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Myanmar is a member of Cambodia-Lao-Myanmar-Thailand-Vietnam (CLMTV) Geoscience Cooperation Team. As a CLMTV member, DGSE field party had done the geoscience activities programme under the topic "Geoscience for Future Energy: Dayang Island/Toward Myanmar". The field party was selected around Kayah and Mon States for geotourism and potential geoscience areas because of these areas are optimum many natural limestone caves, waterfalls, Hot-springs and other famous tourist attraction sites. The Selected areas are also one of the corridors of the CLMTV Geotourism potential Pilot Project.

The main objectives are to increase knowledge on geological sites, to create job opportunity and to upgrade living standard as well as regional sustainable development of the area. Moreover, Evaluating the geotourism potential of geological object is one of the main directions of geotourism development in Hpa-an and Mandalay area, southern Myanmar. On the other hand, this study aims to demonstrate the importance and interest of its limestone karst morphology and cave and gneiss landscape waterfall in the hope that will be recognized as an area, containing a high number of potential tourists. The improvement of economic, conservation and tourism in CLMVT countries, Geosite refers to a site or area with geological and/or geomorphological significance. Geosites have the potential to be acknowledged as both natural heritage and tourism resources with potential economic benefits (Hase 2005), especially if located in protected areas, and what made mostly physically and intentionally accessible to tourists (Osse 1996, 2000). Geosites are interesting places with geological and scientific significance which must several criteria for research, conservation, education, tourism, and sustainable development. The geosite is one of the country's most exciting and educative tourism sites. This geosite has been long known and several legends about it were written and taught in schools.

A Geographical Information System (GIS) approach is undertaken for conducting the present study. The evaluation of goosies has been developing since the 1990s in terms of their interpretative potential and provision (Hose 1997, 2000). Before field work, the survey team prepared desk study, reviewed for the accessibility and collected survey tools, such as goosie survey form, goosie evaluation form, topographic map, geological map, GPS, tools for cave surveying, stationery and etc. The geological system was classified as geomorphological goosies (limnological, karst, tectonic, volcanic, and biogenic), fossil goosies, hot spring goosies, structure goosies, cultural and historical sites. The final score of a goosie is based on the main (scientific and educational) and additional (management and infrastructure) values. Field activities were carried out during July 2018 and included a description of the main geological features of the potential goosies, collection of each site to a specific geological feature, and comparison of preliminary information to the current state of the country. Detailed photos and measurements, cultural and ecological aspects and rigorous recording of locations and access conditions were also performed. Goosies that constitute the final inventory list are the most representative of each geological framework and were selected based on the data obtained during fieldwork. When two or more goosies had the same geological features, sites with the highest number of scientific publications or with the highest integrity conditions were prioritized. Each goosie was classified into a primary, geological interest in the country and new geological goosies.

Geological potential was created by using geologic evaluation guidelines of GLMTE Geosciences Working Group. Following this geologic guideline was created by Department of Mineral Resources (DMR), Thailand. Geological evaluation shows the locally which evaluates mainly according to value and development and management of geological resources.

Geologic evaluation grade is classified as important class more than class one, national importance, part of country importance, province importance and no class compared with other class. A geologic should have enough qualification for reference in terms of geology. The information has been considered from many dimensions i.e. geological importance, geological diversity, rareness, geological history, diversity, aesthetic appreciation and diversity of landscapes. One or many dimensions are acceptable. Academic value result and development management result average score should get more than 50 % for geologic / potentials.

