people in Qeshm Geopark.

## Showa-Shinzan and Five Scientists --- Creating Visual Archive Story

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Using abundant data accumulating at the Mimatsu Masao Memorial Museum (Showa-Shinzan Museum), and Volcano Study Room of Sobetsu Information Center (Sobetsu Town), we are on the way constructing digital archives focusing specific five scientists who contributed deeply studying the 1943-1945 Volcanic Activity of Mt. Usu, that produced lava dome of Showa-Shinzan 70 years ago, now it is one of the most important Geosites of Toya-Usu Global Geopark since 2009.

The names of those scientists are: (1) Mimatsu Masao (1888-1977) – Amateur Volcanologist (former Sobetsu Post Master), (2) Kouji Fukutomi (1908-1997) - Professor of Hokkaido University in Geophysics; (3) Takeshi Minakami (1909-1985) – professor of Tokyo University in Volcano Physics, Toshio Ishikawa (1909-1995) – Professor of Hokkaido University in Volcano Geology, (5)Kenzo Yagi (1914-2008) – Professor of Tohoku University (later Hokkaido University) in Volcano Petrology.

Earlier data sources are due to Masao Mimatsu, and Yoshio Katsui (including Toshio Ishikawa's collection), and recent data after 1977 eruption are supplied by Saburo Mimatsu, Yoshio Katsui (Volcano Geology), and H. Okada (Volcano Geophysics) who worked at Usu Volcano Observatory, Hokkaido University till 2007.

The final goal is creating visual archive story, easy and quick understanding for the public on the formation of Showa-Shinzan, and the scientists' interactions. The program has some difficulties for the public release, because of protecting privacy and clearing copyright, so we will release the data after careful consideration. We also will expand similar program covering other volcanic Activities in 1910, 1977-82 and 2000 at Mt. Usu.

## **Making The Past Present for The Future: Identification of Cultural Heritage in Langkawi Geopark**

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Cultural heritage, both tangible and intangible, is an invaluable record of human adaptation and creativity, transmitted through generations. Both forms of cultural heritage showcase the traditional knowledge that local people have regarding their world – nature, spiritual, human – and the interaction among them. Cultural heritage acts as a window to the past, a foundation for the present, and as a door for the future. It makes the past present for the future. The sustainability of cultural heritage, however, depends on the awareness, knowledge, acceptance and everyday practices of the local people. In the face of rapid globalisation, advancement of ICT, and the younger generation's lack of interest in the value of cultural heritage, the sustainability of cultural heritage as part of the local community's life and identity is at stake. Hence, efforts to safeguard traditional knowledge and cultural heritage are pertinent. The focus of this paper therefore is to identify the resources of cultural heritage in Langkawi Geopark. The island of Langkawi, conferred the status of a Global Geopark by GGN-UNESCO in 2007, and also known as the Islands of Legends, is an ideal location for documentation of cultural heritage. Based on the concept of integrated sustainable heritage conservation, Langkawi Geopark recognises the relationship between people, geology and biology. However, for Langkawi Geopark, the potential of cultural heritage has not been extensively documented. Local involvement in profiling cultural heritage is crucial for memory keeping of their livelihoods and identity. Through the use of documentary analysis, interviews and participant observation, preliminary findings indicate that the local people have strong attachment to their cultural heritage in relation to the geological and biological landscape. Hence, the need for systematic identification and presentation of cultural heritage is pertinent to realise the geopark aspiration of sustainable conservation, quality of life and education.

## **Volcano meisters are teachers, guides and communicaters.**

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I report the activities of volcano meisters throughout the year. We, volcano meisters guide people from the world. Some of them are interested in how to make citizen evacuate. Some of them want to know what kind of building they need to have in order to protect people from disasters. They are from South America, Europe, Asia, also from Japan. From Junior high school students to senior age. We walk the footpath with them to show destroyed roads, apartment, bridge, hospital, kindergarten. Especially we make efforts to suggest "Nature is not evil". In summer, we bring people to the lake tour. We feel very happy to find out new places full of wonder. Adventure always makes our heart beating. Volcano meisters visit schools. We talk in local gathering. We have a regular program in FM radio and newspaper. In summer, we support camping with children to feel emergency evacuating. In winter, snowshoe tour is very good to see volcanic landscape. We of course speak about danger, but we always enjoy wonderful nature around Toya-Utsu global geopark.

## People's lives brought by Kitamae-Bune and earthquakes in Ogi Peninsula

Yayoi ICHIHASHI

Sado Geopark Promotion Council

Kitamae-Bune (wooden transport craft), was used to travel from Seto Inland Sea to Hokkaido as the westward marine route. Ogi Port in Ogi Geosite was designated as one of the main ports on the westward marine route in 1672. That port was developed incredibly as a hub of east-west distribution of Japan. The development in Ogi area attracted many people.

We still can see the old town scenery and culture still remaining there. Ogi Port has unique geological features called Shiroyama. Shiroyama was formed when clastic materials from the submarine volcano were lifted up by the earthquake. It has two natural ports such as Uchinoma Port and Sotonoma Port. People can choose one depending on the wind direction. It was an advantage as a port.

In 1802 a big earthquake of magnitude 6.6-6.8 hit the offshore area of Ogi. Because of its effect, Uchinoma Port was uplifted about 1m and then it lost its function as a port. Instead, they made anchorages at the uplifted seaside and linked them with a canal. Two anchorages stuck together with a canal looked like joined two Shamisen guitars, so people called it Shamisen guitar canal.

Thanks to its unique geological features of Shiroyama, Ogi Port was developed as a port of call for Kitamae-Bune. Then, Geo guides show people around the area with telling a story from the birth of Shiroyama to Syamisen guitar canal and we make the best use to the story for local development.

## Diversity in Tobishima Island

Seiji KISHIMOTO, Akira SHIMANUKI

Mt.Chokai & Tobishima island Geopark Plan Promotion Council

The concept for the Mt. Chokai-Tobishima Island Geopark is based on the cycle of water and life nurtured by the Sea of Japan and the earth. The proposed geopark area encompasses approximately 80 km of coastline, and its wealth of marine resources has sustained regional existence. Tobishima Island, a coastal island located in the Sea of Japan, has become a geosite that is garnering attention from a variety of perspectives.

### Diversity on Tobishima Island

1. It has a unique ecosystem in which both northern and southern plant and animal species coexist due to the impact of the Tsushima Warm Current (biodiversity).
2. There are tectonic landforms created by sea erosion and land elevation resulting from volcanic activity (geodiversity).
3. The local fishing villages and their history and culture are representative of the Tohoku region along the Sea of Japan (cultural diversity).

The island population that once numbered over 1000 has dwindled to the current population of 220, and is expected to dip below 100 in 15 years. While facing this inevitable decline in population, a variety of groups are presently exploring ways to maintain the regional community and conserve the natural environment.

## Lesvos and Sanin Kaigan Global Geoparks collaboration

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Lesvos Global Geopark and San'in Kaigan Global Geopark are two Geoparks that share many common features like spectacular volcanic and coastal landscapes, geothermal fields, protected areas, rich biodiversity and endemic species, rich cultural heritage, common approach in geotouristic and educational activities as well as innovative local development initiatives on food and handcrafts. On the 12th of February 2011 they have signed a sistering agreement, aiming to the close collaboration of the two territories in various fields of mutual interest like geotourism, educational programmes and networking. The geographical distance between them was not an obstacle for fruitful collaboration, Concrete results during the last years shown that there is great potential and opportunities for common activities among Global Geoparks. As a result of the collaboration between Lesvos Global Geopark and San'in Kaigan Global Geopark several visits from both sides have led to the exchange of knowhow and experiences, to a comparative study, collaboration in conferences, capacity building activities and courses, research and educational activities, presentation of Geopark collaboration and preparation for exchange of exhibitions. Highlight was the visit in 2014 of the Toyooka High School in Lesvos where the students participated in educational programmes, collaborated with the 4th gymnasium of Mytilini, which is a local high school, partner of Lesvos Geopark, both schools presented their home geopark and had the opportunity to get to know each other. The programme was so successful that it will be repeated in 2015.

## **Setting performance standards and operation guidelines for enhanced service delivery**

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Performance standards and operational guidelines are useful tools for the effective management of global geoparks. The Hong Kong Global Geopark Operation Guidelines were produced in 2011 to provide park managers, rangers and other frontline staff with a logical and consistent approach for routine operations. It is also a useful guide to facilitate daily decision-making in response to changing needs, and to ensure accepted standards are adhered to and maintained in the geopark.

A common understanding is imperative to providing consistent, high quality services in any geopark. To further improve operational practices and enhance job standards to meet the rising needs of visitors, our guidelines are periodically reviewed.

This presentation gives an overview of the setting of performance standards and the preparation of operational guidelines in a fully functional global geopark. We will also discuss difficulties encountered, together with valuable feedback from our co-management partners, in implementing the guidelines.

## Development of Spatial Resource Management System in Yehliu Geopark

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Yehliu Geopark possesses specific natural environment and rich sightseeing resources, hence, it attracts numbers of domestic and foreign tourists to visit. In order to pursue evenly both of the quality of tourism and environment protection, the Enterprise Spatial Resource Management, ESRM, was built up for Yehliu Geopark in 2012. The multimedia applications, such as virtual flight guiding system, Yehliu e-docent (Yehliu Tour), and touchscreen tourist guide system, serve with the park information like natural environment monitoring, eco-environment investigation, rock weathering/erosion monitoring, docenting, and historical literatures, to meet the needs of tourists and any park intro requirements.

The ESRM is also a real time information center, besides its introduction and e-docent services. Such platform, ESRM, provides decision makers to determine instantly with events in the park: population in the park, facilities use and maintenance, and emergency announcement and feedback, by appear ESRM integrated info on the dashboard without using traditional method like papers and pens but immediate info. Together with the current and follow-up related investigation results, the function of analysis and simulation is strengthen gradually under persistently collecting about the information of park business management and dynamical information of natural environment by ESRM. The ESRM is hoping to become the data center and to support to make decisions. In the same time, assisting manager to do a better job on running park and its management, environmental education, and tourist service in efficiency and quality.

## APPLYING SPACE TECHNOLOGY TO GEOPARKS

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A Geopark is a nationally protected area containing a number of geological heritage sites of particular importance, rarity or aesthetic appeal. It achieves its goals through a three-pronged approach: Conservation, Education and Geo-tourism. Space Technologies are technologies that are used to observe, measure and understand our planet through earth observation from space, including Remote Sensing (RS), Geographical Information System (GIS), Global Position System (GPS), Virtual Reality and so on. As it has many advantages like large-scale, lower-cost, near real-time, etc, it can play a very important role in the three prongs. 1) Conservation Geological heritage is unique and non-renewable, it represents the geological history and evolution of specific regions. Space technologies have clear and direct benefit for monitoring geological features since RS data can analyze way larger spectrum range than human eyes. By building dynamic monitoring systems using RS data, GIS and GPS, managers can get an objective and comprehensive view of our parks and make a timely response to natural and human-induced disasters. 2) Education A Geopark should organize activities and provides logistic support to communicate geo-scientific knowledge and environmental concepts to the public. With the help of virtual reality, people will have a more visualized and interesting approach for knowledge acquisition and concept formation. 3) Geo-tourism Tourism is really a double-edged sword for geoparks. A GIS-based tourism management system can analyze footfall and classify it on both spatial and time dimensions, which will definitely help our parks develop in a sustainable way.

## Geoparks and University Partnerships for Achieving Post-Disaster Community Development Using Volcanic Wreckage

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This study aims to clarify how disaster wreckage can be preserved and used to attract tourists, as well as to form geopark promotion councils and partnerships with universities and local communities after recovering from a volcanic disaster. The study covers geopark promotion councils of the Unzen Volcanic Area and the Toya Caldera and Usu Volcano in Japan. The promotion councils comprise local governments, universities, citizens' groups, and private companies. The study involved a review of relevant literature followed by interviews with local government officers, researchers, and representatives of citizen groups from 2010.

The study concluded that: 1) the efforts to conserve and manage disaster wreckage of the Unzen Volcanic area were led by local governments. Experts from universities offered technical support for the conduct of research demonstrating the importance of the disaster wreckage and for preserving that wreckage. However, local residents could not participate in the development of the preservation plan. In contrast, local residents of the Usu Volcanic area were able to participate in the planning process thanks to the involvement of experts from universities; 2) in the Unzen Volcanic area, a partnership was forged based on a middle-up-down management model led by the geopark promotion council, while universities participated in the executive meetings.

Meanwhile, a bottom-up approach was adopted to forge a similar partnership led by a proactive joint committee in the geopark promotion council of Usu Volcanic area.

Universities should therefore conclude comprehensive partnership agreements with geopark promotion councils to participate in local efforts as their members

## A first attempt of geopark management led by a civilian society in Japan

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The Tateyama-Kurobe region in north-central Japan, is characterized by the Hida mountain range, over 3,000m in elevation, and the Toyama Bay with steep slope falling down onto the 1,000m deep seabed, both of which are only about 50 km apart. From the plentiful snow and rain in the region, steep rivers flow seemingly to link mountainous and maritime areas, creating coastal alluvial fans. The people have formed a specific culture using this providence of plentiful water, land and marine resources. Geologically, the region is an important representative of tectonic development of Japanese archipelagoes, because it is comprised of relics of continental collision, continental drift during the Paleozoic, and volcanic activities since the Mesozoic, centering on the Hida metamorphic belt.

In the Tateyama-Kurobe region, there already were prolific activities, like volunteer guides and research groups through Toyama Prefecture's Naturalist guide politics; entertaining the possibility of including and maintaining the non-municipal civil perspective, which is a fresh approach different from what other Japanese Geoparks had performed until now. With organizing local businesses and guide associations, together with individuals, the civilian leading "TATEYAMA KUROBE Geopark Society" spearheads the Geopark operations, while the mayors of the local municipalities have formed a separate council on the matter. Both organizations maintain independent relationship as equal partners, and cooperate in promoting the Geopark making use of the respective merits each other. In April this year, the Society has been formally incorporated, and we are planning to raise the level of activity in tourism and other regional contributors.

## Future vision of Aso Geopark and its role in Geoparks Network

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Majority of areas of Japanese Geoparks Network take government-led system. Represented local municipality take a role of its bureau. Temp staff from related municipalities within a geopark area and full-time geopark staff work together in the bureau, and it is operated by burden charge from the related municipalities.

Aso Global Geopark has different management structure from the most of Japanese Geopark areas, Aso Geopark Promotion Council is operated by part of management gains of the Aso Local Development Design Centre Foundation (ASODC), a public interest incorporated foundation. ASODC was jointly established by eight municipalities with an endowment in 1990. This structure contribute sustainable activity to Aso region.

