

Geological Conservation and Geological Tourism in Langkawi-Tarutao Islands

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□ Introduction

- General Information

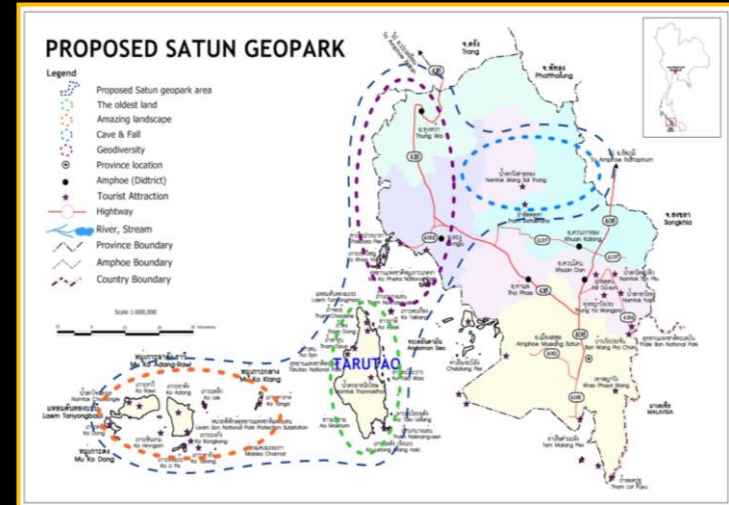


- First proposed by the Thai side on 22nd June 2010 at Krabi, Thailand
- Both sides agreed to carry out the study during the period 2012-2013.

Malaysia-----GGN



Thailand-----Natural Heritage Area of Asia



DMR and other stakeholders are working together to initiate Satun Geopark including Tarutao area, in the near future.

- 1996 Serious works
- 2007 Langkawi Geopark

Location

Langkawi Islands : 478 km²
Tarutao Islands : 200 km²



□ Geological Conservation

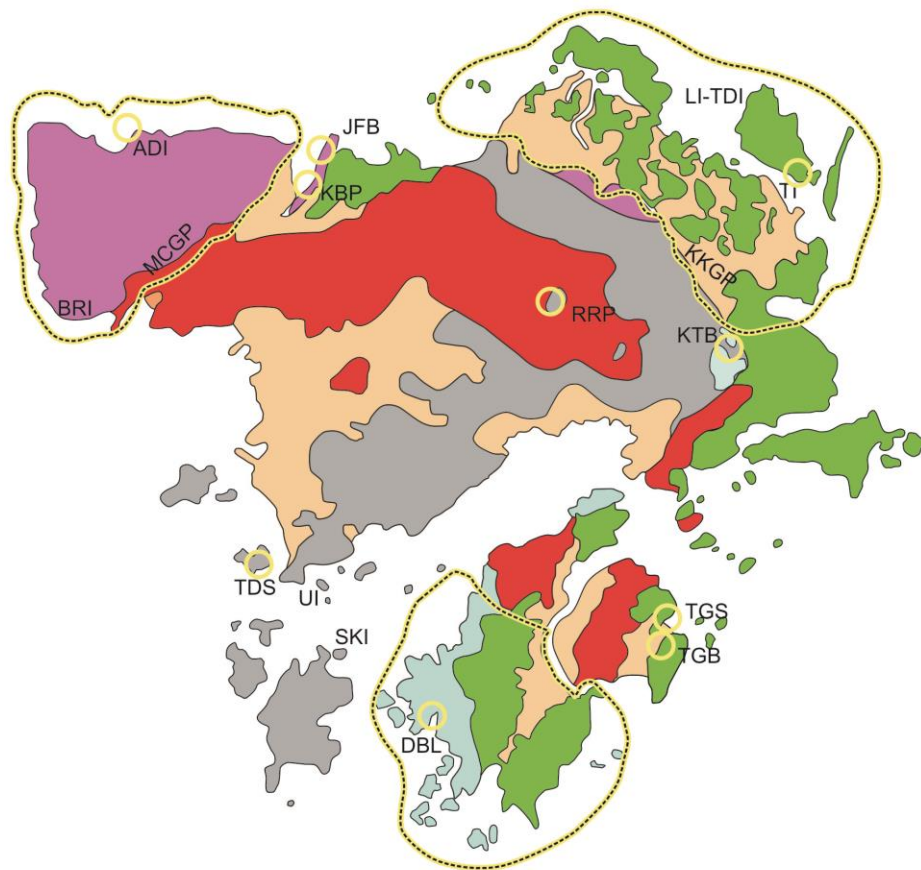
• Geological Conservation of Langkawi Islands

