Geodiversity of Khorat Geopark and Application for Geoproducts

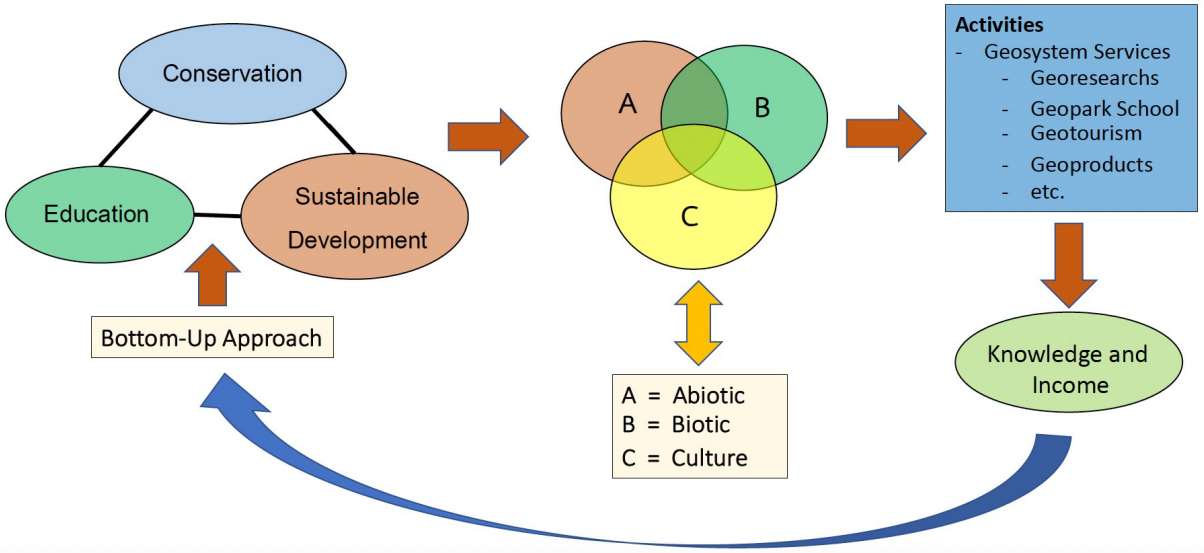
Jaroon Duangkrayom (Ph.D., Assit. Prof.)

Lecturer of Geoinformatics Program, Faculty of Science and Technology, Nakhon Ratchasima Rajabhat University
Researcher of Khorat Fossil Museum
Deputy Director of Education and Information of Khorat Geopark