Geological Potential	Geological Potential
1. Potential to be used as a source of minerals	1. Potential to be used as a source of minerals
2. Potential to be used as a source of energy	2. Potential to be used as a source of energy
3. Potential to be used as a source of water	3. Potential to be used as a source of water
4. Potential to be used as a source of land	4. Potential to be used as a source of land
5. Potential to be used as a source of other resources	5. Potential to be used as a source of other resources

(Fig. 1. Consideration of important level)

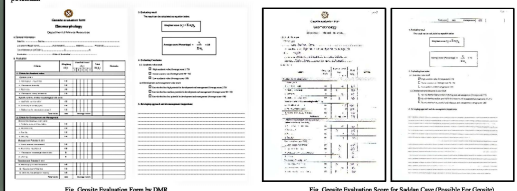


Fig. Cessite Evaluation Form by DMJ

Fig. Gypsum Evaluation Score for Sulfur Cave (Possible For Gypsum)

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Geo-morphological Site refers to a *situs* related to nature and origin of landforms, particularly of the formative processes of weathering and erosion that shape the Earth's surface. Landscapes of geotourism interest include mountain ranges, rift valleys, great escarpments, volcanoes, karst landscapes and arid environments. Geological materials include rocks, sediments, and fossils. Geotourism is tourism that sustains or enhances the geographical character of a place, including its environment, culture, aesthetics, heritage, and the well-being of its residents. The idea is to identify the scientific purposes of geologically and morphologically important places. Maxey for geocooperation to represent them in the best possible way for scientific list, but also to determine their value for the development of tourism.



*Fig. 2*—Demonstration how to isolated tower karsts, and four classic karstic pattern of the erosion of karst surface. (Trevor Waltham, 2000)

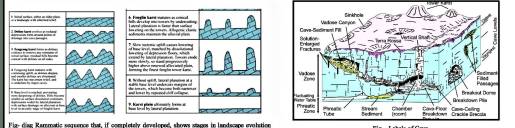


Fig. 2a) Kermatic sequence that, if completely developed, shows stages in landscape evolution.

Karst landforms are strongly developed in Hpa-An, Kain State and Loikaw, Kayah State because of the wide occurrence of carbonate rock containing well developed cracks and joints (Joerg Dreybrodt, 2009). The formation of karst is controlled partially by uneven rainfall and differential daily or seasonal temperatures. Cave and karst geosites are important for geological, morphological and paleontological investigation.

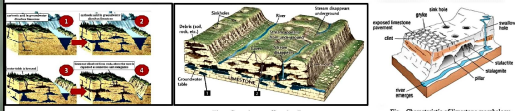


Fig. 4. Four stages of limestone cave

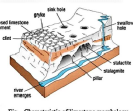


Fig. Characteristic of limestone microphology

Mount Zewakabin is located about ten kilometers south of Iipa-an. It is the tallest mountain near Iipa-an with a height of 2173 feet (723 m). It is the most famous landmark of Kayah State. The Lumbini Garden with a thousand Buddha images at the base of Zewakabin mountain is also a great place to visit along with the monastery at the foot of the mountain. It is also the entrance to go to the top of Mount Zewakabin. A cable car project is being planned for pilgrims to go straight to the top of the great famous mountain from the base. Brachipodops and associated fossils occur thus indicates that the Taunggyi Group in the Zewakabin Range may range in age to early Eocene (Late Sakmanian) (Zaw win, 2009) it is being planned for pilgrims to go straight to the top of the great famous mountain from the base.

It is a truly unique pagoda, set on top of an unusual rock formation. There is a story about an unusual structure in Hsiao An called Kiyau Kiat. Kiyau Kiat is a limestone formation shaped like a pillar which is located inside a monastic compound and it is surrounded by a man-made lake. The visitors can climb the stairs halfway up the pillar. The view on top of the pagoda is beautiful as well and one of the places to watch sunset. It looked amazing and well worth the effort of seeing this beautiful rock form and pagoda and also a great opportunity to take many photos.



Sadan cave is the biggest and the longest (800 meters) of the caves in the area and the 5th longest in Myanmar and it is amazing. There is an impressive chamber at the end with a huge stupa-like structure illuminated by lights, and a nice view out. Then, the visitor will see lots of crystal-like huge massive stalactites. Towards the middle and then especially near the other end, the visitor will hear thousands and thousands of bats, that are high up clinging to the roof of the cave. Actually there are 7 different species of bats numberings about 100,000.