Geoheritage sites in Malaysia are grouped together within a conservation unit;

- Geoforest Park (3)



- Geological Monuments (4)

- Protected Geological Heritage Sites (>10)



CONSERVATION COMPONENT

GEOFOREST PARK

-  MCGP - Machinchang Cambrian Geoforest Park
-  KKGP - Klim Karst Geoforest Park
-  DBMGP - Dayang Bunting Marble Geoforest Park


GEOLOGICAL MONUMENTS

- UI - Pulau Ular
- LI-TDI - Pulau Langgun-Pulau Tg. Dendang
- SKI - Pulau Singa Kecil
- TI - Pulau Anak Tikus

PROTECTED GEOLOGICAL HERITAGE SITES

- ADI - Anak Datai Island
- JFB - Jemuruk Fossil Bed
- KBP - Kubang Badak Pinnacle
-  RRP - Gunung Raya Roof Pendant
- KTB - Kiasp Thrust Breccia
- TGS - Tuba Granite Sill
- TGB - Tuba Granite Boudine
- DBL - Dayang Bunting Lake
- TDS - Tepor Dropstone
- BRI - Burau Residual Island

LEGEND

-  Alluvium
-  Granite
-  Chuping Formation
-  Singa Formation
-  Setul Formation
-  Machinchang Formation

•Geological Conservation of Tarutao Islands

Many activities under the geopark development strategies have been proceeding ;

- Defining boundaries
- Establishment of geoconservation and coordination networks
- Knowledge dissemination
- Enhancing the availability of geopark management plan
- Continually supporting geological study and research
- Public hearing

1. Machinchang Cambrian Geoforest Park

Host of the oldest rock unit in Malaysia known as Machinchang Formation . It contains lots of important geological aspects such as

- Rock and Mineral Diversity



Close-up view of porphyritic texture in the Raya Granite at Teluk Burau



Large K-feldspar phenocrysts in the Raya Granite at Teluk Burau.

• Fossil Diversity



Trace fossil *Dictyodora* sp



Fragmentary trilobite



Saukiid trilobite



Late Cambrian orthid brachiopod

● Sedimentary Structure Diversity



Ripple marks of Machinchang Formation at near top cable car platform.



Cross-bedding within the sandstone of Machinchang Formation at Teluk Datai.

• Landscape Diversity



A thick pile of sandstone beds exposed on vertical cliffs of Machinchang Mountain.



Hard clean, well-bedded sandstone and quartzite of the Machinchang Formation



Nice panoramic view of Oriental Village



Pulau Anak Burau,

2. Kilim Karst Geoforest Park

Kilim Karst Geoforest Park is an area with outstanding karst landscape, Most of the Kilim's rock is limestone of the Setul Formation

- Rock Diversity



Crushed limestone as an evident of Kisap thrust fault



Crushed limestone within the Kisap thrust fault zone.

• Fossil Diversity



Scyphocrinites loboliths



Tentaculitids



Malayaspira rugosa



Teiichispira kobayashi

• Landscape Diversity



Icon of Kilim Karst Geoforest Park at river mouth of Sungai Kilim



Various shapes of karst peak in the Kilim Geoforest Park

3. Dayang Bunting Marble Geoforest Park

The biggest attraction of the Dayang Bunting Marble Geoforest Parks is fresh-water lake named.. Tasik Dayang Bunting or Lake of Pregnant Maiden



Limestone hills forming the shape of pregnant maiden



Vessel-shaped Pulau Jong

This geoforest park has several rock formations including Setul Limestone (Ordovician-Middle Devonian), Chuping Limestone (Permian) and Raya Granite (Triassic).