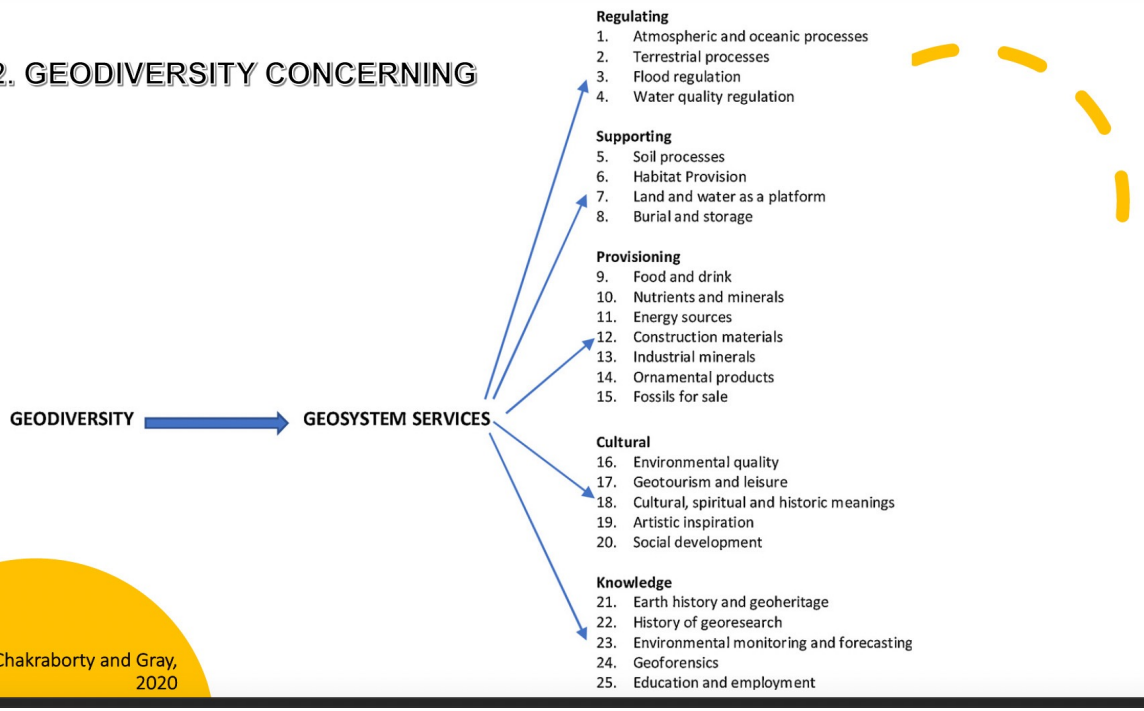
Content

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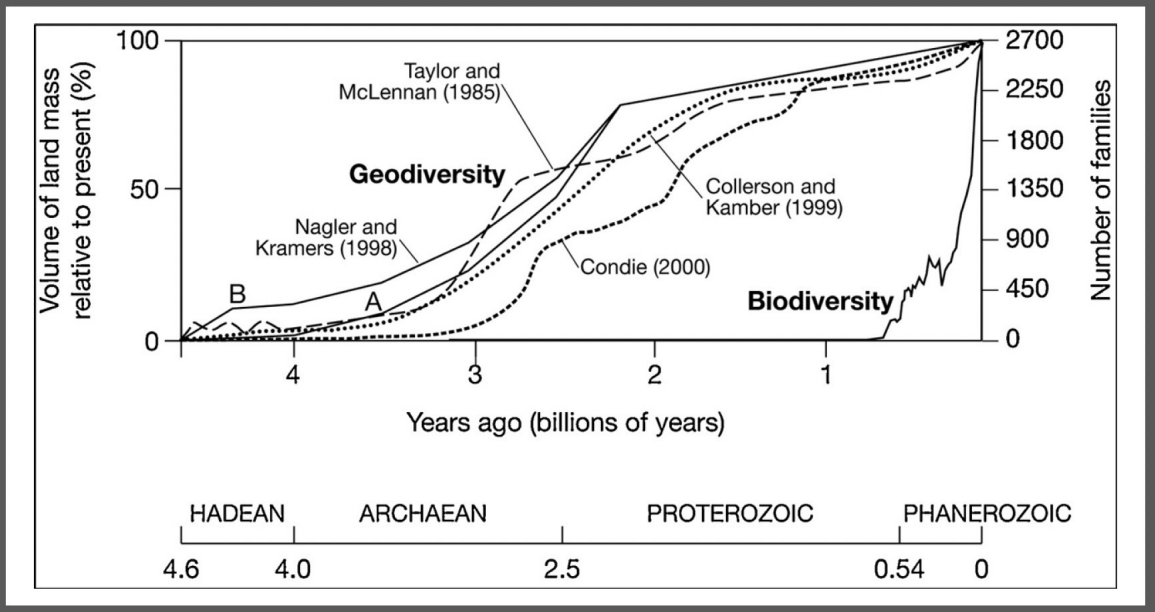
1. GEOPARK CONCEPT



2. GEODIVERSITY CONCERNING



Chakraborty and Gray, 2020

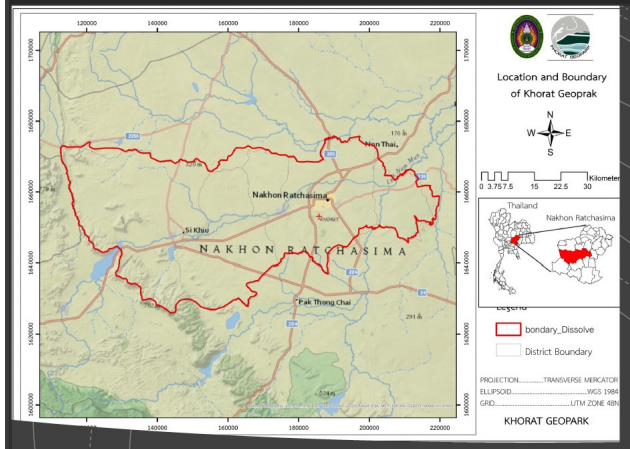


Chakraborty and Gray, 2020

3. Khorat Geopark Territory

3.1 Location and Boundary

3.2 Geosites

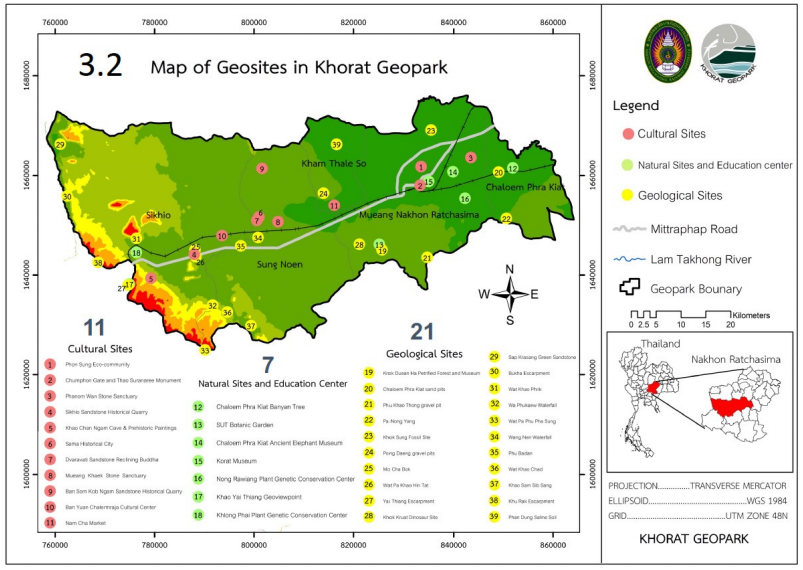




http://www.unesco.org/new/ fileadmin/MULTIMEDIA/HQ/S C/images/UGG_South_Asia_ Map.jpg)