However, staff in ASODC has also temporally contract from their each municipalities. For that reason, staff changes in period of time. Moreover full-time geopark staff has also temporally contract from the council. Therefore the issue may affect for future sustainable operation.

To tackle the issue, turning the council to an incorporated organization from ASODC can be one of the solutions. The ideal incorporation organization may promote efficient geotourism by collaborated with Aso Geopark Guides Association and other related bodies by taking travel agency license. We are now researching on establishing the new structure to take a role as destination management organization for more sustainable and globalized Aso region.

## Cooperation between geoparks network and biosphere reserves network in Japan- Through Hakusan as a focal point -

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Hakusan Tedorigawa National Geopark is an aspiring geopark. Its area overlaps partly with the Mt. Hakusan Biosphere Reserve. Hence, Hakusan belongs to both national networks: Japanese Geoparks Network (JGN) and Japanese Biosphere Reserves Network (JBRN).

JGN is composed of 36 national geoparks (including 7 global geoparks) and 17 candidates. Its networking activity is very strong and it is playing a fundamental role to exchange the member's experience to improve each other. On the other hand, JBRN was founded quite recently, far after the designation of the first biosphere reserve (BR) in Japan. It is composed of 7 BRs. JGN is being a good example for this growing network to establish its organization.

Conversely, BRs have a long history as an official program of UNESCO, and are in line with the Japanese National Commission for UNESCO. Currently, geopark is getting to be an official program of UNESCO, and is waiting for the decision of the General Conference. The experience of JBRN will be a good example for JGN to seek their way how to adopt this change in the national level.

Hakusan is one of the very few members which belong to both networks. We are introducing both network's activities, experiences, and current status to each other so that both can learn from each other and improve their activities. And as an aspiring geopark, we are willing to take an additional role to be the focal point between not only national but global networks in the near future.

## **Transboundary geoparks for what and to whom?: Case study of a cross-national geopark in Hungary and Slovakia**

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The number of transboundary geoparks are increasing worldwide. Many geoparks have plural number of municipalities, although management is easier in geoparks with single municipality. Some geoparks even have national borders. The aim of this study is to clarify how a geopark with a national border is managed, and to examine the meaning of the territoriality. A case study was conducted in Novohrad - Nógrád Global Geopark (NNG) with a national border between Hungary and Slovakia with some comparisons with geoparks in Japan.

## Management of Caoling Geopark, Yunlin County, Taiwan

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Caoling village is located in the east part of Yunlin County, Taiwan, and has been one of the most famous scenic sites in Taiwan. In coupling with international trend of geoconservation development, the residents of Caoling village decided to establish the Caoling Geopark in 2004. This presentation briefly illustrates the management of Caoling Geopark during the past decade in four different parts, including geoconservation, geotourism development, environmental education and community participation. In the geoconservation context, we have been monitoring and recording the change of geoconservation sites. Management plans have been proposed and implemented accordingly, in order to identify the threats of each landscape and to prevent and handle natural disasters. For example, the 921 National Earthquake Memorial Site was set up in 2005. The main goals of this protected area includes: (1) to protect residents and visitors from the unstable area, and (2) to preserve its natural processes. In the geotourism development context, 6 recreational trails have been constructed to connect several landscape sites together to provide enhanced recreational experience for tourists. Natural landscapes interpretation training courses have also been held each year to train residents as interpreters. In the environmental education context, the Education Center was recently set up in the Caoling elementary school, and the Environmental Education Center was opened in the community. In the near future, Caoling Information Center will also be launched to serve tourism and education affairs. In the community participation context, Caoling's residents are involved in all the aforementioned contexts. For example, some residents have become the bus drivers that guide the tourists around the major landscapes and provide interpretation service. Recently, the residents have also been working together to design and develop Caoling's Geoproducts.

## Management Framework of Chinese Geoparks

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China started to set up national geopark system in the year of 2000, since then, the geoparks have been rapidly developed across the county. By now, China has the largest number of GGN members (31) in the world, besides, there are more than 200 national geoparks and much more provincial geoparks in China.

The geoparks in China are dominated by governments, because the geoheritage protection is one of governmental duties. At the first beginning, China paid much attention to the establishment of an effective geopark management system. The highest geopark management organization in China is the Ministry of Land and Resources, with a leading group and expert committee of geopark (geoheritage) evaluation, which are responsible for assessing national geopark application, policy-making, geopark development plan, financial support and daily geopark management at the national level, and also for the global geopark candidate selection and recommendation. The departments of land and resources at different government levels are responsible for their own geoparks. The Chinese Geopark Network is in charge of coordination, organization of national geopark activities.

## The Satun Geopark: Thailand first's aspiring geopark

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The Satun Geopark, covers an area of 2,597 km<sup>2</sup>, and is located in Satun Province, one of the southernmost provinces in Thailand adjacent to the Andaman Sea. The Satun Geopark, which was announced as a provincial geopark in August 2014, contains various distinguishing landforms including over 70 islands in the Andaman sea, sandy beaches, diverse forest types, Karst formations, mountains, caves, water falls, and prominent mainland fossil sites. Fossils from the Cenozoic and Paleozoic are the most commonly encountered. Several ancient fossils are found in potentially Thailand's largest sea cave which is approximately 3 km long. Unfortunately many fossil sites have been removed or destroyed as a result of human activities. To protect the natural beauty of these resources and develop the local economy toward sustainable tourism, the local governments from multiple levels in collaboration with scientists, local people, schools, and private sectors has established the first provincial geopark of Thailand. Additionally, there are now local museums which provide both training and display fossils as well as other natural and historical objects to encourage awareness of their intrinsic value. In addition the museum serves to educate on sustainable conservation and geotourism. The Geopark activities have expanded the number of people visiting the region in only a few months which will ultimately result in greater conservation concern for the geological resources found in Satun.

## **Geo-cultural Heritage Of Dong Van And Krong No Geoparks – Approach From Geological Aspect.**

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Relationship between Human and Nature, even in the pre-historical time has long been discovered. Residents living in different natural regions have created different indigenous knowledge treasures, which so-called *geo-cultural heritages*, to adapt themselves to the environment they live. “*Geo-cultural heritage* is very a treasure of comprehensive indigenous knowledge and living skills of local people, contains exceptional cultural factors, which reflect the perception of the community about features of their surrounding natural environment”.

DVG was recognized as a member of GGN in 2010, then has as recently as become one of 111 GGN's member after the 2014 revaluation. It is located in a typical karstic mountainous region in the Northernmost of Vietnam, contains outstanding natural and cultural heritages represented for a karstic region. Minority ethnic groups have created a famous Rocky Culture there.

Meanwhile, KRG is located in the largest basaltic plateau in South Part with typical volcano-geoheritages such as spectacular landscapes of craters, waterfalls, tree mold fossils, basalt flows, columnar basalt, the longest lava caves of Southeast Asia, and so on. KRG is homeland of *The Cultural Space of Gong of The Central Highland* recognized as “*Masterpieces of the Oral and Intangible Cultural Heritage of Humanity*” by UNESCO in 2005 and basaltic lithophone sets represented for volcanic geological platform.

In both geoparks, almost geo-cultural heritages resulted from different geological platforms. They are an effective tool and have been exploiting for geo-tourism thanks to their uniqueness, attraction and unlimited exploitation potential. Geological approach to geo-cultural heritages of two geoparks will be mentioned in the article.

Key words: Dong Van Karst Plateau Global Geopark (DVG); Krong No Aspiring Volcano-Geopark (KRG); geo-cultural heritage; Rocky Culture; volcano-geoheritage; basaltic lithophone sets.

## **Krong No Aspiring Volcano-Geopark In Dak Nong Province, Vietnam**

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Krong No aspiring volcano-geopark covers approximately 2,000km<sup>2</sup>, located in Krong No District, Dak Nong Province, The Central Highlands, Vietnam. The geopark has great potential on geoheritages related to activities of Chu'Bluk volcano. Natural and cultural heritages consist of geoheritage, biodiversity, archaeology, history and culture, and so on. They all meet criteria for a national geopark, expecting to become a GGN's member.

Six geoheritage types have been recognized in Krong No: 1. Paleontological: unique large tree mold fossils in basalt, many other fossils; 2. Morphological: spectacular landscapes such as mountain ranges, basalt flows, lakes, craters, waterfalls, and the longest lava tube cave system in Southeast Asia; 3. Rocky: different-facies volcanic rocks such as columnar basalt, foamed basalt, volcanic bombs, ultramafic xenoliths, and so on; 4. Stratigraphical: boundaries between terrigenous and magmatic formations; 5. Mineral Resources: bauxite, precious to semi-precious rocks, especially huge blocks of opal-chalcedon and others; 6. Tecto-structural: is one of valuable geoheritage type of the geopark.

In the region, there are Nam Nung Nature Conservation Region and Dray Sap Landscape Special-use Forest with hundreds of plant and animal species listed in the Red Book of Vietnam and Globe.

Krong No Geopark is a part of The Central Highlands – homeland of “The Cultural Space of Gong in The Central Highlands” recognized as “Masterpieces of the Oral and Intangible Cultural Heritage of Humanity” by UNESCO in 2005. Among many valuable cultural heritages, 3,000-2,500 year-old lithophone sets considered as one of the most ancient, unique musical instrument of humanity.

Recently, scientists are studying to set up the national and international geopark dossier for the region.

Key words: Krong No aspiring volcano-geopark; Chu'Bluk volcano; geoheritage types; tree mold fossils; lava tube caves; lithophone sets.

## **The case for Latin America: New aspiring Geoparks in the region. The benefit of networking**

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The work of the Regional Bureau for Science of UNESCO in Latin America and the Caribbean in Earth Sciences focuses on the creation of a Geoparks Network in Latin America and the Caribbean. Geoparks are part of an integrated concept of geoprotection, geoeeducation and sustainable economic development, mainly through geotourism where citizens, public managers, private sector, and scientific organizations work together. The contribution of Geoparks towards sustainable development starts to be appreciated in this region.

The consequence of assessing the geological, natural and cultural heritage of a territory is the need of tools for their management. The Latin America and the Caribbean Geoparks Network and the Global Geoparks Network (assisted by UNESCO) have the function to provide these tools, aiming at promoting the sustainable development of a territory through the valorization and conservation of its geological, natural and cultural heritage as well as promoting geo education and local economic development. There is a need for Latin America and the Caribbean to work towards an effective collaboration with geoscientists, local authorities and tourism organisations, and to set up a structured network of interpretation facilities to support the development of Geopark activities.

## KINTA VALLEY – AN ASPIRING GEOPARK FROM MALAYSIA

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During the mid-20<sup>th</sup> century Kinta Valley was well known as the world largest tin producer, hence mining activities were responsible for its early development. Kinta Valley Geopark has beautiful karst landscape rich in biodiversity and culture diversity. Ipoh City at the centre of this geopark is located about 200km north of Kuala Lumpur. The Geopark covers an area of 1952 square km, comprises of Ipoh City Council, Batu Gajah and Kampar Municipalities. It has population of about 630,000 comprises mainly of three major ethnic races, Malay, Chinese, and Indian, with small population of local natives and other ethnics minorities. More than twenty geosites have been identified. Most of these geosites are related to karst landforms, waterfalls, hot springs and ex-mining land refurbishment areas. Some are protected by Forestry Department Act and Local Government Ordinance. Gua Tempurung and Gunung Puah geosites are National Heritage Sites. Gua Tempurung, Sungai Kampar White Water Rafting, Gunung Datok and Gunung Rapat are popular tourist destinations, domestically and internationally. Most of these tourism and recreation developments are managed by private sectors. Kinta Valley Geopark is endowed with many historic buildings, museums and townships. It is also well known for pomelo and other agricultural products, local handicraft and culinary products tagged and promoted as part of Geopark products. Several initiatives have been organized to bring all stakeholders together in support of the geopark concept. With all its assets and strong support from stakeholders, Kinta Valley Geopark seeks to be future Malaysian candidate for global geoparks.

## Kirishima Geopark: The Geopark You Can Travel by Train

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Kitamae-Bune (wooden transport craft), was used to travel from Seto Inland Sea to Hokkaido as the westward marine route. Ogi Port in Ogi Geosite was designated as one of the main ports on the westward marine route in 1672. That port was developed incredibly as a hub of east-west distribution of Japan. The development in Ogi area attracted many people.

We still can see the old town scenery and culture still remaining there. Ogi Port has unique geological features called Shiroyama. Shiroyama was formed when clastic materials from the submarine volcano were lifted up by the earthquake. It has two natural ports such as Uchinoma Port and Sotonoma Port. People can choose one Depending on the wind direction. It was an advantage as a port.

In 1802 a big earthquake of magnitude 6.6-6.8 hit the offshore area of Ogi. Because of its effect, Uchinoma Port was uplifted about 1m and then it lost its function as a port. Instead, they made anchorages at the uplifted seaside and linked them with a canal.

Two anchorages stuck together with a canal looked like joined two Shamisen guitars, so people called it Shamisen guitar canal.

Thanks to its unique geological features of Shiroyama, Ogi Port was developed as a port of call for Kitamae-Bune. Then, Geo guides show people around the area with telling a story from the birth of Shiroyama to Syamisen guitar canal and we make the best use to the story for local development.

## **What we did and what we have to do to make public courses fun and interesting**

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We've already organized public courses 10 times since 2010. The course includes field works, experiments and lectures to study geological features of Sado Island. It is an important base to nourish Geo-guides. After participants finish the course, they can apply for the Geo-guides training course.

At the beginning, there were courses on geology of Sado Island, so people thought Geopark was to study geology, but since 2014 we've lessened some geology classes in the course and started to offer some opportunities to visit marine facilities and to study endemic plants of Sado Island instead. Participants, who were interested in Geopark from the viewpoint of geology at first, find out that their culture and lives are always affected by the earth. Then, they also enjoy learning the connection among them. Now, The Participants have an important role as Geo-guides to tell how to enjoy Geopark.

However, we still have some tasks to work on. First, we need to get rid of a stereotype of Geopark as difficult study of geology. That's why we need storytellers to let people know how they and the earth always relate to each other. Then, we also need to arrange more attractive courses to help them feel closer to Geopark.