- Rock and Mineral Diversity
- Landscape Diversity
- Island Karst Morphology



Tasik Dayang Bunting,

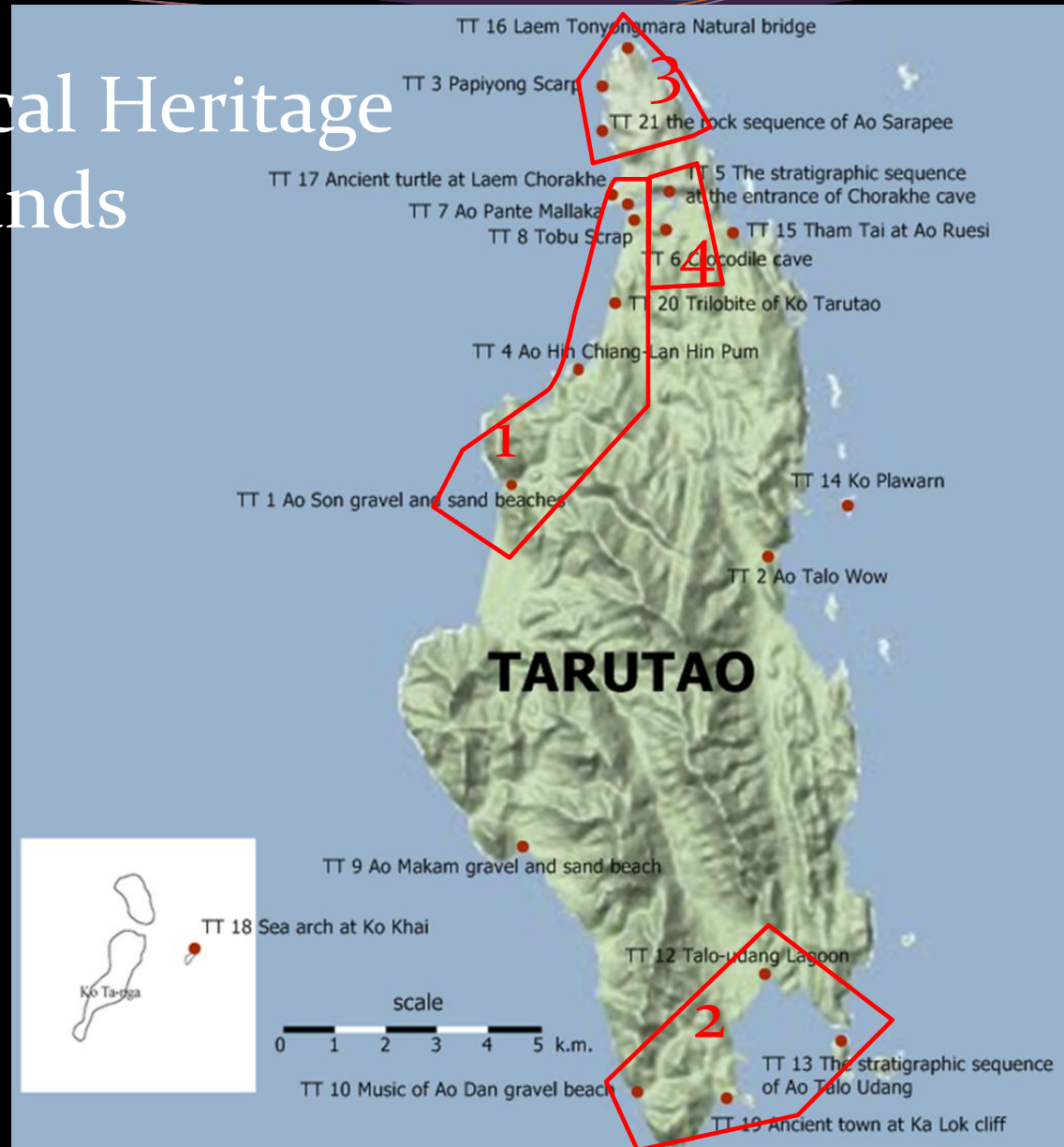


Recreational facilities

• Protected Geological Heritage Sites of Tarutao Islands

All 20 geosites and geoconservation sites in Tarutao Island are well protected by National Park Act.1961

To conserve the geosites, Thailand has followed some Langkawi geopark's practices such as specify geo-conservation areas, present their importance and, develop and promote geotourism.