3.1 Location and Boundary

- Total area is 3,167 sq.km
- Population is about 736,000 (2018)



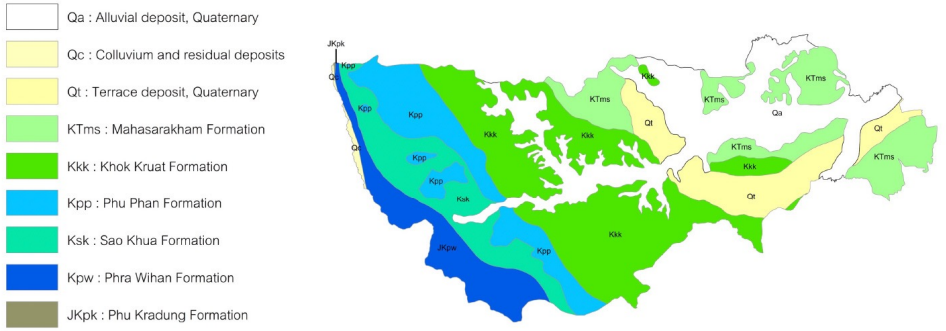
4. Geology of Khorat Geopark

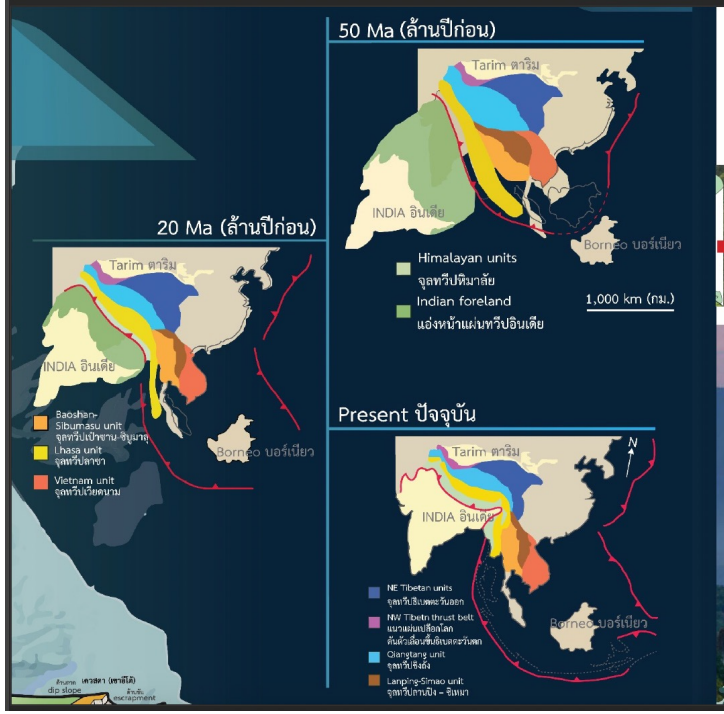
4.1 Geological Map of Khorat Geopark

4.2 Geological Structure and Stratigraphic Column

4.3 Main Geological Highlight

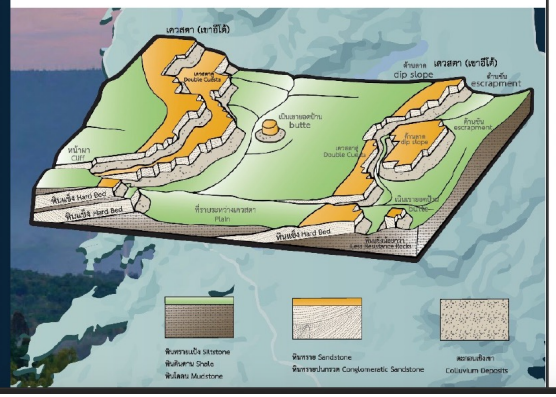
4.1 Geological Map of Khorat Geopark

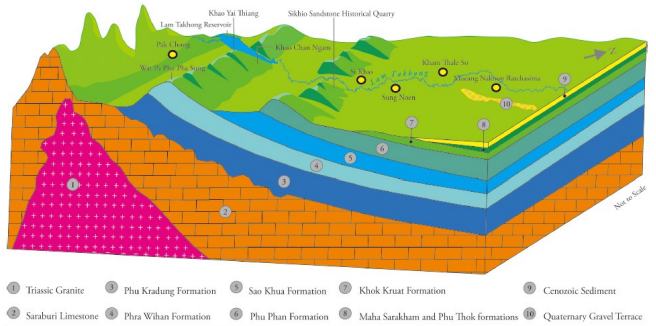




4.2 Geological Structure and Stratigraphic Column

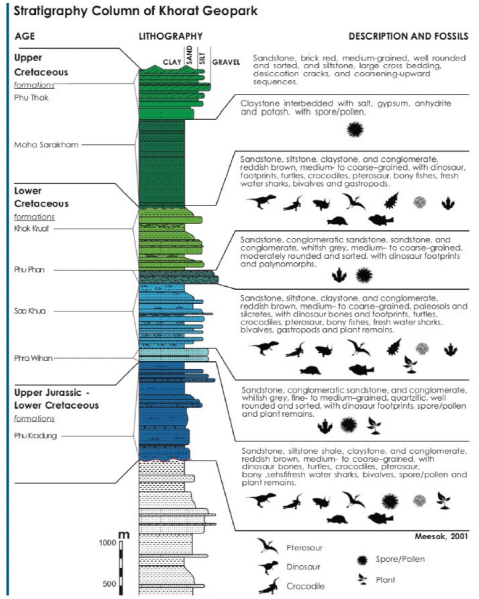






4.2 Geological Structure and Stratigraphic Column

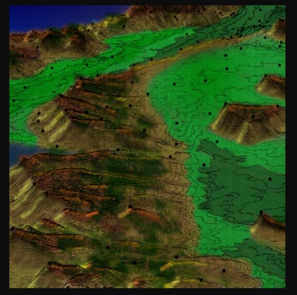
- Area of Khorat Geopark at present after lifting of the land and erosion with the carrying away of sediments along the Lam Takhong antecedent river.



4.3 Main Geological Highlights

- In the western part of the area is the double cuesta of sandstone that tilts to the east 6-10 degrees.
- In the eastern part of the area is the Mesozoic and Cenozoic fossils that were discovered in the sandstone of Khok Kruat Formation and loose sediments in the sandpits.