On the other side of the cave, the tour can hire a boat, go through a small cave and back around to the main entrance, without having to walk back through the cave. The cave is known as an adventure rather than a beauty. Saddam cave involves a cave temple but also a hike through underground passages to the far side of a mountain and a return by wooden boat. It really is something special. April is a very good to travel. It is really amazing to go into the cave, boat trip and walking to the entrance. Saddam Cave is the most famous attraction of the tour and it is one of the biggest reasons tourists visit Ho-An.



**Yakapayan** cave is about two kilometers distant from Kawaga cave. It is also decorated with Buddha images, big and small. The roof of the cave has a low shelf from which the hermit, who dwelled inside the cave, flow through the natural water power from precipitation below the summit of Yakapayan. 'Yakapayan' is a historic monastic site of the pre-colonial times. Yakapayan cave looks like a temple that is looking for its guru as it is so empty. It is good to see the hermit's footprint on the cave floor. In the Apo An to enjoy the beautiful sunset, the visitors can also take some scenic view passing under the stone cave and across mountain.

**Hpa Pasing Cave (The Longest Cave in Mon State)**

The Hpa Hsung limestone cave is ancient limestone cave and the largest natural limestone cave at Kyauksew Township in Mon state.



*Gemstonehotels worldwide like the waterfalls, residual hills, gorges etc. persons not only gain an immense scientific value but also gain a considerably high economic value in terms of tourism return. Such return is manifested in the form of percolation of money from visitors to the local economy. Geotourism will be special relevance in these particular places where geology and geophysics are the main attractors (Hovse, 2000). Zn-Kysyl waterfalls and Sin' W waterfalls are famous among local people. Both granite waterfalls are located near the main road and rail line of Yerevan – Maragaryn, nearby Zn-Kash and Sin' Wey village. They are panoramic and a pleasant place as a picnic spot. As they are a monsoon waterfalls they are not very much water in the other season except rainy season. The water is warm and translucent. The environment is clean and fresh. Both waterfalls are frequented by locals, especially during the Full moon day of Yerevan Waterfalls and rainy season.*

### Historical and other Tourist Attraction Sites

The Three Pagodas Fault is a right-lateral displacement [strike-slip fault](#) between [Burma](#) and [Thailand](#) named after the [Three Pagodas Pass](#). It developed as a consequence of the collision between the [Indian](#) and the [Eurasian Plate](#). The Three Pagodas Fault Zone (TPFZ) is a roughly 50 km wide zone separating the westernmost range of the [Tenasserim Hills](#) from the [Tenasserim coast](#) in [Myanmar](#) (Rhodes, et al. 2005). The whole area is marked by a great number of [fault traces](#) and [homoclinical ridges](#) of Paleozoic limestones. The visitors can study three pagoda fault near Kyaikkitti pagoda.



**Fossil Site** refers to nature site with any remains, impression, or trace of a living thing of a former geologic age. Examples include skeletons, footprints and signified areas. This category of geological sites is categorized by important fossil sites such as paleontological sites, crucial fossils and stratigraphic correlation. Fossils that can be found in the Permian Period of Myanmar are corals (scylathy colonial rugose corals tubular corals), sponges, graptolites, graptolids, crinoids, hyrozoans, brachiopods and so on. Among them fusulinids (Order of foraminifera), syringopora, lithothamnion can be used as index fossils for Permian Period (about 252 Millions years ago) of Myanmar.

**Bayin Nyi Cave & Hot Spring**

Hot Spring Site refers to spring with water at temperatures, substantially higher than human body temperature or higher than the air temperature of the surrounding region. A hot spring is spring produced by emergence of geothermal heated groundwater that rises from the Earth's crust. There are geothermal hot springs in many locations all over the crust of the earth. Most of the hot springs is located in and around the igneous (granite) alignments in Myanmar. In some cases, hot water and steam bubbles up from the surface hot, rising through fissures, fractures, faults, and joints of the surrounding rocks.