## CONCEPT AND PRESENT ISSUE OF SANUKI GEOPARK PROJECT

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Sanuki region is the old name of Kagawa Prefecture, which is situated in the northeastern part of Shikoku, a large island in southwestern Japan. The Sanuki Plains stretch to the north, and the Seto Inland Sea beyond that is dotted with 116 islands of all sizes, to form an impressive archipelago. Dr. Shuichi Hasegawa, professor of Kagawa University, proposed a concept of Sanuki Geopark in 2010 and has continued activities on research, lectures, excursion and symposium for local citizens. Sanuki will serve as a unique geopark with the following unique points: 1) Unique Setouchi volcanism which produced sanukitoid and sanukite 2) Unique monadnocs, comprised of mesas and volcanic necks resulting from Setouchi volcanic activities 3) Unique stone cultures using diverse properties of volcanic rocks.

Understanding the strong points and weak points of the Kagawa Prefecture is essential for sustainable development. Sanuki Geopark Project will provide the base of sustainable development and re-creation of local society. Sanuki Geopark Project will be the ultimate disaster education. At present, the Sanuki Geopark Project is deadlocked. This paper summarize the concept and present issue of Sanuki Geopark Project.

## **The proposals from Hakusan Tedorigawa National Geopark - Weaving a geomorphological geostory with ecological and cultural features -**

Tsuyoshi HIBINO <sup>1</sup>, Shinsuke NAKAMURA <sup>1</sup>, Tatsuto AOKI <sup>2</sup>

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<sup>2</sup> Kanazawa University

Hakusan Tedorigawa National Geopark was designated as a Japanese geopark in 2011. Our main feature is our geostory called “Journey of Water” which stands for the water cycle between mountains, rivers and sea. We can see another journey accompanying water, called “Journey of Rocks” which stands for erosion, transportation, and sedimentation.

These two journeys are not the only phenomenon throughout the world, but since Japan is so tectonic and so pluvial, we can see the hydrologic cycle in a very compact scale and the topographic formation in a very short time scale. Hakusan Tedorigawa Geopark is a good miniature of such Japan. For evidence, Mt. Hakusan is one of the great snowfall area among the world and Tedor River is one of the steepest river in the world, which shows the high erosion level. In addition, our area has the headwaters and the river mouth in our small area which provides a good field to learn the watershed management system as a whole.

This geostory has many benefits such as its connection of geology (including geomorphology), ecology and culture. For example, people in the mountainous area make rice cakes from Japanese horse chestnuts, and these forests develop on unstable lands. From this point, geology, ecology and culture could be integrated in a single unified geostory which indicates the earth as a fundamental being for human and other organisms.

This is what we would like to propose for the Global Geoparks Network, adding a new value to the network.

## **The proposed Khorat Geopark: conservation of prominent geosites and important natural resources of Thailand**

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Nakhon Ratchasima, also known as Khorat, is one of the most prominent provinces in northeastern Thailand for its unique geological heritage and diverse natural resources. The aspiring Khorat Geopark is proposed in 2015, covering southwestern Nakhon Ratchasima, 9,862.24 km<sup>2</sup>, including Paleozoic, Mesozoic (new taxa of dinosaurs, crocodile, hybodont shark, and turtles), and Cenozoic fossil sites. The Cenozoic sediments contain diverse mammalian fossils and petrified tree trunks.

Some of the most exciting discoveries in the area are the new ape taxon, *Khoratpithecus piriyai*, and 10 of the 44 total genera of ancient proboscideans, in addition to fossils related to currently living African mammals, such as hyenas and giraffes. To conserve fossils, the Nakhon Ratchasima Rajabhat University has collaborated with the provincial government and the Department of Mineral Resources by establishing on-site museums and organizing educational programs related to geology and paleontology for the public. The proposed geopark will include important ecological sites in the Dong Phrayayen-Khao Yai Forest Complex World Heritage Site and the Sakaerat Biosphere Reserve under the Man and Biosphere Reserve Network UNESCO. Numerous wildlife species and plants, including vulnerable, threatened, and endangered species, are protected in these tropical forests. The Sakaerat Environmental Research Station facilitates some of the region's most comprehensive research and monitoring programs and hosts science camps for approximately 17,000 students each year. The establishment of Khorat Geopark will aid in conserving the geological resources and benefit locals as part of the integrative program of protection, conservation, tourism promotion, economic, and sustainable development of the region.

## **The Strategies of Development for Penghu Geo-park in Use of Geo-dessert**

Benkang CHEN

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The committee of Promotion for Penghu Geo-park established in 2002 has been around for 13 years, though accomplished good results in hardware and software for many geological spots, but recently, the development trend seems to be slowing down. Therefore, how to add innovative ideas to accelerate the development of Penghu Geo-park is worth discussing. Combine the experience of C.G.S project 「 Promotion and Development Project of Geoscience Network for Taiwan」 in promotion geological knowledge and geopark in Penghu area, this paper is trying to develop the strategies of development for Penghu Geo-park in use of geo-dessert. First, choose the representative geological elements of Penghu Geo-park, including columnar basalt, massive basalt, spit, sour goo stone, lava flows, etc., and then look for the characteristics of Penghu existing desserts, including black sugar cake, peanuts, rice cakes, scallops sauce etc., and then to formulate strategies for future growth by interviewing with local business company people. After the interviews, five products developed, including basalt black sugar cake, pineapple basalt cake, spit peanut candy, rice cakes and sour sauce scallops goo stone and lava and with Geo-park logo. The following are potential markets, including the earth science education units, geological professional company, relevant government departments, etc., and finally extended to private tourism system, and even the world geo-park system. With the support of the community making creative geo-dessert by adding geological landscape elements, people can realize the geological meanings, and in the same time to achieve the aims of education, conservation of geo-park and it is helpful for economic growth.

## **Geopark as a Nodal Nexus for Development: on enhancing community functioning and avoiding creative destruction**

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As development has become a buzz word that implicates favorable changes for places, many cases have shown the creative destruction of communities with commodification and entrepreneurialism. In Taiwan's community-based geopark development, means for social and economic vitality are sought vigorously. The social networking seems to become a favorably strong link that maintains interest and vigor in the conservation of landscape and the natural environment. For safekeeping the environment, knowledge exchange and experience sharing are vital. However, the geopark development also points to the slightly short of economic success and means that serve to sustain community's long term prospective for networking and landscape conservation. As some communities are able to secure resources for proper functioning, some are either short of the knowledge or the means for fulfilling the core values of geoparks.

This paper will illustrate the social networking success and the substandard economic enhancement of Taiwan's geopark communities. Then, with first hand and participatory observation and qualitative interviews, this paper will develop a socio-cultural and economic framework/system for Taiwan's geopark community.

Finally, this paper will point out contextual solutions for improving or enhancing social and economic vitality of the geopark communities.

Keywords: community development, learning community, creative destruction, commodification, post-modern development, geopark community.

## Hong Kong Global Geopark: Enhancing Local Engagement and Sustainable Economic Development

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The Global Network of National Geoparks (GGN) stipulates one of the main strategic objectives of a Geopark is to stimulate economic activity within the framework of sustainable development. The philosophy and vision of geoparks provide a balance between conservation of geoheritages, local socio-economic development and local community empowerment. Geopark will not have its soul if the local communities are not involved. Empowering them will increase their sense of ownership to conserve local resources whilst improving the quality of life. The importance of sustainable regional economic development and geotourism is being reflected from the 25% weightings attached amongst the six criteria in geopark assessment. Though GGN has set up guidelines, sustainable economic development is a very broad and elusive concept that is not easy to concretely put into practice. It is specific to local context. The Hong Kong Geopark, officially opened in 2009, was accepted as a member of the GGN in 2011. Situated in a cosmopolitan city with advanced economy, the operation of Hong Kong Global Geopark is very different from those geoparks in rural areas where economy is less developed. This presentation discusses how Hong Kong Global Geopark helps to enhance local engagement and sustainable economic development in an advanced economy. It also identifies areas for improvement to make geopark an even more effective approach to make Hong Kong one of the most livable cities in the world.

Keywords: Hong Kong Global Geopark, cosmopolitan city, sustainable economic development, geotourism, local engagement

## **STRENGTHEN THE CONTACT BETWEEN MAN AND NATURE, THE POPULAR SCIENCE ACTIVITY OF GEOPARK HOME IN 2015**

Han FEI

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Geopark Home is organized by China University of Geosciences and Wuhan Geosciences Journey Info Tech Co., Ltd. As a professional team with geological background in hydrological-engineering-environmental geology, tourism planning and information technology, we are keen on geological tourism and devote ourselves in earth protection, geological conservation promotion, geological relics exploration and geoparks popular sciences extension. Many geoparks and mining parks have assigned in Geopark Home.

Geoparker Volunteer Community is founded by Geopark Home. It brings volunteers of geoscience popularization together and provide a platform for activity release, management and promotion of parks. Volunteers from more than 20 provinces who devoted themselves in geology( tectonics, mineral, paleontology, fossil, astronomy), plant, insect, animal, bird, fish, outdoor sports( mountain-climbing, hiking, hot-air balloon, gliding, diving, sailing), media and image contribute to the park research and geoscience popularization planning.

In 2015, we believe more volunteers will be attracted by our community. They will actively devote themselves in tourism research, promote the idea of nature respecting and conservation, help people to know the history of earth evolution and raise their awareness of protection for geological heritage when they appreciate the nature scenery.

## **Investigation And Study on Community's Developing and Protection Of Shilin Geopark, Yunnan, China**

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Shilin Geopark is located in Shilin Ethnic Yi Autonomous County in eastern Yunnan province, which represents one of the world's most spectacular examples of humid tropical to subtropical karst landscapes occurred some 270 million years ago. The zone of Shilin Geopark for tourists covers an area of 20 km<sup>2</sup> and is surrounded by a much bigger buffer zone which covers an area of 330 km<sup>2</sup>. There are 75 natural villages and about 67,700 people live in the whole Park. How to balance development of the local community and the protection of resources in the park is a big problem for the administrative organization.

Because of the strong limitation on natural resources using in the park, the contradictions between the needs of community's development and the constraints posing on Geopark conservation are becoming more and more serious. In order to evaluate the relationship between the community's developing and protection of Geopark, the administrative bureau undertook the research and study, and the result suggests that developing rural tourism can be considered as a good way to solve the problems. Developing rural tourism can improve the local community engagement to the tourism, and create a lot of jobs and career opportunities, help the local people reduce the dependence on the land and natural resources. Consequently, it can increase the tourism multiplier, and enrich the local people in a more sustainable way rather than depending on subsidy from government.

# CONNECTIVITY MODEL OF MIGRANT FISHERMEN ACTIVITY FOR SUSTAINING LOCAL COMMUNITIES AT SALURA ISLAND INDONESIA

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Salura Island is one of the outer islands are located in the southeast of the island of Sumba. The island is surrounded by the Indian Ocean has a sloping topography of the coast in the north and steep in the south. Most of the terrain is hilly rocks and only about 25% of the land inhabited plains Salura Village community. Salura island inhabited by a population of 568 people and 138 households. Population density ranges from 52 persons per square km, with an area of 29 km square. The existence of the island Salura be an attraction for migrant fishermen from Lombok Island in West Nusa Tenggara. Seasonal migration is done is to make an arrest in Salura fishery resources, especially squid. With the continuous increase of fishing activities and resource use in coastal squid and sea Salura East Sumba Island, then most of the needs of migrant communities and local residents depend on nature as a provider of ecological, social and economic daily. This raises for squid resource sustainability in the location of fishing activities, because the abundance and availability will continue to decrease. The purpose of this study is to identify socio-ecological connectivity of coastal and marine at Salura Island, assess the level of people's dependence on resources and formulate strategies migrant fishing community empowerment and local communities, and also formulate management model squid fishery system integrated based on the level of connectivity and adaptation using ABM (Agent Base Model).

Key Words : salura island, migrant fishermen, SES, ABM, Indonesia

## THE APPROACH OF SAKURAJIMA-KINKOWAN GEOPARK

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The area of Sakurajima-Kinkowan is certificated as Japanese National Geopark in September of 2013. We organized the guide tours and seminars to increase the opportunity to experience the geological attractiveness and feature that could be proud of Sakurajima-Kinkowan. Also, we broadened the people who are involved in geopark such as holding the events named “Geo-Kids” for children or “Geo-Café” for women and young people. Also, we launched a working group as a beginning to broaden the member of our geopark. The volcanic ash is troublesome and gives the negative image to the people in Kagoshima; however the environment that volcanic ash falls almost every day is a distinctive characteristic of Kagoshima which is rare in the world. Therefore, the working group organizes the event to rethink how to coexist with an active volcano by introducing the examples of the way to utilize the volcanic ash. Sakurajima-Kinkowan Geopark promotion council promotes various kinds of activities for citizens to participate in the geopark and raise the awareness of geopark. In this poster presentation, we will report the efforts of Sakurajima-Kinkowan Geopark that we have done

## **Integration of Balinese Belief in Sustainable Tourism Strategy for Batur Global Geopark -Case Study of Catur Village**

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The Batur Global Geopark's designated area covers the whole Kintamani district which has been a popular tourist destination as well as conservation area for Bali Island. The establishment of the geopark in 2012 with its international branding and underlying ideas in conservation, education and improvement of the local economies was seen as a perfect fit for the Kintamani district. This has brought a new hope to the declining tourism in the area. However, despite of many discussions with the local communities, there is still no concrete strategy of implementation for the whole Kintamani district let alone the tangible benefits for the local communities which created negative attitude towards the further development of geopark. This research aims to identify problems and potencies based on the overall response (attitude, perception and participation) of the communities towards the establishment of geopark and utilize the results to develop an integrated strategy for the whole district. This paper, however, only focuses on results obtained in one study area, the Catur Village. Data were collected through literature study, ground check/observations, in-depth-interviews, and focus group discussions. Data were analyzed to determine the overall response (attitude, perception and participation) of the community. The implementation strategy was developed by using the recently developed ecotourism model (Arida et al., 2014) which translates the spatial planning into the system of Balinese belief and therefore, the tourism products will give not only financial benefit but also invaluable religious achievements for the local community. The strategy was further up-scaled to the district level.

Key words: Batur Global Geopark, Catur Village, response analysis, ecotourism model

## **Importance of Resident Involvement in Geopark –In case of Making Geopark Model Route in San'in Kaigan Global Geopark**

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One of the important roles of geopark activities is resident understanding of the geopark concept, territory and its features. For this purpose, it is important that local residents participate in geopark activities positively. However, in Japan, where local development has been undertaken by governmental organizations, it is difficult for local residents to take part in geopark activities. This time, we planned "Geopark Model Route" across the San'in Kaigan Geopark in cooperation with local people, to promote better understanding and communication with local people, government and academia involved in geopark activities.