5. Geosystem Service : Potential of Geological Formations for Geotourism, Education, and Geoproducts

5.1 Various activities services in the area of Cuesta and Pra Wihan Formation

5.2 Agrotourism in the area of Sao Khua Formation

5.3 Historical services in the area of Cuesta and Phu Phan Formation

5.4 Geosite in the area of Khok Kruat Formation

5.5 Rock Salts in the area of Maha Sarakham Formation

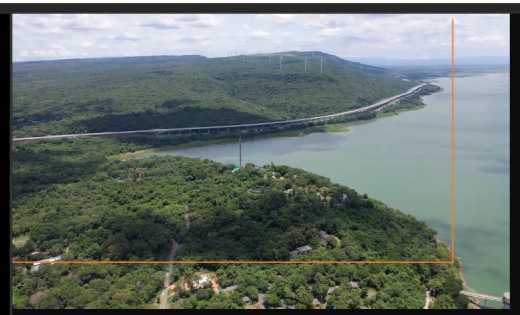
5.6 Neogene Paleobiodiversity in the loose sediments of sandpits along the Mun River

5.7 Petrified Woods in the Quaternary Terraces



5.1 Various activities services in the area of Cuesta and Pra Wihan Formation

- 5.1.1 EGAT ' s Wind Turbine Farm
- 5.1.2 Natural Classroom in the Dry Evergreen Forest : in case of Khao Chan Ngam and Phu Pha Sung
- 5.1.3 Burrow Fossils
- 5.1.4 Phu Saen Dao Natural Activities
- 5.1.5 Organic Agricultural Farm
- 5.1.6 Coffee and Macadamia Nuts Farms at Dong Mafai Community
- 5.1.7 Ban Mae Eed Homestay and Agrotourism