1. Ao Pante Malaka-Ao Son bio-diversity area

This protected area is the fossiliferous diversity area of the oldest rock unit in Thailand known as Tarutao Group

- Rock and Sedimentary structures Diversity



Thin-bedded sandstones and mudstones



Closed- up views of ball and pillow structures



Good exposure of the laminated limestones

- Fossil Diversity



Fossil assemblages in sandstones



Giant spines of trilobites

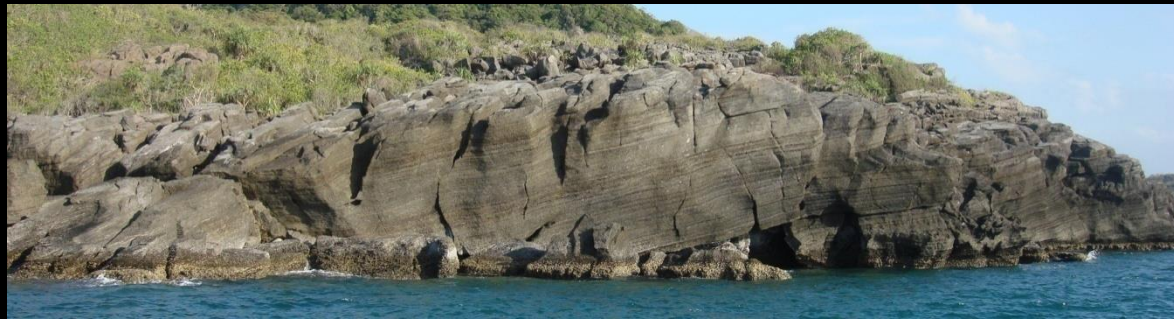


Several types of trilobite



Perfect bodies of brachiopod

● Landscape Diversity



Limestone Landscape of the lower part of the Thung Song Group at Malaka creek, Tarutao Island

2. Ao Dan –Talo U Dang geo-diversity area

Geodiversity in this area is remarkable as stratigraphy and rock age which are perfectly continued.

- Rock and Sedimentary structures Diversity



Exposure of the Pante Malaka Formation



Ancient town at Ka Lok cliff, Ao Tami,
Tarutao Island

● Fossil Diversity



Close-up view of incomplete brachiopods in sandstone of the Talo Wao Formation



Various forms of the stromatolites in limestone loose blocks at Ao Dan, southern part of the Tarutao Island

3. Tanyong Mara Landform area

This protected area composes of various kinds of geological features i.e. beautiful karst topography, geodiversity and stratigraphy which are continuous sequence.

Tanyong Mara Landform area consists of three subunits of the lower-upper part of the Thung Song Group which are The Pante Malaka Formation , The Lae Tong Formation and The Rung Nok Formation

- Rock and Sedimentary structures Diversity

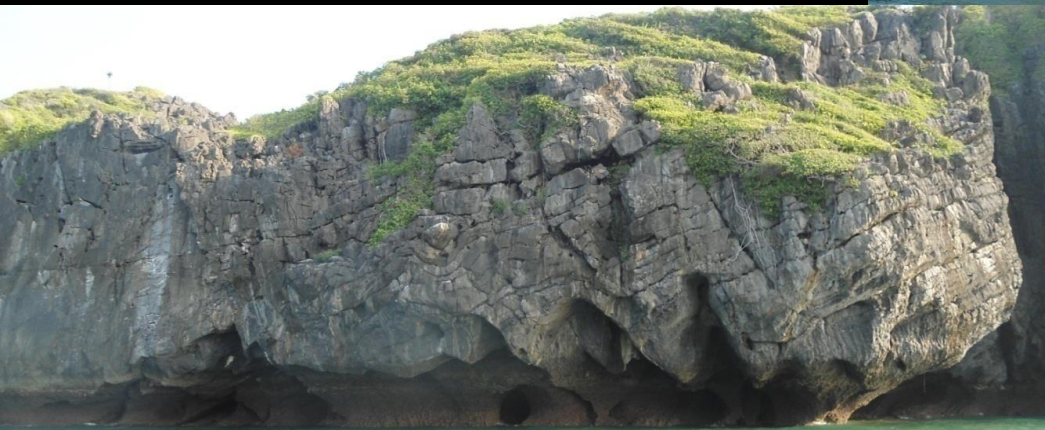


Exposure of the Pante Malaka formation



Exposure of the argillite-dominant of the Lae Tong Formation

● Landscape Diversity



General view of the Ordovician limestone at Laem Tanyong Mara, Tarutao Island.