In a geopark, creating a tour route and map which allow visitors to explore the geosites easily is required. We have therefore prepared a "Geopark Model Route" for walking tours, sea kayaking, driving in half-day or one day, and for enjoying the feature of each geosite. Each map includes outlines of about twelve must-see geological spots, allowing visitors to enjoy sightseeing and understand the San'in Kaigan Geopark.

We were able to make "Geopark Model Route" useful for local residents, by involving experienced local people in the area. By working together by local residents and researchers, scientific information could be shared among local people. However, some problems were found in its operation. The map is not used effectively in the area which has fewer visitors and no local guides. From now on, it is also necessary to accept visitor's opinions and modify continuously maps more effective and useful for visitors and local residents.

Key words: Geopark, Community Development

## What has been changed in Jeju Island since designation of global geopark

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Jeju is a volcanic island formed from Quaternary volcanic eruptions and is well known for its outstanding beauty and natural value. In addition to being designated a UNESCO Biosphere Reserve and World Natural Heritage, the entire island, covering 1,849.3km<sup>2</sup>, has 12 geosites and was made a member of the Global Geoparks Network (GGN) in 2010. After joining GGN, Jeju Special Self-Governing Province (hereafter Jeju Government) has pursued various initiatives in the past 4 years to promote Jeju Island Global Geopark. These initiatives include: building a more structured management process through a dedicated team responsible for Jeju Geopark; increasing the number of geosites and upgrading their infrastructure; holding educational programs on geoheritage; setting up consultative bodies for local economic development; organizing geotrail events; developing various geoproductions; and engaging in public outreach activities. Jeju's membership in GGN has brought about significant changes to local tourism trends. What were basically sightseeing tours are now evolving into experiential, exploratory, and educational tours. As the leading tourist destination of Korea, Jeju Government continues to focus its efforts on expanding Geopark tourism programs. Jeju Island Global Geopark strives to be an exemplary Geopark, serving to promote the value of geoheritage, contributing to the conservation of geological diversity, and supporting the development of local communities.

## **The first development model for geoparks: The CES Model**

Young NG

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A geopark is established to achieve geological conservation, geoscientific education and sustainable development. Criteria are set by the Global Geoparks Network (GGN) as standards to achieve these objectives. Aspiring geoparks must meet these criteria in order to be accredited as global geoparks. After acquiring global geopark status, most geoparks will incorporate these criteria into their earlier short and long term development plans. To conduct effective self-gauging of their performance according to the GGN criteria, a development model may help to reflect the actual situation, identify matters of concern, adjust or re-allocate resources and predict future problems and trends. Currently, there are no simple measurements available to measure the performance of geoparks. Therefore, a 'Conservation, Education and Sustainable Development Model' (CES Model) is developed to indirectly assess their performance through comparing proportions of investment on conservation, education and sustainable development. The financial records of a geopark are screened and extracted to obtain three sets of data associated with investment on conservation, education and sustainable development. The proportions of the categorized data are compared to check the weighing of each data set to tell whether the geopark is doing more on conservation, education or sustainable development. The overall performance of the geopark is then evaluated by considering the age of the geopark. The model can actually depict how well a geopark is doing towards establishing an ideal geopark of achieving the three original geopark objectives. It can also be used to compare different geoparks, whether they are conservation oriented or sustainable development oriented. However, the CES Model may have limitations such as the difficulty of creating an accurate classification of investment items and the possible lack of an independent auditing body to ensure the accuracy of the data supplied by the geoparks. Its effectiveness is also hampered by the fact that high investment does not necessarily guarantee high performance. Therefore the CES Model requires more field testing, fine tuning and improvement. It is however, by far one of the most effective models to assess the performance of geoparks.

Keywords: GGN criteria, scientific model, CES Model, measuring performance

# The Construction Situation and Existing Problems of Jingpohu Global Geopark

Ma Xiao-qun<sup>1</sup>, Wang Kai-ming<sup>2</sup>

1. The Administrative Management of Jingpohu Global Geopark
2. The Hydrogeology and Engineering Geology Exploration Institute of Heilongjiang Province

## 1、 Index

Jingpohu Global Geopark lies within the boundaries of the Ning'an city of southeast Heilongjiang Province and it belongs to the Mudanjiang city's administrative division. As for regional geological structure, the park is located between Siberia plate and Sino-Korea plate, the north part of east China Cenozoic magmatic rock belt and the west side of the Asian largest fracture zone, Tancheng—Lujiang Fracture (abbreviated as Tan-Lu Fracture, -2400km) and it is one of the main volcanic region in east China (Fig 1). The geographic coordinate is: east longitude 128°30'00"—129°11'00", north latitude 43°43'34"—44°17'55" and a gross area of 1400km<sup>2</sup>. Inauguration of the Jingpohu Global Geopark by UNESCO in October, 2005.

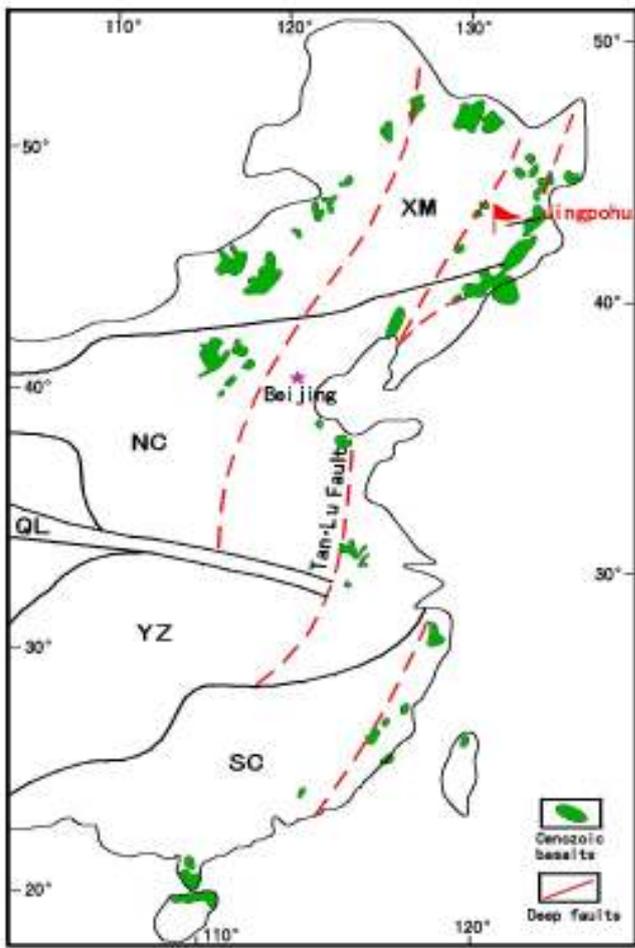


Fig 1 The distribution plan of Cenozoic volcanic rock in east China

## 2 General Situation of Geosites

### 2.1 Geosites landscape classification

According to *The Technical Requirements of National Geopark Planning, "National GeoPark Construction Technical Requirements and Work Guide" (Trial)* and other technical requirements, by the geheritages landscape classification system and the name, Geheritages of the park are divided into two categories :landscape and water landscape, of which include seven categories of ten sub categories, see table 1.

Table1 Categories of Jingpohu National Geopark

Type	Class	Subclass	Name of Geheritages
Landscape types	Volcano Landform	Volcanic Mechanism Geheritage Landscape	Volcanic Cone
		Volcanic Lava	Lava Flow

		Geoheritage Landscape	Lava Platform Fumarolic Cone/ Fumarolic Disc
	Granite Landform	Granite Geoheritage Landscape	Granite Landscape
	Tectonic Landform Landscape	Tectonic Landform Landscape	Jingpo Valley
Water landscape	Spring	Spring Landscape	Warm Spring
		Spot Spring Landscape	Sandie Spring、 Daganpao Spring
	Lake Landscape	Lake Landscape	Jingpo Lake
			Xiaobei Lake 、 Mandarin Duck Lake、 Xuanwu Lake
			Zhuanxin Lake 、 Ziling Lake 、 Dongda Small Lake
		Wetland Landscape	Ziling Lake Wetland
	River Landscape	River Landscape	Mudanjiang
Songyi River、 Fangshengou River、 Dajiaji River			
Waterfall Landscape	Waterfall Landscape	Diaoshuilou Waterfall	

## 2.2 The description of the main geoheritages

The main geoheritages landscapes of the Jingpohu Global Geopark include the forest composite volcano, lava flow, lava tunnel, Jingpo Lake and Diaoshuilou waterfall etc, at the same time , it also include the neolithic age Yinggeling Culture Relic and Tang Dynasty Shangjing Longquan Government Relic etc , which contribute to the Jingpohu geopark very important teaching and research value, aesthetics admiration value, ecology value, history and culture value.

### 2.2.1 Landscape Type

#### 2.2.1.1 Volcano Landform

##### 1、 Volcanic Mechanism Landscape

There have been found 16 craters in the geopark which distribute in the underneath forest, Daganpao, Wudaogou, Mihunzhen, Hama pond and Xingshan etc..

## 2、 Volcanic Lava Landform

Volcanic Lava: The overflowing lava was from Underneath Forest volcano, Wudaogou Volcano and Mihunzhen .From crater to the end of lava flow, the total throw is up to 761m. The complete lava flow is of 65km length . In a whole view, the whole lava flow is like a black giant dragon waving in the steep mountains to form light-wave uplift hillock, ridge mound, drumlin, lava dam, rock pond, lava bubble, lava gas maar, lava collapse, separation fracture, jet cone, fluent lava, corded lava, reptile shaped lava, steamed bread shaped lava etc.

Lava Tunnel:There have been found 10 collapse lava tunnel, cumulative length more than 20km. There are colored lava stalactite on in the cave ceiling ,lava bed , lava basin, lava flower, lava line on the cave wall , which contribute the high value of geology the aesthete and scientific research,especially the lava cascade.

Volcanic Debris :Volcanic Debris mainly distribute near volcano including volcanic bomb, cinder, lapillus, volcanic sand, carbonized wood, pumice, bedrock breccia, anatectic origin inclosure and all kinds of others one expects to find.

Lava Platform: The lithology of lava platform near the Lake Jingpo Lake is consistent, belonging to alkaline basalt series.The most are basanite, the less are alkaline olivine basalt, which were unified named The Jingbo basalt by the previous and were divided into early, middle, late and recent of Jingpo basalt. The alkalinity of the rock gradually increased from the early to the near future, and the transition from the sodium and potassium to the potassium quality. According to genesis, volcanic rocks can be divided into basaltic lava, secondary volcanic rocks, volcanic pyroclastic rocks, and volcanic clastic sedimentary rocks.

### 2.2.1.2 Rock Landscape

Rock Landscape is mainly granite in the park, exposed area 1143km<sup>2</sup>, of which lithology was mainly adamellite and granodiorite at Zhang Guangcai Ridge Mountain Period more than 600 million years ago and syenogranite, tristgranite and adamellite at Yanshanian Period more than 200 million years ago .The granite in this area has gone through construction, erosion and weathering, etc internal and external dynamical geological effects during hundreds of millions of years' geological historical period, and thus formed the rare granite geoheritages sights with various character today.

There are Taoist mountain, the pearly gates, Xiaogushan Mountain, Dagushan Mountain, Chengqianglazi, Baishilazi, deer island, Maoshan mountain and so on in Jingpo Lake coast granite geological vestiges landscape.

Granite geological relics in the Mudanjiang coast mainly include : Granite Canyon (Jingbo Canyon), Granite Whale Back Rock, Granite Stone pit, granite dikes and others.

### 2.2.2 Water Landscape Geosites

#### 2.2.2.1 Lake Landscape

Jingpo Lake: The largest lake in the geopark is Jingpo Lake and the length from south to north is 45 km with an area of 79.3km<sup>2</sup>. The strata (rock) formation age span is 0.68 billion years and the rock types include sandy gravel, glutenite, basalt, granite and ash rock. Rock types include sand and gravel, gravel rock, basalt, granite and tuff. So, Jingpo Lake has a very significance teaching and scientific research value.

Diaoshuilou Waterfall: Diaoshuilou Waterfall is the exit of the Jingpohu to Mudan River. It was formed by lava collapsion and down-cutting by river erosion. Its origin was unique and interesting. It's a grand waterfall. Its width is usually 40 m and its drop height is 12 m. In flooding period, its maximum width can reach 300 m, with water flow of 4000 m<sup>3</sup>/s. In summer time, waterfalls straight down, causing high white waves, hazy fog, and rumbles, forming a magnificent view. In early winter, water flow of the waterfall becomes low, and water flows slower. Water becomes frozen while it is flowing, forming crystal clear icy waterfall, which is a marvelous view. In deep winter, the surface water is blocked, but the deep pond under the waterfall keeps to flow without formation of ice. Therefore, Diaoshuilou Waterfall not only has high aesthetic value, value of sightseeing, and value of tourism, but also has very high value of geonomy and research. Thousands of visitors are attracted to come for sightseeing every year.

### 3 Park Construction Situation

Since Jingpohu Global Geopark become Global Geopark in 2005, the park has mainly carried out the following work:

#### 3.1 Establish park management organization

There are a large number of geological relics in the park. Once is destroyed, the geological relics will not be restored. Therefore, we established park management organization in the early construction , monitoring, maintenance and prevention the damage and pollution of geological relics .

#### 3.2 Promote service infrastructure

With the development of the Geopark, the existing infrastructure has been unable to meet the needs, for example , the lack of access to some of the geological relics landscapes, the lack of professional of the park's internal science interpretation system, the lack of special characteristics of service reception facilities and other outstanding issues. Many visitors have not been feel the difference with other tourist attractions. Therefore, the Administrative Management of Jingpohu Global Geopark increase the intensity of capital investment for similar problems, which has completed the investment of hardware upgrade and heritage protection nearly 130000000 yuan. The 3.6km of geological relics protection road, the 850 blocks of scientific explanation card , the 23000m<sup>2</sup> of parking lot and a new geological museum have been complete.

### 3.3 Develop effective protection measures

First of all, we have carried out the basic survey on the basis of geological relics in the park, divided the geological relics, produced the introduction of the Jingpohu Global Geopark protection management approach , and then implemented the hierarchical protection of geological relics. Use "point" protection for the typical geological phenomena, use "line". Use "line" protection for the typical strati-graphic section and structural section . Use "surface" protection for the large body of the geological landscape. Protection of the delimitation of the geological relics protection zone.