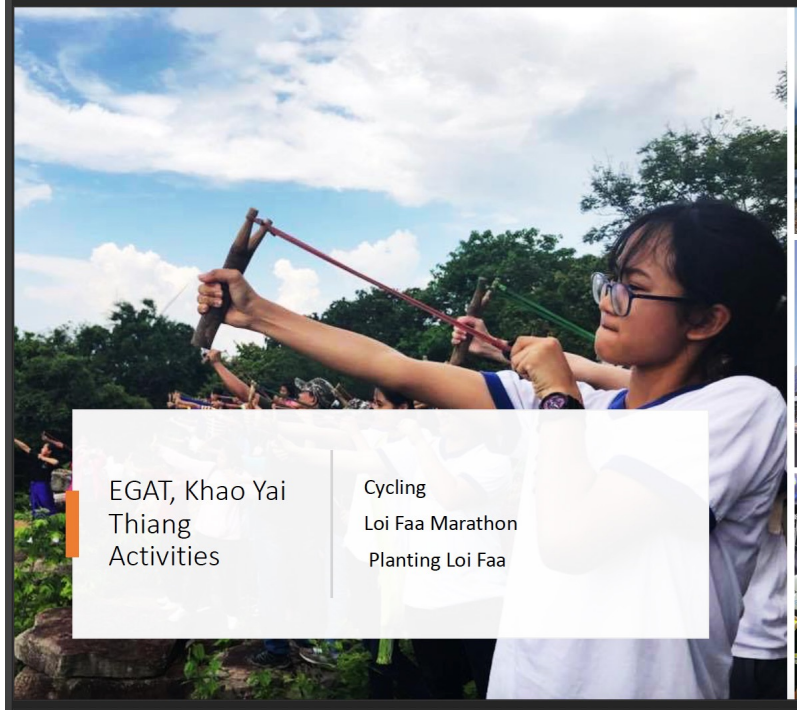


5.1 Various activities services in the area of Cuesta and Pra Wihan Formation

5.1.1 EGAT ' s Wind Turbine Farm www.egat.co.th

The wind blowing in this area has a wind speed of 6.14 meters/second, which is more than Laem Phromthep, Phuket Province (5.65 meters/second) and Ban Ao Phai, in Chonburi Province (5.19 meters/second). That allows the wind turbines at Lam Ta Khong to produce up to 1,250 watts of electricity per plant, or about 4.60 million units per year, replacing 1.1 million liters of fuel per year and reducing greenhouse gas emissions that cause global warming by up to 2,300 tons per year.





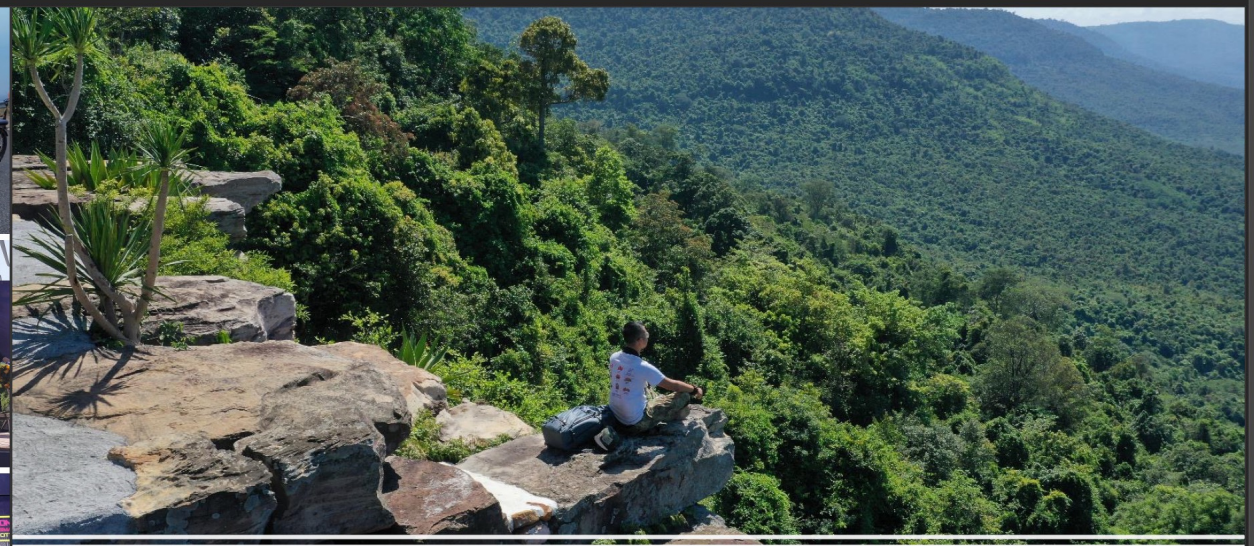
EGAT, Khao Yai Thiang Activities

- Cycling
- Loi Faa Marathon
- Planting Loi Faa









5.1.2 Natural Classroom in the Dry Evergreen Forest : in case of Khao Chan Ngam and Phu Pha Sung













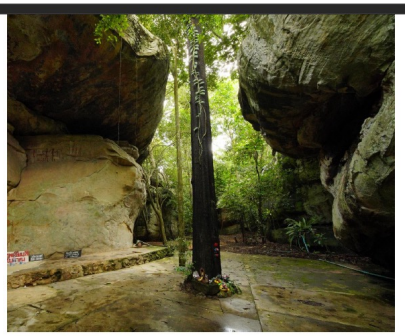
5.1.3 Burrow Fossils at Phu Pha Sung Natural Classroom