Based on fieldwork and evaluation score, 13 potential geosites were identified taking into account their scientific, educational and touristic values. There is hope for the area developing as a result of exploration and evaluation for geosites. The Department of Geological survey and Mineral exploration has so far contributed to the collection of geosites and a list of geosites that exists in the country has been generated. The community begins to appreciate the importance of the geosite and would benefit from its development. Baitsam area and Hpa pang area geosites do not get over 50 and less development and management score to be geotourism potential. But both geosites are high academic score and can be geotourism potential in future.

No.	Genets	Absent/lost	Developmental Mammogram	Contrastive Developmental
1	Korobikid-korobikid	75	65	Presence
2	Anda	70	60	Presence
3	Anda	70	60	Presence
4	Anda	70	60	Presence
5	Anda	70	60	Presence
6	Anda	70	60	Presence
7	Anda	70	60	Presence
8	Anda	70	60	Presence
9	Anda	70	60	Presence
10	Anda	70	60	Presence
11	Anda	70	60	Presence
12	Anda	70	60	Presence
13	Anda	70	60	Presence
14	Anda	70	60	Presence
15	Anda	70	60	Presence
16	Anda	70	60	Presence
17	Anda	70	60	Presence
18	Anda	70	60	Presence
19	Anda	70	60	Presence
20	Anda	70	60	Presence
21	Anda	70	60	Presence
22	Anda	70	60	Presence
23	Anda	70	60	Presence
24	Anda	70	60	Presence
25	Anda	70	60	Presence
26	Anda	70	60	Presence
27	Anda	70	60	Presence
28	Anda	70	60	Presence
29	Anda	70	60	Presence
30	Anda	70	60	Presence
31	Anda	70	60	Presence
32	Anda	70	60	Presence
33	Anda	70	60	Presence
34	Anda	70	60	Presence
35	Anda	70	60	Presence
36	Anda	70	60	Presence
37	Anda	70	60	Presence
38	Anda	70	60	Presence
39	Anda	70	60	Presence
40	Anda	70	60	Presence
41	Anda	70	60	Presence
42	Anda	70	60	Presence
43	Anda	70	60	Presence
44	Anda	70	60	Presence
45	Anda	70	60	Presence
46	Anda	70	60	Presence
47	Anda	70	60	Presence
48	Anda	70	60	Presence
49	Anda	70	60	Presence
50	Anda	70	60	Presence
51	Anda	70	60	Presence
52	Anda	70	60	Presence
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66	Anda	70	60	Presence
67	Anda	70	60	Presence
68	Anda	70	60	Presence
69	Anda	70	60	Presence
70	Anda	70	60	Presence
71	Anda	70	60	Presence
72	Anda	70	60	Presence
73	Anda	70	60	Presence
74	Anda	70	60	Presence
75	Anda	70	60	Presence
76	Anda	70	60	Presence
77	Anda	70	60	Presence
78	Anda	70	60	Presence
79	Anda	70	60	Presence
80	Anda	70	60	Presence
81	Anda	70	60	Presence
82	Anda	70	60	Presence
83	Anda	70	60	Presence
84	Anda	70	60	Presence
85	Anda	70	60	Presence
86	Anda	70	6	

Sl. No	Genetic	Academic Score	Development and Management Score	Graduation Potential
1	Kynkikatali kurti	73	66	Fairly
2	Indian cow	73	66	Fairly
3	Baluchian cow	68	66	Fairly
4	Baluchian cow found at	85	66	Fairly
5	Vedhayan cow	36	64	Fairly
6	Karagan cow	74	57	Fairly
7	Gondwari Murumani	64	64	Fairly
8	Bhojpur cow	47	68	Fairly
9	Karavangan cow	44	49	Fairly
10	Karnikarni dew pagadi fish	55	66	Fairly
11	Son Yaw water	67	52	Fairly
12	Son Kyn water	63	58	Fairly
13	Bhagwati hot spring	62	53	Fairly
14	Set Set branch	48	39	Fairly

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