3.4 Strengthen publicity and education and training, enhance the protection of consciousness

Strengthen propaganda and the awareness of protecting the environment to the tourists and residents of the surrounding villages. Through the development of tourism , increase revenue to promote the local economy and sustainable development. In the Global Geopark publicity week , world earth day and other Memorial Day, commemorate the dissemination the information of geological science knowledge publicity and other education activities.

### 3.5 Strengthen scientific research and explore the geological connotation

Jingpohu Global Geopark is rare global geopark, which incorporate geology, history, archaeology, humanity, animal, plant and others. More and more geological scientists have visited and explored the park, relates to the subject with volcanic geology, ecology, tourism, science, environmental science, biology and Archaeology and so on. The Administrative Management of Jingpohu Global Geopark and scientific research units have been setting the scientific research plan , and gradually implementing the research plan to improve the geological connotation of Jingpo Lake .

## 4 Existing problems nearly ten years of construction process

Although remarkable achievements have been obtained during the past ten years, which have promoted the development of local economy, and enhanced the public awareness of the geological park and the awareness of the protection of geoheritage during the development and construction of the park, the construction of Jingpohu Global Geopark is still in the development stage, which has a long way to go. At the present stage, there are some problems in the construction of the geopark.

### 4.1 Incomplete of geological relics investigation

Although a series of geological survey work have been carried out in the process of the construction of the geopark, the amount of Geological Trace resources is not clear. The detailed investigation of many volcanic geological relics has not yet been completed, of which the distribution, number, size, type, cause of formation, scientific value and development value were lack of accurate and complete data, which have caused the difficulties of protection

object, protection scope, level, development planning and evaluation.

#### 4.2 Coordination of the protection and development

The establishment of the geopark is to protect the typical geological phenomena and important geological relics as the premise, but in the process of the construction, many problems are still outstanding. For the safety of visitors, establish the path along the cliff and other service facilities for scientific expedition, but many volcanic geological relics have been destroyed in the construction. How to accurately coordinate the relationship between protection and development to , to reduce the loss and waste of resources as far as possible, to prevent the transition development, are still problems we need to solve.

#### 4.3 Less prominent of characteristics and brand

Since the successful application of the National Geological Park in 2005, a number of capacity building have been Carried out , but it is difficult to fully reflect the characteristics and brand of the park .Such as the identification of discontinuities in the interpretation of the fragment, the shallow cognitive stage of the geopark for visitors. A survey showed that the interpretation of the brand can read only about 38% of the total visitors, 83% of tourists eager to obtain knowledge from the geopark, but it is difficult to obtain fully satisfied information from the geopark. How to reflect the characteristics of volcanic geological science tourism and its own brand from the park dining, accommodation, transportation, sightseeing , souvenirs, entertainment and so on, to supply a distinctive experience for tourists, it is still to explore.

#### 4.4 Lack of professional personnel in management organization

We has been a series of social recruitment of Jingpohu Global Geopark in recent years, but it is still a long-term work . Many of them know little about the geological relics, and cannot correct understand the importance of geological relics. Tour guides explain the geological relics landscape in the mechanical way. So the protection of geological relics is in the temporary solution stage.

#### 4.5 Inadequate of promotion and publicity

Geopark popular science tourism must be publicized effectively with park website, magazine, newspaper, broadcasting, micro-blogging, public advertising and other media, to achieve reputation effect by word of mouth. Although the Lake Jingpo has done a series of propaganda, but it is still not enough to study the unique volcanic landscape of the park . How to distinguish the similar geological relic landscape in the propaganda process, and to strengthen the rare geological relic landscape need to be further improved.

### 5 Conclusion

China's geological park is still in the growth stage, Jingpohu Global Geopark is also in the growing age depending on other Global Geopark. But the problem that we explored in construction process is our power section. Though when we get the reason of the problem, we

could find the solution, then our geopark could step into adult age. Later we will enhance the protection of geoheritages, the construction of geopark, the management level of geoheritages. We will make the geopark become a base of the protection of geoheritages and teaching and scientific research. Finally, we will make a contribution in the process of geopark.

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## Ten years of the Xingwen Global Geopark, China

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This year is the tenth anniversary of the establishment of Xingwen Global Geopark, which is located in Xingwen County, Sichuan Province, southwestern China. It was listed as a Global Geopark Network member by UNESCO in 2005. Xingwen Geopark covers an area of 156km<sup>2</sup> and offers a broad variety of locations of geological and cultural importance. This paper reviews the great achievements made in geoconservation, management, education, infrastructure and geotourism by Xingwen Geopark during the last ten years, and which demonstrate that a geopark is a sustainable way to advance geoheritage conservation and improve the livelihood of local people, particularly ethnic minorities. Meanwhile, implications and suggestions for its future development and scientific popularization are discussed.

## Geosite evaluation method for geoparks management and promotion

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Geosites are often attractive geotourist destinations in geoparks and may be valued depending on the focus, such as scientific, educational, cultural, conservation and/or economic. The accurate assessment will provide the basis for their effective protection and promotion. During the last decade a number of methods have been proposed for various protected areas in Europe (e.g., Coratza and Gusti, 2005, Reynard et al., 2007, Kubalikowa, 2009, Rybar, 2010, Bruschi et al., 2011, Tomic and Bozic, 2014). Nevertheless, all these models applied to the sites usually give different results, even though some of them indicate similar concepts. Many values are subjective and difficult to be measured due to the great variety of sites and ambitions. It is necessary to find the most suitable assessment criteria for different locality types. We have therefore developed an evaluation procedure for qualifying geosites that applies different combination of geosite's attributes for each a numerical value is assigned. The result is a radar chart consisting of six fields related to the six main values, which also illustrate the proportionality of natural and anthropogenic elements of the site. The rating results may serve as suggestions for future activities in regard to the sustainable planning and management of geological heritage locations and their transformation into geotourism destination.

## Problems regarding the conservation of geoheritage in Japanese Geoparks

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Members of the Japanese Geoparks Network (JGN) have been informed by Global Geoparks Network (GGN) Guidelines and comments by site evaluators of the criteria for conservation of geoheritage. However, these criteria are poorly suited to the current conditions of the Japan Archipelago, because the guidelines are based on areas with relatively calm tectonic settings. As a result, sometimes geoparks located in active tectonic regions such as Japan are not able to make decisions according to these guidelines. Thus, we should promote geopark activity by making the criteria more suitable to active tectonic regions and current situations. In order to solve this problem, we conducted a survey regarding understanding of geoheritage conservation for affiliated regions within the JGN, which has revealed the current situation in Japan. Based on this study, we found (1) an absence of understanding of the value of “geodiversity (Gray, 2013)” and (2) lack of chances to form cooperation agreements based on the interests of stakeholders and scientific background, especially when the geo-site and area have been determined. Based on our results, we will try to promote understanding of geoheritage, and also try to form unique criteria and guidelines for conservation sites that are suited to the situation in Japan.

## Some Suggestions In Implementing The Sustainable Development Strategies Of Geopark In China

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From 2010 to 2014, a total of 9 evaluation and 33 revalidation missions performed by nearly 40 individual experts assigned by UNESCO have played in China. Finally 9 applying areas successfully became parts of GGN Family, and most of the revalidation areas also got the membership of GGN for a further four-year period except 5 ones for a two-year period only. Whatever the results, each recommendation in letters proposed by GGN Bureau and the evaluators is valuable and thought-provoking. Based on that, some common/crucial suggestions should be taken into consideration by the Chinese Geoparks for improvement in following sustainable developments.

1)Territorial integrity and Single promotion area. The different scenic areas within a Geopark must be physically united within a unified boundary, managed with integrated activities and promoted under one Geopark identity.

2)Geopark visibility. The promotional strategy using the GGN logo as a label of quality must be implemented. Special effort should be also given to promote its membership of the GGN.

3)Easy-to-understand Geo-information. Accurately simplify at least two languages of the geosite information showed in interpretative panels or paper materials.

4)The diversity of elements inside Geopark. Integrate and highlight the history, culture and biodiversity of the area into the Geopark. Connection of geo-heritages with other heritages is very necessary and highly appreciated.

5)Sustainable education programs and pragmatic cooperation. Education on geosciences among Geopark schools should be developed to the regular teacher programs, and also be extended to local inhabitants and related tourism services staffs.

The existing twinning agreements with other Geoparks should show tangible activities and results. Pragmatic cooperation must be advocated.

## **Improvements of Huangshan Global Geopark Since Last Revalidation in 2012**

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After the second revalidation in 2012, GGN Bureau gave Huangshan Global Geopark eight recommendations for improvement, which refers to geological heritages protection, science popularization, unify the sign boards and integration of the history, culture, archaeology and biodiversity. Since then Huangshan has made great efforts to improve: We have updated our protection plan for geological heritages. Protection list was extended and detailed. Several protection projects were carried out. For science popularization, bases for research and education were established, in association with universities and institutes. Geological heritages data library of Huangshan Geopark was recognized by experts. Several research topics were completed. According to principle of unified design, we promoted the integration work of sign boards in the entire area of geopark. Besides, we have made our education plan, published leaflets and new materials for science popularization, hold activities like volunteer week and special exhibitions. For integration of the culture and geological heritages, we organized photographic exhibition, painting and calligraphy exhibition, which present the scenery of Huangshan and its' culture. We also enhanced international corporation. Theses years, we established new partnership with Yosemite National Park and Banff National Park, became member of IUCN, and was listed in Green List of Protected Area. We have participated in the development of the "Global Sustainable Tourism Criteria for Destinations" (GSTC-D). And together with HIST, the Division of Ecological and Earth Sciences of UNESCO, We have hold the "Huangshan Dialogue on UNESCO Designated Places and Sustainable Development".

## Geotourism: a global phenomenon

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Geotourism is now an established global phenomenon. In both natural and built environments it provides a holistic approach to understanding an area by providing information about its Abiotic, Biotic and Cultural components. The advancement of geotourism completes our understanding of the environment arguing that to fully understand and appreciate the environment we must know about the Abiotic elements of climate and geology first, as these determine the Biotic elements of animals and plants which live there. By extension, the combination of the Abiotic and Biotic elements determine the Cultural Landscape of how people have lived in the area in the past, as well as how they live there today, in the present. Geotourism attractions are now being developed around the world primarily as a tool for the sustainable development of local and regional communities. A major vehicle for such development is through Geoparks. This presentation will define and characterise Geotourism then illustrate how it is contributing to regional development in a range of countries around the globe by adding economic value through specific attractions, activities, tours and amenities. It concludes by advocating the development of Geotourism in Geoparks needs to be based on best practices as geotourists are becoming more aware and discerning.

## Promotion of Geoheritage, Geopark and Geotourism through a New Thematic Map Series about Nature and Geology

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A prominent tool to reach out to the public and tourists (and to develop “Respect of Nature”) are excellent maps, which provide tourists with best information available in the source country in a well-balanced manner within a geo-scientific and socio-cultural realm. Several questions arise as to how the impact of geoparks can be enhanced; how they can be better promoted; how people worldwide can be informed about geoparks and attracted to visit them; and how geoparks can increase their revenues to be able to fulfill their functions etc. It is believed that one of the options is to stimulate more tourism and in this regard a new, harmonized thematic map series about nature and geology is proposed that might be of interest for the Global Geoparks community. While respecting the individual (and most probably rich) practices of each Geopark in producing up-to-date information including maps to their visitors, it would be worthwhile to consider several advantages of this proposal, e.g. the possibility to provide member geoparks worldwide, with frequently updated maps of the same high quality in all available forms and formats (smart phone applications, hard copies etc.). It is further proposed that the maps be funded, with contribution also from member geoparks, by Kartographie Huber GmbH and her project partners.

## Developing Geotourism as Part of Sustainable Development in the Ciletuh Sukabumi Region, West Java, Indonesia

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Indonesia is a country rich with natural and cultural resources, which have the potential to be developed further the tourism sector. Located in the ring of fire, Indonesia has 3 world heritages, 50 national parks and 7 geoparks in Indonesia. Geopark is a form of sustainable development with a new paradigm in managing resources such as natural resources, human resources, and cultural resources. Geopark concept in Indonesia is the development of a region based on a sustainable manner that combines three diversities, namely: geodiversity, biodiversity, and cultural diversity. Sukabumi regency is located at West Java Province, Indonesia where there is Geopark Ciletuh as a new tourism destination. The area has geosites with the oldest rock formation in the region, fossils, water fall and natural amphiteater. Tourism in the area have brought concerns regarding issues such as biodiversity conservation, waste management, and water supply. The study objectives is to explore how geotourism can contribute to the region sustainable development, and what the implications are there for Geopark stakeholders. Mixed method (desk study also field survey) and descriptive analysis was used in the study. The study found exploitation of natural resources (local mining) in the area that can threaten tourism activitiy also sustainable development and weakness in the regional policy for development that focus mainly on regional growth but fails to include preservation of the built environment. The community is lacking capacity building in understanding the geopark concept and their role in sustainable development process.

**Keywords:** Geotourism, Sustainable Development

## Geoheritage and Geotourism in the Lichi Badland Geopark, Taiwan

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The Lichi Badland Geopark, located in the southeastern part of Taiwan, is one of the Taiwan Geoparks Network launched at 2011. Geologically, the Lichi Badland Geopark is mainly composed of the Lichi Formation with prominent badland due to the widespread mudstone. Exotic blocks with various rock types and dimensions, such as sandstone, andesite, limestone, gabbro, serpentinite, basalt, etc. are embedded in the formation. The unlithified and chaotic formation, also was called as Lichi *mélange*, has long been considered to be the product of arc-continent collision between the Eurasian continent and the Philippine Sea plate, and is the principal evidence for the emergence of Taiwan Island. Because of these outstanding geoheritages in the geopark, more than 10 geosites such as badland gorge, exotic block hill, panoramic view platform, etc., and 4 trails equipped with panels, as well as 5 practical traveling routes have been explored through detailed surveys by a combination of Earth scientists, local people, and government institutions in the past years. These allow the visitor to appreciate and comprehend geological, geomorphological, cultural, and botanical elements in the geopark. Besides, four kinds of geology- and landscape-based programmes have been carried out for elementary school students and teachers, undergraduate students, and local people, as well as furthermore more than 200 persons have taken the courses in the last five years. In addition, a total of twelve propagation materials such as books, folders, brochures, posters, etc., were also published as supplementary for geotourism. In order to accomplish the goal of sustainable development, geotourism activities including orienteering event for bike riding, geopark week, badland exploration, drawing competition for kids, etc. organized and conducted by local community, which have been carried out and about 500 visitors attended in the past five years. These performed activities not only achieve the goal of landscape protection but also increase in the employment opportunities and income for the local people. Some preliminary results have been achieved, nevertheless, a lot of efforts on developing new trails and traveling routes, establishing a structured network of interpretation facilities, enhancing tour-guide services, and connecting geological and cultural heritages, are necessary to endeavour in the future.