140 million years ago



5.1.2 Khao Chan Ngam Natural Classroom









ธรณีประวัติเขาจันทน์งาม
Geological History of Khao Chan Ngam



140 ล้านปีก่อน Million years ago

แม่น้ำสายใหญ่ มีทิศทางไหลจากตะวันตกเฉียงเหนือ ลงสู่ที่ราบต่ำทางทิศตะวันออก ตะกอนที่ถูกพาพัดมาทับถมกันเป็นชั้นหนา ๆ ตามการเอียงเทของแอ่งโคราช ต่อมาแม่น้ำได้พัดพาตะกอนทรายมาทับถมกันเป็นชั้นหนาเกิดเป็นหินทรายหินกรวดมนและหินทรายแป้งสลับกัน ต่อมาได้เกิดการเปลี่ยนแปลงของเปลือกโลกครั้งใหญ่ ทำให้แม่น้ำสายเดิมเปลี่ยนทิศทางการไหลเป็นไหลขึ้นทางทิศตะวันออกเฉียงเหนือ ตะกอนทรายที่ทับถมกันมาก่อนหน้านี้ได้ถูกยกตัวขึ้นเป็นที่ราบสูงโคราช และเกิดการกัดเซาะผุพังเป็นลานหินทรายและหุบเขาต่าง ๆ ในปัจจุบัน

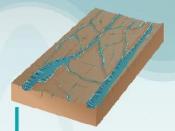
The large river was flowing directly to the west that recognized from the evidence of the tilting direction of the cross bedding layer appeared by such a river brought sediments to accumulate and hardened into a thick layer of sandstone of the Phu Phan Formation.



หลัง 50 ล้านปีก่อน After 90 million years ago

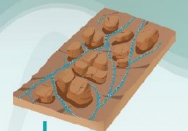
แผ่นธรณีภาคอินเดียชนกับแผ่นยูเรเซีย (ยุโรป+เอเชีย) ชั้นหินของกลุ่มหินโคราชถูกดันขึ้นกลายเป็น เกิดเป็นที่ราบสูงโคราช และการเกิดแนวเทือกเขาภูพาน

The Indian tectonic plate collides with the Eurasian plate (Europe + Asia). The rock layers of the Khorat Group uplifted to be the Khorat Plateau and then the cuests formed.



ชั้นหินบริเวณนี้ถูกกัดเซาะด้วยทางน้ำ ไปเรื่อยๆ ตลอดช่วงหลัง 50 ล้านปีที่ผ่านมา

The rock layers in this area have been continuously eroded by waterways over the past 50 million years.



ทางน้ำชอบมุมทิศตะวันออกเฉียงเหนือมากขึ้น และกัดเซาะชั้นหินโผนมากขึ้นจนกระทั่งเกิดเป็นหุบเหวลึก ดังที่เห็นในปัจจุบัน

The waterway moved more northeast and eroded more vertical rock layers until it forms a deep ravine as seen at present.



ตั้งแต่ 140 ล้านปีก่อน เรื่อยมาจนถึง หลัง 100 ล้านปีก่อน
From 140 million years ago until after 100 million years ago

ตะกอนที่ทับถมกันเป็นชั้นหนาบริเวณนี้ ประกอบด้วย หน่วยหินภูพาน หน่วยหินเสาขัว หน่วยหินโคกกรวด หินยาง หินโพนสา และหน่วยหินโคกกรวด ที่ราบสูงโคราช ปกคลุมด้วยหินตะกอนยุคครีเทเชียส เมื่อประมาณ 190 ล้านปีก่อน ทะเลได้ท่วมเข้ามาครั้ง ทำให้เกิดชั้นหินเกลือหินและยิปซัม ของหมวดหินมหาสารคาม และถูกทับถมด้วยชั้นหินทรายแดงของหมวดหินโคกกรวด ต่อมาแผ่นดินยกตัวขึ้นเป็นที่ราบสูงโคราช

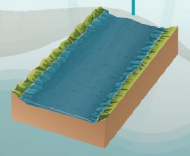
The sedimentary layers of the Khorat Group have accumulated in a thick layer covering the sandstone bed of the Phu Phan Formation, consisting of the Sao Khua, Phu Phan, and Khok Kruat formations. After 100 million years ago, the sea came to cover the land at northeastern Isaan's Basin, then the climate become a more arid condition. Seawater has dried up and has accumulated to form a thick salt layer of the Maha Sarakham Formation. This formation was covered with a layer of eolian sandstone of the Phu Thok Formation that was affected by the desert environment.

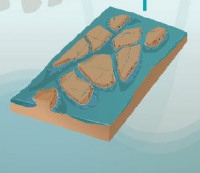


เวลาผ่านไปหลายล้านปี
Millions of years have passed

ได้มีแม่น้ำสายใหม่ไหลผ่านบริเวณพื้นที่ และมีการเปลี่ยนทิศทางการไหลเข้าสู่ทางการเอียงของแอ่งน้ำไปทางตะวันออกเฉียงเหนือ

There has been a new river flowing through the area and changed the flow direction due to the inclination of the river base to the northeast.