4. Malaka Natural area

This protected area shows the gorgeous karst topography where some part of the Thung Song Group is exposed.

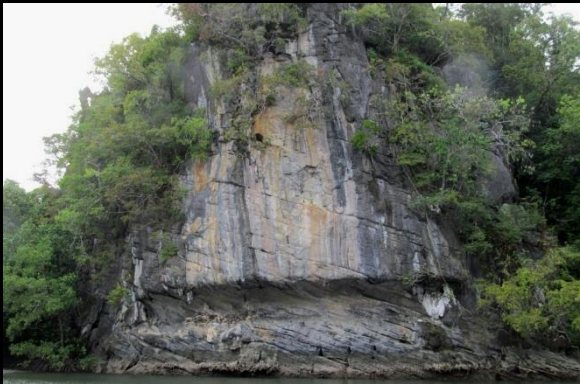
- Rock and Sedimentary structures Diversity



Exposure of limestone along Malaka canal



Thick- bedded, cross-bedded, stylolitic, limestones



Good exposures of paleo-sea cave



Thin-medium bedded limestones with rare of brachiopods

Development of Geological Tourism

- Development of the Geological Tourism in Langkawi Islands
- Geotrail
- Langkawi Research Centre
- Board and displays in sites and media



- Social networks community

Many government agencies are actively involved in ensuring socio-economic well being of the local community. This is to ensure that the local community is not being marginalized from the mainstream development of the economy.

The local community is given priority in certain job opportunities.

- Other facilities

- Cable Car

- Machinchang Walking Trail



• Development of the Geological Tourism in Tarutao Islands

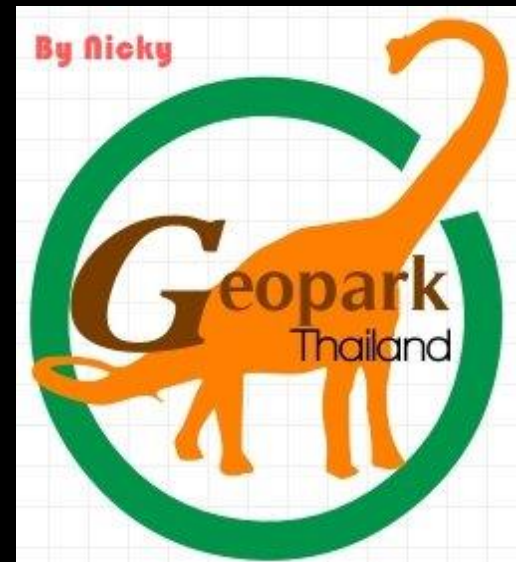
Although the development of geo-tourism in Tarutao Islands is now in the beginning process, some activities are set up in order to give the basic geological information to visitors.

The activities we have been conducting such as;

❖ Promotion



Geoparkthailand website.



Geopark Thailand facebook.

❖ Communication, Access and Education

- Encourage the development of geo-boat trips to visit inaccessible sites from the sea.
- Develop geological exhibition both at Satun province and Tarutao visitor centre.

❖ Geotrail

- Develop the geotrails incorporating a general leaflet, individual geosite leaflet and on-site interpretative signs

□ Conclusion

• Geological conservation in Langkawi Islands

Geological conservation areas in Langkawi Islands are preserved in the form of....

- Geoforest parks,
- Geological monuments, and
- Geological heritage sites

• Geological conservation in Tarutao Islands

While in Tarutao, all geological heritage sites are grouped into 4 protected areas

- Ao Pante Malaka-Ao Son bio-diversity area
- Ao Dan –Talo U Dang geo-diversity area
- Tanyong Mara Landform area
- Malaka Natural area

Thank you
Kob Kun ka