## **The Nisiopi Petrified Forest Marine Park:**

### **A new geotourism attraction in Lesvos Global Geopark, Greece.**

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Nisiopi islet (or Megalonisi) is located at the westernmost tip of Lesvos, 1.5 km west of the village of Sigri. In the northern part of the islet exists a great concentration of plant fossils. The Petrified Forest of Nisiopi is part of the wider Petrified Forest of Lesvos. It includes a large number of petrified logs belonging to the angiosperms and conifers. These logs can be found not only on the islet but also at the bottom of the sea surrounding the islet and constituting thus a spectacular geosite.

The Natural History Museum of the Lesvos Petrified Forest has submitted a project proposal for funding under the NSRF 2007 – 2013 and specifically the Operational Programme "Crete & Aegean Islands" which was approved in 2011. Since then it is conducting a series of excavation, conservation and protection works as well as works for the improvement of the accessibility to the various geosites of the islet as the petrified tree trunks needed immediate protection and conservation and similar works have never been done before in that area.

The operation of Nisiopi Marine Park will contribute to the development of geotourism and the improvement of the economic and social development of the region through the creation of new jobs and will contribute to the protection and preservation of the natural environment. It will also provide a more complete view of the Petrified Forest of Lesvos, a unique protected natural monument.

## **Putting Geotourism for everyone into practice: Examples from the Oki Islands Global Geopark**

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The Oki Islands Global Geopark emerged in 2009 from a grassroots regional development initiative that commenced in 2004. The goals of the original organization were to discover the many resources of the region, including the land, nature and culture, and develop guides to convey this heritage to visitors and local people. These goals have passed directly onto the geopark and have evolved into a three-tiered concept that focusses on identifying the links between the “geohistory of the land”, “unique ecosystem” and “lifestyles and traditions” of the Oki Islands. In Japan, earth science is not popularized and the term “geopark” is perceived as scientific and difficult. As a strategy to combat this perception, the geopark makes efforts to introduce geological themes through more accessible topics such as lifestyle, culture and nature. In doing so, travel agencies and other businesses that previously had a view that “geopark” is a difficult concept to sell, have gradually come to change their views and develop products. As a result, the geopark has seen an increase in tourist numbers. This approach has also seen favorable reactions from foreign tourists. The geopark is now introduced in foreign travel books such as Michelin Guide, Guides Bleus and Lonely Planet, as well as in other media. This presentation will introduce methods aimed at making the geopark accessible to all.

## Tourism-induced livelihood changes at Sanqingshan Global Geopark of China

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Although tourism has the potential to improve livelihoods, it may also disrupt livelihood systems, social processes and cultural traditions. The livelihood changes at three rural villages at Sanqingshan Global Geopark of China, are assessed to determine the extent to which tourism-related livelihood strategies are contributing to local livelihoods. A sustainable livelihood framework is adopted to guide the analysis. The three villages exhibit different development patterns due to institutional, organizational and location factors. The new livelihood strategies involving tourism that were constructed and incorporated into the traditional livelihood systems resulted in different outcomes for residents of different villages. Village location, including the relationship to site tourism plan, affected the implications for rural livelihoods. High dependence on tourism as the single livelihood option can reduce livelihood sustainability. Practical implications are suggested to enhance livelihood sustainability at the geopark.

Keyword: tourism, community, sustainable livelihood, World Heritage

## Development of Mobile Guide Application for Increasing in Geo-Park Visitor's Experience Value

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In our project, we develop Geo-Park guide application with a smartphone for increasing in the visitor's experience value. This application is different from some developed, and we think it is important to providing useful functions for Geo-Park visitors are on site. This application has three functions. These are "Geo-Site information function", "Navigation function" and "Visit record and link with SNS function". These are explained below. At first, we explain "Geo-Site information function". The display has a map screen in this function. The map screen has some markers corresponded to some Geo-site. You tap one of the markers, you can get Geo-Site information corresponded to the geo point of that simply. Next, we explain "Navigation function". The display in watching Geo-Site information has two buttons. You tap one of the buttons, the display moves to "Navigation function". The function is like a car navigation system. This function is useful for you when you want to visit a Geo-Site. At last, we explain "Visit record and link with SNS". This function is that visitor is in a Geo-Site. The Visitor can share that they are on site with SNS, and this application records the time of visitor coming the Geo-Site. They can make sure where Geo-Site they visited. Furthermore, It's possible to apply this function for some gaming as "Stamp Rally". We think that we can improve visitor's Geo-Park experience better by using these functions.

## Tourists' awareness on Global Geoparks

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Since global environmental problems continue to be serious after the start of the 21st century, geoparks have caught attention as a place where people can enjoy activities in nature and enhance their knowledge about geology as a part of environmental education. This study focuses on tourists' awareness about nature, geology, environment, geopark, geotourism etc. when they visit geoparks. Fieldworks were conducted at Unzen Volcanic Area Global Geopark (Japan) and Funiushan Global Geopark (China) and the collected questionnaires were analyzed and some findings are presented in this article. For example, it is not possible to conclude that Japanese tourists are highly aware of geoparks. Likewise, although Chinese geoparks have longer history and attract many tourists, the geopark system is also not well understood and geotourism is regarded as similar to ecotourism. Thus, in order to achieve the three overall objectives of the Global Geoparks Network, both Japanese and Chinese geoparks should make more efforts to raise public awareness of the Geopark system.

## Development of new activity programs in Muroto Global Geopark

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For sustainable development of geotourism in geoparks, it is very important to create interesting programs such as guided geotours and activity programs. The Muroto Geopark Geotourism Promotion Team has been set up since July 2013. Before we started to make this team, we announced to the committee members and local citizen that they were able to join the team if they were really interested in creating new geotourism. We kept announcing that anyone interested can join and can do so whenever they please. So far, several new geotours and activity programs have been developed and under operation in 3 different seasons. A regional Expo of Eastern Kochi area including Muroto Global Geopark is organized from April 29<sup>th</sup> to December 23<sup>rd</sup> 2015. We had a chance to apply for financial support from the office of this expo for developing new active programs. Several proposals were prepared based on the discussions among the Geotourism Promotion Team members and Geo-guides, and Geo-masters. Three plans were approved i.e. the “nature experience program including observations at rocky shore”, “cycling” and “research experience of wild animals”. It is believed that these activities will contribute to the sustainable development of the area.

## Contemporary Art inside Geoparks. The experience of the Haute Provence Geopark (France)

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From more than 20 years, the CAIRN Art Center in partnership with the Haute Provence Geopark is inviting famous international artists to realize artworks inside the 2000 Km<sup>2</sup> Geopark's territory. Today more than 130 artworks are realized and are offering a new dialogue between landscape and geology.

Among these artworks exist a specific program called « Refuge d'Art » which is a single, integral work of art, to be visited over a ten-day hike. Created by the British artist Andy Goldsworthy in partnership with the CAIRN and the Haute Provence Geopark, it is unique in Europe, involving an itinerary of 150 km that traverses a number of exceptional landscapes. It brings together hiking and contemporary art, thereby highlighting both nature and culture.

Linking up three Sentinels (stone cairns, each one located in the heart of a valley), the circuit follows ancient paths among the remnants of an agricultural way of life that was once intense. Goldsworthy wanted to mark the circuit with Refuges in the form of disused houses belonging to the non-protected rural heritage, including chapels, farms and sheepfolds. These have now been restored, and a specially-designed sculpture has been incorporated into each one. They provide shelter for a pause along the route, or indeed, in some cases, the possibility of an overnight stay.

This initiative, through the years, has developed a new « cultural » tourism inside the Geopark and has generated new employment of Geopark guides trained in the same time in geology, contemporary art and Geopark policies.

## **Play Management Functions of Geoparks and Guarantee Sustainable Development of Geoparks**

Jie YANG

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Alxa Desert Global Geopark is currently the only desert global geopark in the world. The presentation is mainly centered on Alxa Desert Global Geopark taking the leading role in the geopark areas by establishing and improving the management organization as well as the renovation of management modes, fully mobilizing and performing the functions and duties of the management organizations, and conducting the construction and management of the geopark by acting in accordance with the circumstances. The content includes explanation of the development situations of legislative protection work at higher level by cases, the conversion and practical applications of scientific research and its achievements, explorations and attempts of various kinds of science popularization activities, settlement of difficulties encountered in the popularization work and how to play the brand effect of the global geoparks, and carrying out of featured community activities to promote the development of the local economy, etc. Thus the following two matters are expounded in the presentation: one is the importance of management organizations; the other is that the play of management function is the main factor influencing the construction and management of geopark, implementation of targets and future developments.

## The role of National Park and the collaboration with Geo Park

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National Parks are locations where development and other types of human activities are restricted in order to protect the superb natural landscapes that are representative in Japan and where facilities have been installed to provide essential information and other functions to help visitors enjoy the sights and otherwise come in closer contact with nature. Each National Park has been officially designated by Ministry of the Environment and is administered pursuant to the Natural Parks Law. As of April 2015, 32 locations throughout the country have been designated as a National Park. National Parks and Geo Parks have the common value in the outstanding natural scenery and biodiversity based on geological features. Because of that, 24 of 36 Geo Park areas in Japan overlap National Park areas as San'in kaigan. In those areas, National Parks have important role to preserve geological features in Geo Parks.

Collaboration in information and programs for visitors are expected to contribute to promote the wise use and the promotion of local tourism. In San'in Kaigan National Park, Takeno snorkeling center provides geo-canoeing program and exhibitions of San'in Kaigan Geo Park in addition to nature interpretation programs such as marine biodiversity studies

## **Tourism Blueprint of Langkawi Global Geopark**

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Langkawi is an archipelago of 99 islands with total area of 478 km<sup>2</sup> located in the northwestern corner of Peninsular Malaysia. Langkawi is dubbed as the birth place of Malaysia with widespread of Cambrian rocks (~550m.a). However, anthropologically, civilisation only began in the 17th century A.D. when traders first stopped by and made Langkawi their transit homes. Beginning as remote islands, Langkawi grew with various kinds of myths and legends. After Langkawi was transformed into a Duty Free Island in 1987, it gradually became one of the premier island tourism destinations in Malaysia. Tourism events were organized using Langkawi majestic name to attract more tourist to Langkawi. Among the iconic events are Langkawi International Aerospace and Maritime Exhibition or popularly known as LIMA, Le Tour de Langkawi and Langkawi Regatta had seasonally attracted large crowds to Langkawi, in addition to holiday shoppers. Most of the event organized in Langkawi was using the advantage Langkawi has on its landscape and geological features. This scene changed again when Langkawi was awarded by UNESCO with Global Geopark status in 2007. Langkawi Geopark development concept was introduced focusing on sustainable nature tourism encompassing flora, fauna, geology and landscape. Geotourism was introduced in order to promote various geosites, geoheritage trails, geoforest parks, and geopark products in Langkawi. Langkawi Tourism Blueprint was launched to provide a better tourism environment for Langkawi Global Geopark. Focus is given towards enhancement of tourism services and infrastructures. This includes upgrading present infrastructures, building the new Geopark Discovery Centre, encouraging multi-disciplinary research, and creating more attractive and innovative programs for capacity building.

## **DONG VAN KART PLATEAU GEOPARK development: Another look from cultural anthropology.**

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A "geological park" concept (geo-park) is referred to a physical area containing geological heritage and landscape values (UNESCO 2014). Accordingly, it generally focuses on conserving and managing natural and material values. However, in fact, almost all geoparks (especially Asian geoparks) are constructed within living areas and/or cultural heritage sites such as archaeological sites, historic sites, and cultural landscape (Farsani, Coelho & Costa 2011). From perspectives of cultural anthropology, this paper considers the "geopark" as a cultural construct and geopark management as a construction of cultural identity. Therefore, it argues that the model of geopark as a Western cultural construction of regional identity may affect and change identity constructs and identity constructions of Asian societies geoparks located. This argument is examined by analysing ethnographic data collected from participation and observation of the researcher to minority communities at Dongvan kart plateau Global Geopark (DGG) in the North of Vietnam. Decolonizing methodologies and ethnographic methodology are the writer's theoretical perspective positions in this paper.

## Partnership between Universities and Promotion Council in the San'in Kaigan Geopark.

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San'in Kaigan Geopark Promotion Council concluded comprehensive agreement with University of Hyogo in 2013 and with Tottori University of Environmental Studies in 2014. Teaching staffs in the Graduate School of Regional Resource Management, University of Hyogo and Regional Innovation Institute, Tottori University of Environmental Study directly join to administration in the geopark.

They have cooperate and constructed networking in the San'in Kaigan Geopark mainly through the coordination of lifelong education programs, e.g. guide training, seminar for the public, "Geo-Caravan" and general meeting of "San'in Kaigan Geopark Saloon". Geo-Caravan is one of outreach programs composed of exhibitions, seminars and events in the San'in Kaigan Geopark. It is organized and performed by the cooperation among the staffs of facilities, active groups, administrative organ and university staffs. San'in Kaigan Geopark Saloon is open informal meeting and social gathering held throughout the San'in Kaigan Geopark. Participants of them are composed of various stakeholders, e.g. researchers, some NPO staffs, administrative officer of the geopark, geopark guides, staffs of accommodations, merchants, farmer, fishermen and others. These programs are useful to networking among not only administrative organs but various stakeholders in the community.

Agreement between the universities and the geopark promotes participation of teaching staff from each university to the Geopark administration as Geopark staff, either as geopark bureau members or members of the Geopark committees. Promotion of geopark activity tends to be led by local governments in Japan. Participation of university's faculty members and teaching staff is effective to facilitate networking in local community and local governments.

## A Unified Grand Management Framework for the Multiple Internationally Designated Areas (MIDAs) of the Jeju Island.

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Jeju has four internationally designated sites, World Heritage (WH), Biosphere Reserve (BR), Global Geopark (GG) and Ramsar site (RS). As though having the MIDAs is a wonderful thing, it is also a burdensome to effectively manage the MIDAs. Jeju struggled the way to go forward since they culminated so called 'the UNESCO Triple Crown' plus RS. Among the endeavors, institutional progress was one the most memorable achievement, as there were many obstacles to integrate the four sites which are governed different contexts and hierarchy. Now the MIDAs except the RS are managed by the WHHRI, a branch of Jeju Province, by the Ordinance that authorizes the WHHRI to have an independent budget and plan.