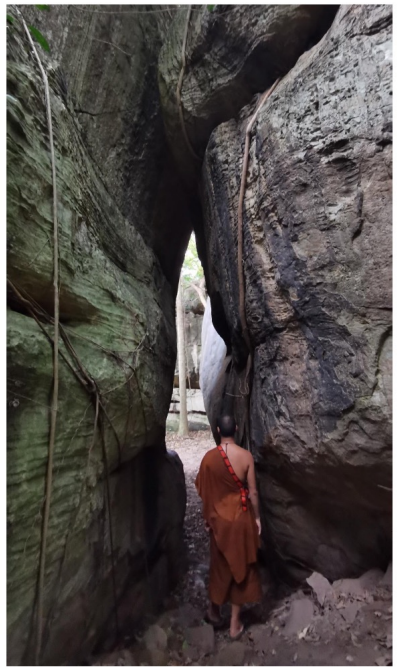
กระทั่งมีประมาณ 3-4 พันปีก่อน
About 3-4 thousand years ago

คนโบราณได้เข้ามาตั้งรกรากในพื้นที่ และได้วาดภาพเพิงผาไว้ อย่างไรก็ตาม หลักฐานเหล่านี้ ชั้นหินยังคงมีการผุพังอย่างต่อเนื่อง และเกิดการหักโค่งเอียงมากขึ้น ดังจะเห็นได้จากชั้นหินเอียงบริเวณบันไดหินแขวน ที่จะเห็นว่าชั้นหินมีการหักโค่งเอียงมากขึ้น

Ancient people have settled in the area and painted human and animal figures. However, after that period, the rock layers are also tilted and continually breaking up. This can be seen in the evidence from the slanting stone layer around the hanging stone staircase and the color painting is appear near the ground.

สำนักงานโคราชจีโอพาร์ค
Khorat Geopark Office



















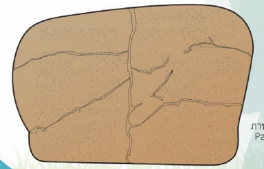
EGAT

บันไดหินแขวน
Hanging Rock



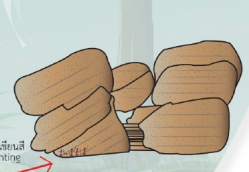
หลังจากชั้นก้อนหินเกิดการกัดเซาะ หินบางก้อนได้แยกเป็น 2 ก้อน และก้อนหนึ่งเกิดการล้มเอียง หินก้อนที่ปิดทับด้านบน ได้หลุดล่วงลงมาแขวนอยู่ตรงรอยแยกของหิน 2 ก้อนนั้น เกิดเป็นภูมิประเทศหินแขวนที่น่าฉงนใจ

After the rock layers had been eroded, some of the rocks separated into 2 parts, with one part tilted. The overlying rock had fallen and was suspended in the crevice of the 2 rocks, forming a surprising landscape of a hanging rock.





ภาพเขียนสี Painting



ภาพเขียนสี Painting

ด้านประชาสัมพันธ์ โคราช จีโอปาร์ค วัดเลิศสวัสดิ์(เขาจันทน์งาม) Tel. +66 99 55584-1

สำนักงานโคราชจีโอพาร์ค Khorat Geopark Office Tel. +66 44 370739 ext.40 , Email : khoratgeopark@gmail.com





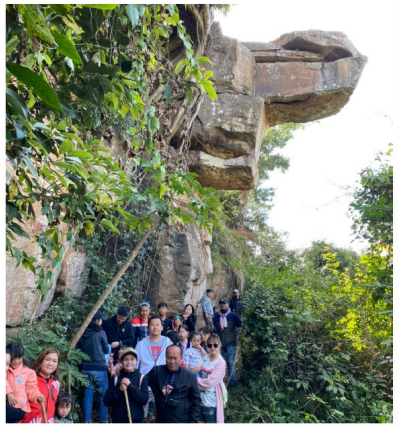
EGAT

WILDLIFE of KHAO CHAN NGAM
สัตว์ป่า
วัดเลิศสวัสดิ์ (เขาจันทน์งาม)

กลุ่มวิสาหกิจท่องเที่ยวชุมชนของเที่ยว จีโอพาร์คภาพเขียนสียุคก่อนประวัติศาสตร์
Tourism Enterprise Group Geopark Prehistoric Painting .
Tel. +66 89 955 5861 , Email : Athitavaja55@email.com

KHAO CHAN NGAM
วัดเลิศสวัสดิ์ (เขาจันทน์งาม)

BIRDS
นก





5.1.4 Phu Saen Dao and Pha Ku Rak Natural Activities



5.1.5 Organic Agricultural Farm at Ban Wang Sai Thong, Phu Saen Dao

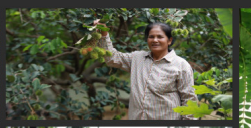
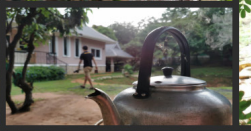