Now we are preparing the more effective way of progress to include the RS which is directly managed by central government. This will be pursued by submission of an amendment of the special Act, which gave all authorities to Jeju except national defense and foreign affairs.

There come several benefits from the integrated management of all the MIDAs; Brand discrimination by comparative approach, understanding of the deep inside by mutual exchange of opinions having different background, coherence of the common objectives for the people, increased visitors with diverse media exposure etc.

Jeju suggested a Global Network of the MIDAs and an Education and Training Centers for the MIDAs. We want to share others' experiences of managing and operating the MIDAs to go further.

## Wind duct experiments on mega-ripple formation processes

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Mega ripples, which have usually ca.1m wave length, have been observed at one site in Tottori Coastal Sand Dunes since 2013. The place was surroundings of the maximum exposure area of volcanic ash and pumice layers in Tottori Sand Dunes. In rainy time, surface water streams generate on these volcanic layers to form rill erosion and transport coarse particles of aggregated ash to surrounding fine sand surface. Quantity of these transported coarse particles exceeded a threshold according to enlargement of the ash and pumice exposure at 2013, which produced mega ripples. That suggested us formation processes of mega ripples.

We made a rectangular wind duct experimental apparatus (7.3 m long, 9 cm wide and 60 cm deep) and prepared polypropylene particles (4 mm in diameter, 0.9 in density) for coarse particles in the field. First, fine sand was laid in 23cm thickness on duct floor, second scattering polypropylene particles on the sand surface at some quantity and then run experiment at 16-17 m/sec wind velocity for 30-40 min.

We succeeded to form several mega ripples ca. 1m wave length, 7 cm height, concave upward shape with coarse particles concentrated at ridges and nearby stoss side slopes, which imitate perfectly mega ripples in the field. Mega ripples move downward slowly at 4 cm/min. Significant information from duct experiment is that mega ripples are formed at degrading stages. This knowledge suggests that mega ripples are observed in restricted area in the field, which make a sharpe contrast to wind ripples observed uninterrupted.

## “Apoi Dream Project”

### – Junior High School Students’ Initiatives to Protect Mt. Apoi’s Alpine Plant

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Mt. Apoi Geopark spans the entire town of Samani with Geosites dotted throughout. Mt. Apoi, a symbol of Samani, is a mountain made entirely of peridotite. Because of its unique soil, weather, and geological environment, the mountain, despite its low altitude, is home to a large and varied population of alpine plants. In 1952, Mt. Apoi’s alpine plant community was designated as a National Special Natural Monument. However, in recent years the number of alpine plants has drastically plummeted due to illegal digging of the flowers, being overeaten by deer, and changes in the global environment. The state of Mt. Apoi’s alpine plants has become a critical situation. At Samani Junior High School, in collaboration with universities, the local organization known as Mt. Apoi Supporters Club, and the town office, we have started the initiative to grow the alpine plants from seeds and plant them in a test area. This initiative, once called “Flowers of Apoi” but now known as “Apoi Dream Project,” aims to restore the nature of Mt. Apoi, the symbol of Samani.

## **Learning of Nishi-Izu area via Geopark Activities in Matsuzaki High School**

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The Izu Peninsula joined JGN in 2012. Before that year we started Geopark activities in Matsuzaki High School. We try to keep tanada (rice terrace) culture in Matsuzaki and to maintain the environment of undeveloped mountains in Nishiizu in the curriculum for the period of integrated study. These initiatives are for the preservation of nature and the traditional culture of the Nishi-Izu area. In Science Club, we learned about the specific geology of the Izu Peninsula via Geopark activities. For example, we preserved pillow lava, which is one of the oldest strata in the Izu area, with local residents. We cleaned up there with them and explained the history of the formation of pillow lava to elementary school children. To inform the very important geosite, Ishiki area, we prepared a pamphlet about Ishiki Pillow Lava both in Japanese and English. These pamphlets are written in very easy words so children and foreign tourists can recognize its importance. We also prepared a Geo Carta Game dealing with Nishi-Izu area culture based on ground and nature and we played the carta games in a symposium and geo camp on the Izu Peninsula. There are so many special products, beautiful scenery, and traditional events in this area, and we try to introduce such customs to other people. Other activities and survey for the people of Nishi-izu are also discussed.

## **A study of Kleptoplasty in Sea slug (*Elysia trisinuata*) found in Iwami coast.**

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Some sea slugs live as 'plants' when provided with only light and air as a result of acquiring plastids during feeding on its algal prey. The captured plastids are retained intracellularly in cells lining the digestive diverticula of the sea slug, a phenomenon sometimes referred to as kleptoplasty(M. E. Rumpho et al. 2010). One of the kleptoplastic sea slug species was found in Iwami coast, Tottori prefecture, and the behavioral response to light stimulus were examined. The results indicated these sea slugs have positive phototaxis.

## **Oki High School Improvement Program Utilizing the Geopark**

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In February 2015, five Oki High School students went to Saint Mary Mackillop College in Canberra, Australia. We studied English, helped in Japanese classes and as part of a cultural exchange presented on our home, the Oki Islands and the Geopark. We demonstrated the rich cultural heritage of the Oki Islands and its contrast to big city Osaka and Tokyo life. We showed the everyday life of Oki Islanders; their jobs, the food they eat and their relation to the environment. We also demonstrated the cultural history of Oki and how it was related to its unique location as an island in the Sea of Japan. For example, the fact that every village in Oki has its own festivals and traditions is due to Oki's mountainous interior and the historical isolation of the villages.

We also demonstrated the fascinating natural history of the Oki Islands. We showed the geological evolution of the Oki Islands from their formation and break from mainland Japan as well as the biological history of the islands. This is visible today in popular sightseeing places in Oki. Finally, we showed the importance of the Geopark in the Oki Islands and how it combines cultural and natural history to show the vibrant community that Oki is today.

## **Sustainable local development utilizing the geopark concept: Examples from Oki-Dozen Senior High School.**

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Oki-Dozen Senior High School is located in a remote island region with a mountainous landscape. Geographical isolation alongside an aging population with a low birth rate has led to declining school enrollments and in 2008 the school faced the possibility of closure. In response to this situation, the school, working with local residents, developed the “Island Exchange” program which opened the school to students from all over Japan. This enabled the school to continue operating and today around half of student enrollments are exchange students. The success of the program has attracted attention from all over Japan. Despite this, the absence of tertiary education facilities in the Oki Region means that the majority of high school graduates leave the Oki Islands to continue their education. In order to pass the precious resources of the Oki Islands Global Geopark to the next generation, activities for sustainable development such as the “Island Exchange” must be accompanied by efforts to foster feelings of love and pride for the region. This presentation will introduce a program for sustainable regional development that utilizes elements of the geopark in order to improve the high school education system. This program involves the following process: “discovery of regional resources through hands-on activities - identification of tasks - development of task solving program - verification of task solving program - pass on to the next generation - enactment for sustainable local development program”.

Keywords: Oki Islands Global Geopark, remote island, pride, sustainable regional development

## **Good Relationship between Geopark Movement and Local Communities Can Promote the Development of Geopark**

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We all know that promoting the development of local economy is one of the three major themes of geopark construction. This goal is of great importance in dealing with the relationship between geopark and local communities. Geopark movement is closely related to local communities. Only if the geopark movement meets the vital interests of the local communities, the geopark can achieve a sustainable development. Then, what are the local communities' vital interests? In my opinion, it includes two aspects, one is that, geopark can't affect their normal living environment; the other is that, geopark should be helpful in improving their living conditions or economic income. In this respect, Alxa Desert Global Geopark has made significant achievements; it almost reached a win-win situation between geopark and local communities. First of all, Alxa Desert Global Geopark has been doing its best to protect the environment and the geoheritages in it, which, at the same time, also can protect the living environment of the local communities. Second of all, for the local residents, Alxa Desert Global Geopark provided a lot of employment posts to improve their living standards and their participation also made it easier to manage the geopark; Finally, for the local industries, such as the restaurants, hotels and so on, Alxa Desert Global Geopark brought a lot of visitors to sustain their business and in return, these industries also made it possible to accommodate more visitors of geopark. So, good relationship between geopark movement and local communities can promote the development of geopark.

## **The Participation of Community - A Key to the Sustainable Development of Ningde Global Geopark**

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Ningde global geopark became a member of the GGN on October 3rd, 2010. During development over the past five years, the geopark has realized community participation is very important to local sustainable development. The cooperation between geopark and local community embodies the following aspects. Firstly, with the support and help of geopark, the local residents run restaurants, hotels and shops, and develop local tourism commodities, which do a great contribution to local economy development. Secondly, the geopark invites local residents and students to visit geo-museum and geological sites and teach geo-science for them, which make them have a good understanding of geopark concept. Thirdly, the geopark holds the cultural tourism festival each year to promote geopark influence and show the fruits of development to local communities.

## Cooperation between Geopark and the revival efforts of an endangered village

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Ohara Village, located in Kitadani Town of Katsuyama City, is an endangered village that is on the verge of disappearing. To ensure that Ohara Village has a place in the future, sustainable development activities are being conducted. In this report, examples of sustainable development will be introduced, as well as the potential for collaboration with Geopark.

Examples of sustainable development are as follows.

Admission into the National Nature Park.

Activities centered around the restoration of old homes.

Collection of funds for natural environment preservation efforts

Exchange through the protection and conservation efforts of rare species

Utilizing regional resources to the fullest potential through holding eco-tours and geo-tours.

## **70th Anniversary of the Showa-Shinzan Lava Dome Formation of Mt. Usu in 1943–1945.**

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Showa-Shinzan is a dacitic lava dome formed at the eastern foot of Mt. Usu during 1943-1945, and had been observed and studied from many-sided view points for its birth to the present. In 2013-2015, we are celebrating the 3 years-long 70th years anniversary of the dome formation, so we performed many activities with the help of the members of the Toya Lake and Usu Volcano Meister Network (representative Mt. T. Ikeda), the Mt. Usu Area Geopark Friends (representative Mr. S. Mimatsu), and Sobetsu Town Office (Mayor Mr. T.Sato). Mimatsu Masao Memorial Museum, and Volcano Study Room of Sobetsu Information Center played a key role for collecting historical data, constructing various archives, and supporting various field study tours and workshops as one of the Core Center of Toya-Usu Global Geopark. The activities covered; interview of people who experienced the eruption when they were still young, inspecting the former residential sites to clarify the changes and finding the remnants. Supporting international activities; Sapporo JICA's 6 years field-study/workshops on improving managing ability of volcanic disasters in Central and South America, international workshops/symposiums (VUELCO2013, LAVCEI2013, IEEE2014, AOGS2014), commemorative symposium/workshops, and 32 years long Field Kids Program, Children's Bousai Camp and etc. After the disastrous eruption of Mt. Ontake in September 2014, opportunities contacting with visiting Media increased, and this triggered to let local people to remind and realize the necessity to prepare before the next eruption on the occasion of the 15th anniversary of the 2000 eruption of Mt. Usu.

## **Major Progress Made in China Funiushan Global Geopark Since 2010**

**Jun LI**

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Funiushan Global Geopark was formally approved as a member of Global Geoparks Network (GGN) by UNESCO in 2006 and successfully passed revalidations respectively in 2010 and 2014. Since 2010, the Geopark has made obvious improvements according to feedbacks from GGN Executive Board. (1) The Administration Committee of China Funiushan Global Geopark was set up, and Interim Regulations on Management of Funiushan Global Geopark was issued as well as the Geopark's logo. (2) The protection of geological relics and related scientific researches has been carried out positively. Cretaceous dinosaur fauna developed newly such as the discoveries and named dinosaur skeleton fossils such as *Xixianykus zhangi*, *Qiupalong henanensis*, and *Yulong mini*. (3) Xixia Dinosaur-egg Fossils Museum, Dinosaur Museum and other scientific popularization sites are named as Scientific Popularization Base of Land and Resources and National Scientific Popularization Base. Collaborated with CCTV, a series of TV documentaries had been made such as Panorama of Funiushan Mountain and etc. Some popular science readings were published such as Exploration of the Cretaceous, Sketch of Funiu Mountain and etc. (4) It has reached agreements and entered into sisterhood relationships with Songshan Global Geopark, Yuntaishan Global Geopark, Xingwen Global Geopark, Shennongjia Global Geopark in China, Langkawi Geopark in Malaysia and Psilorit Global Geopark in Greece. (5) The external propaganda and marketing of the Geopark has brought about a great impetus to the development of tourism industry, 5 Scenic Areas of the Geopark were designated by the National Tourism Administration as a scenic area of 5A grade.

## Geotour combined local folk stories with earth science

### – the folk story geotour –

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There are many folk stories in Japan, and they have inherited from generation to generation. Most of matters in folk stories generally seem to be unscientific and unreal. However some stories use to hand natural phenomena and/or big disasters happened down to next generation. For example, big snakes or dragons which came up in the stories often compared debris or lava flows to strike people. Of course some stories are contents to love and pleasure for beautiful natural environments and to thank for a blessing from nature. This shows that we can carry out a geotour using folk stories, if we can explain the scientific (geological) significance of the description in folk stories. Staff of Unzen Volcanic Area Geopark office collaborated on a group of folk story reciters and constructed and carried out a new type geotour combined earth scientific information of geosites to folk stories together. In the geotour, first a reciter introduced the folk story concerning a geosite on the geosite. Next, the staff of geopark office explained earth scientific significance describing in the story. By performing this story telling and explanation in several geosites, we offered the value of the local cultural and earth science significance to the participant using folk stories. We held two times of the geotours in 2014 (participants were 56) and wide generations from 7 years old to 80 generations participated in geotours. In this poster, I introduce some “geo-folk stories” and the state of the geotours.

## Geomorphosites and its application for geotourism in Hong Kong Global Geopark, SE China

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In addition to being a world famous metropolis, Hong Kong also boasts a wealth of geomorphosites with scientific, aesthetic, ecological and cultural values, especially the representative and comprehensive coastal landforms which are the good example of the variety and complexity of geological processes and morphogenetic events in Hong Kong and presents a wide range of geological and geomorphological topics. For the purpose of protecting the world-class geoheritage and efficiently promoting geotourism, the national geopark of Hong Kong was established in 2009, and listed as Hong Kong Global Geopark (HKGG) by the GGN Bureau in 2011. HKGG was developed under the well-established Hong Kong Country Parks and Marine Parks with nearly 40 years of experience in park construction. In light of the good management foundation and a whole series of initiatives and activities conducted to promote geotourism, HKGG becomes a pioneer in the development of geotourism in China and can be used by the geoparks in other countries as model of good practices for geotourism at present and in future. Within this framework, this paper focuses on the geomorphosites and geotourism of Hong Kong Global Geopark. It gives a list and a description of the geomorphosites and presents the situation of geomorphosite assessment in HKGG. It also analyzes the development of geotourism in this area. Finally, it summarizes geomorphosite enhancement experience for the promotion of geotourism in HKGG.

## GEODIVERSITY OF CILETUH GEOPARK AS NEW DESTINATION OF GEOTOURISM IN INDONESIA

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The Ciletuh Geopark is located in west coast of West Java Province, Indonesia. The Ciletuh Geopark is become Local Geopark since this August and now under preparation to become national geopark. This Geopark was initiated by the local government of Sukabumi in 2014. The geological heritage within the geopark is the occurrences of "ophiolite complex as fossil subducted between Eurasia and Indo-Australian plates during Cretaceous. The tectonic event afterward also created spectacular geomorphological landscape as called Ciletuh Amphitheater as well as the erosional process by sea water resulting the unique of rocks appearances such as dragon, alien face, buffalo, turtle etc.. This Biodiversity of the area also provide conservation for green turtle, and some other wild animals such as sea eagle, tiger/panther as well as conserved trees of raffles arnoldi, cantigi, mangrove etc. There are four geoarea within the Geopark, those are Tamanjaya geoarea; Ciwaru-Gunung Badak geoarea; Citisuk-Cikepuh geoarea; and Citireum Ujunggenteng geoarea. Several geo-trekking is provided to visit geo-site within the geoarea.. The Geopark provide land and cruiser the touring destination, as well as trekking, swimming and fishing.

**The Tamanjaya geoarea** provide a spectacular geomorphological landscape that representing the giant amphitheater which directly viewing to beautiful blue ocean of Ciletuh Bay and supported by several wonder of remarkable waterfall surrounding it. **The Ciwaru-Gunung Badak geoarea** deliver the beautiful landscape of Ciletuh bay from the highest peak or Girimukti, several outstanding waterfall, sandy beaches; and geoheritage rock formation complex represent the tectonic fossil of subduction between Eurasian and Indo-Australian plates during the Cretaceous age, which is consist of melange, ophiolite, phillow lava, nummullite limestone and serpentine. **The Citisuk-Cikepuh geoarea** offering cruiser to the beautiful shaped and scenery of rock due to geological processes; sandy beaches; as well as blue ocean of Ciletuh bay. **The Citirem-Ujunggenteng geoarea** proposing the most adventure site for cruiser that include diving, snorkeling, surfing, fishing, sea birds and dolphin watching and conservation of green turtle.

Several facilities' also available nearby the area, such hotels and homestay for accomodation, local tourist guide, signboard,

Keywords: Geopark, Ciletuh, West Java, Geo-tourism, Geosite

## A STUDY ON COMPARISON AND DEVELOPMENT OF GEOPARK TOURISM PRODUCT

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As an important part of geopark tourism, geopark tourism product is one of the most important signs which can reflect tourism development level of geopark. Geopark tourism products of mature geopark in Asia-pacific region embody humanistic science, environmental protection and participation; the designers give great importance attaches to the interaction to the buyer including local communities in promotion plan. And most of tourism product of Chinese geopark are simple and lack of the features of geologic and scientific popularization.

Based on detailed comparisons of tourism products between Chinese and mature geopark in Asian-Pacific region, this paper is designed to obtain new ideas of product development, popularize geoscience and increase the development of local community.

Keywords: geopark tourism product, comparison, development

## Construction of Chinese Yuntaishan Global Geopark and Jiaozuo Phonomenon

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The construction of Yuntaishan Geopark excavated scientific implications of those geological relics and improved scientific values of this geopark. Yuntaishan Brand was known in the world and drove tourism industry rapid development, which has created a new realm for the sustainable development of this resource-exhausted city and has obtained win-win effect between geological relics protection and development and utilization of geological resources for tourism. The extremely rapid development of Jiaozuo tourism industry was called as 'Jiaozuo Phenomenon' by all sectors of the community, resulting in extensive social influences.

Keywords: Yuntaishan; Construction of geopark; Protection of geological relics; 'Jiaozuo Phenomenon'

## New Style Geotourism at Sakurajima-Kinkowan Geopark

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Sakurajima-Kinkowan Geopark offers various kinds of experience learning programs. Digging hot spring, volcanic ash clay activity, and creating pizza and its kiln are the popular programs.

These are not just "simple activity" but we give them a twist as to "learn" about the volcano. In digging hot spring program, we explain about the lavas of three different eras and the difference of the vegetation on the lavas. After the explanation, the students experience the hot spring comes out from the sand near the sea shore. Within digging the sand 5cm in deep, the hot spring appears every places in the area, however the color and the temperatures are different depends on the points. We make the students to find the hottest hot spring and give a present to the champion team who found the hottest one. The reason why this program is popular is that it has the contents of both "finding" and "competing".

We also develop the program named "rogaining" which is the field sports similar to orienteering. The rogaining is the game that group of 2 to 5 people go around the check points written on the map within a time limit and compete the total score. It has the contents similar to treasure hunting, so that the participants can go to the places where they rarely can visit and the minor regional resources.

Sakurajima-Kinkowan Geopark, offers the school trip program with learning and enjoyable contents to make them fulfilling activity programs.

## **Prospective Customer study based on the Internet questionnaire survey, in case of Sanriku Geopark.**

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The author carried out an Internet survey of prospective tourists visiting the Sanriku Geopark, conducted to understand their travel habits, impressions of the Sanriku coastal area, and motivations for travelling. Additionally, a principal component analysis (PCA) was performed using a multivariate analysis technique to examine their characteristics as tourists and images of travel destinations they would want to visit in the future. With regard to their travel habits, the respondents' answers indicate that they mostly go on 2-day family trips in a private vehicle, and in the majority of cases, their purpose behind travelling is "to feel refreshed" or "to eat delicious food." Based on this data, a PCA employing variance-covariance matrices revealed that tourists are basically seeking "extraordinary" and "healing" experiences from their travels. The principal component scores from the PCA were used and the average scores of each gender calculated. A t-test identified a trend of women seeking "healing" experiences more actively than men ( $p < 0.10$ ) at a level of 0.1%. On the other hand, with regard to the tourists' impressions of the Sanriku coastal area, the results of the multivariate analysis suggested that prospective visitors tend to perceive the coastal area comprehensively in terms of both "nature and scenery" and "local area and culture" to the same degree as those who have previously visited the place. For the area to be resuscitated as a tourist destination, it is important to construct a regional brand and devise strategies that will lead to the region's rebirth as a top travel site. This can be achieved by offering higher quality experiences and services without destroying the traditional image of the Sanriku coast.

## **Effect of the education for disaster mitigation in Hakusan-Tedorigawageopark**

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The authors discussed the effects of the education through the geopark on the establishment of the recognition of the junior high school students about natural disasters.

In the area of HakusanTedorigawa geopark territory, the occurrence of various natural disasters such as volcanic eruption, earthquake, landslide, flood, tsunami and flood tide is predicted. Each disaster occurs in a characteristic distribution due to geologic and geomorphologic conditions. Because the local government provides all information on these disasters in one map, local peoples have difficulties in understanding the disaster in their local area (Aoki and Hayashi, 2015a; JpGU). Thus, the authors have carried out the questionnaires' survey to junior high students who lives in the Hakusan Tedorigawa geopark territory to recognize the territorial diversity of awareness on the features and mitigation of potential disaster. These students have been learning the geo diversity and geodynamics of their own area through the education for geopark. So, we can discuss the effect of the geopark education for the disaster mitigation.

## **Actions of Hakusan Tedorigawa Geopark Promotion Council for the volcanic disaster prevention of Hakusan volcano**

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Mt. Hakusan is a famous geosite of the Hakusan Tedorigawa Japanese Geopark, which is characterized by geodiversity, biodiversity and cultural diversity. One of the most striking features of Mt. Hakusan is active volcano (Hakusan volcano). Many craters formed by the volcanic activity are distributed around the summit. There are many historical documents that describe the eruptions of Hakusan volcano in the past. Now, Hakusan volcano seems to be calm surface but seismological studies reveal that the activity is going on inside the volcano.

To mitigate volcanic disaster around Hakusan volcano, Hakusan Volcanic Disaster Prevention Committee was established in March 2013. The Hakusan Tedorigawa Geopark Promotion Council collaborated with the Committee for spreading the knowledge on Hakusan volcano. It has already tried raising public awareness of volcanic disasters on Hakusan volcano before the establishment of the Committee. The Council organized lots of lecture meetings and geo-tours on Hakusan volcano. These lecture meetings and geo-tours increase public awareness on not only the past and recent activity of Hakusan volcano but also the volcanic disaster in the future.

Now, the Committee developed a Volcanic Disaster Prevention Planning. It has an important role to impress the plan through geopark activities, which covers local citizens, school teachers, tour operators, administrative officers, mountain climbers and so on. The Council is trying to make contents that contribute to mitigation of volcanic disasters around Hakusan volcano.

## Natural disaster and disaster prevention efforts in Geoparks

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When the 5th International UNESCO conference on Geoparks was held in Shimabara in 2012, we accepted “The Shimabara Declaration”.

“Role of geoparks in natural disasters: Our Earth brings us blessing including natural resources and beautiful, inspiring landscapes. However it can also occasionally generate large disasters such as earthquakes, tsunamis, volcanic eruptions, landslides, and floods.

Education about our dynamic planet in geoparks is the most effective way to help our local communities to understand how to coexist with nature which occasionally generate geohazards.”

There was a huge Tsunami disaster in the Tohoku area which was caused by magnitude 9.0 earthquake on March 11, 2011. Our geopark network communities have to use effectively this experienced disaster to reduce the damage from future disasters, where education is one of the tools for this purpose for the people who lives in the geohazard area.

Even after the Tohoku disaster, natural disasters continuously happen around the geopark areas in Japan.

In this situation, we analyzed the multivariate statistics of action assignments and approach assault in Japan geoparks, on natural disasters and blessings. We used the data of workshop or of the questionnaire conference at Sanriku geopark in October 2014 and we considered solving this problem.

## AREA PROMOTION SYSTEM THROUGH THE DISASTER PREVENTION GEOTOURISM

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This presentation introduces the Disaster Prevention Geotourism on the basis of the instance in Nanki Kumano Geopark. Visitors are easily able to learn the experience on disaster prevention in this geopark where has the unique natural features based on its historical and cultural background. The idea is to understand natural disasters as a positive feature for area promotion to learn about how to deal with them rather than seeing them as a negative heritage.

The damage from natural disasters sometimes could exceed expectations, and there are limitations to its prevention and prediction. Therefore, by being aware of this, it is necessary to continue on disaster prevention activities, and to develop systems for responding to disasters and crises that could occur in the future. At the moment, a disaster prevention geo-tour is being considered as a way of sharing the local history and memory of disasters by providing talks based on the experience. It aims to inherit the experience thorough the tour to increase the effects of disaster prevention by promoting local culture. Nanki Kumano Geopark has organized the disaster prevention geo-tour carried out as Japanese Geopark authorized memory on September 21 in 2014 and the reproduction disaster prevention geo-tour on January 31, 2015. From the analysis of the both of geo-tours, it became evident that it was rather difficult to understand the association of various geo-sites and the disaster site. Therefore, it suggested the importance of clarifying to construct a story of the disaster prevention geo-tour.

## Study on the weathering rate of tuff under different environments

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Weathering and flaking depth of rock are different because of orientation and environment in Yandangshan Global Geopark. The degree of rock weathering can be shown by weathering speed. The weathering depth of decorative surface made of tuff in different orientation in the former residence of Mr. Zhang Yuanxun located in Xinheta Town, Wenling, Zhejiang Province is measured using an accurate instrument. The average flaking depth of 9 tuff stone in 5 measuring areas ranges from 1.56 to 6.86 mm and the maximum weathering depth varies from 3.48 to 20.49 mm. Therefore, the calculated average and maximum weathering velocity is 0.003594 ~ 0.015806 mm/a and 0.008018 ~ 0.047212 mm/a respectively. It is found that the rock weathering velocity towards west is highest and facing south is lowest. For example, we can have a discussion about the slates of tuff which could be found in Zhangyuanxun's former home, No.122 in Dongmen street of Xinheta town in Wenling city, Zhejiang province. Research on differences between orientations and speed, depth of weathering has been done, then we estimated the average speed of weathering during a period of 434 years on slates which were used for building. Based on field investigation, the 9 tuff slates which we prepare to do study on relationship between their weathering speed and environment are all got from the famous ancient underground quarry which was called Changyudongtian in Wenling. Research of petrology and mineralogy also show that the above 9 slates belong to the same properties, and they have no difference in mineral composition and structure, what's more, they maybe from the same stratum and the locations could be very closed. By observing we can find that different area of measurement have obvious differences in depth of weathering. The contour lines of each area reflect the level relationship of weathering: if the contour lines were sparse, the level of weathering could be small; otherwise, the level could be large. Considering the different aspects on temperature, humidity, illumination, ultraviolet radiation intensity and obscured conditions, the weathering velocity difference of the stone is caused by different environment.

Key words: different orientation; tuff slab; depth of weathering; rate of weathering; geopark Yandangshan.

## **Educational case study for disaster risk reduction using cardgame (cross road) and geohazard of Aso Geopark**

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Disaster prevention and mitigation education on downpour, landslide and volcanic disaster which frequently occurs in the Asia Pacific region is the common theme to tackle among APGN. 2012 torrential rain caused landslide around somma in Aso, and took many people's lives. In 2014, Nakadake crater had erupted. Not only installing protective structures, but also delivering disaster prevention and mitigation education for efficient evacuation to individuals is essential to reduce disaster damage.

Aso Geopark collaborated with Implementation Research and Education System Center for Reducing Disaster Risk, Kumamoto University to deliver disaster prevention and mitigation education training towards high school and university students aiming at development of its education methods. During the three days training, the students took lectures on geo-hazards and visited to observe landslide disaster sites, which affected by the 2012 torrential rain, and Nakadake crater which has been in eruption since November 2014. After the training, students had ideas on crossroad, a game to raise awareness of disaster prevention to understand how to tackle or evacuate from disaster by learning from own experience. Many of them are using existing crossroad which was designed by experience from 1995 Great Hanshin Earthquake. Therefore, the students delivered unique questions such as "Do you get on a bus while some group members are missing, when volcano erupts during visiting crater?" Moreover we received student's feedbacks saying that summarizing group opinions and decision making are hard. Integrating regional disaster cases to the crossroad has an effective way to raise own responsibility to tackle disaster risk.