5.1.6 Coffee and Macadamia Nuts Farms at Dong Mafai Community

5.1.7 Ban Mae Eed Homestay and Agrotourism at Khao Chan Ngam Community





5.2 Agrotourism in the area of Sao Khua Formation

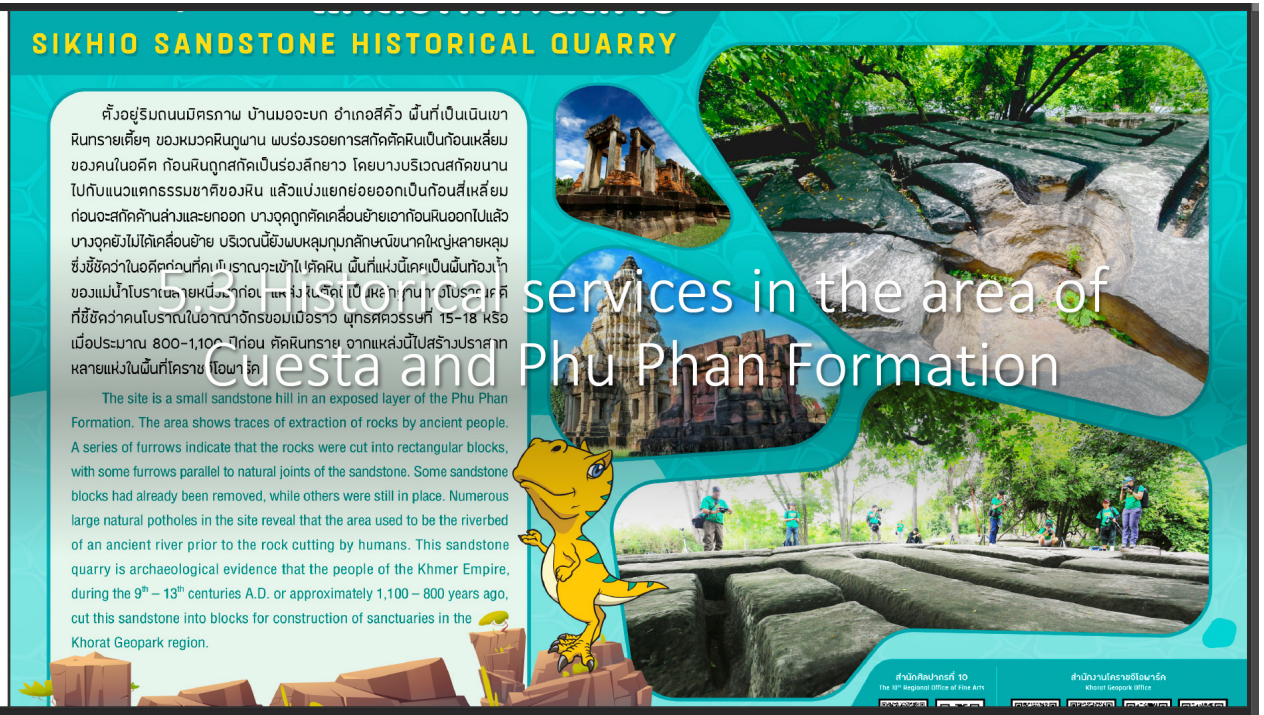
- Khao Prik Agriculture Industrial Institution, Department of Corrections
- Khao Sam Sib Sang Agriculture Farms








5.3 Historical services in the area of Cuesta and Phu Phan Formation





This area is a mound of coarse sandstone at Khao Hoeb encompassing an area of approximately 1,000 square meters. One can see potholes of many sizes, such as 165 cm in diameter by 120 cm in depth and 240 cm in diameter by 50 cm in depth. In some areas of the sandstone, there are grooves where stone blocks have already been removed, while in other areas parallel grooves have been carved into the sandstone, but the blocks had not yet been cut out and removed. In addition to this, there is another rock quarry site nearby in the area of Khao Hin Tat (Stone Cutting Hill) Forest Temple covering an area of approximately 1,600 square meters. This site is similar to the first site but has grooves indicating that a greater number of stone blocks had been removed. Some blocks had been cut out and moved from their original locations but had not been removed from the general site.

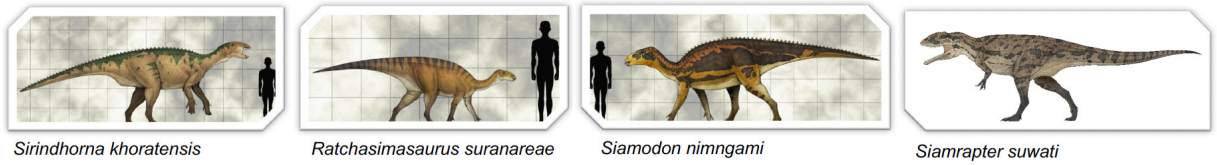
5.4 Geosite in the area of Khok Kruat Formation

5.4.1 Dinosaur sites in Muang, Kham Tale So, and Sung Noen districts

5.4.2 Sri Chanasapura Dhvaravati ancient city and Reclining Buddha

5.4.3 Sung Noen Sandstone Historical Quarry





5.4.1 Dinosaur sites in Muang, Kham Tale So, and Sung Noen districts





5.4.2 Sri Chanasapura Dhvaravati ancient city and Reclining Buddha

Oldest sandstone Reclining Buddha image in Thailand, 1,300 years ago.





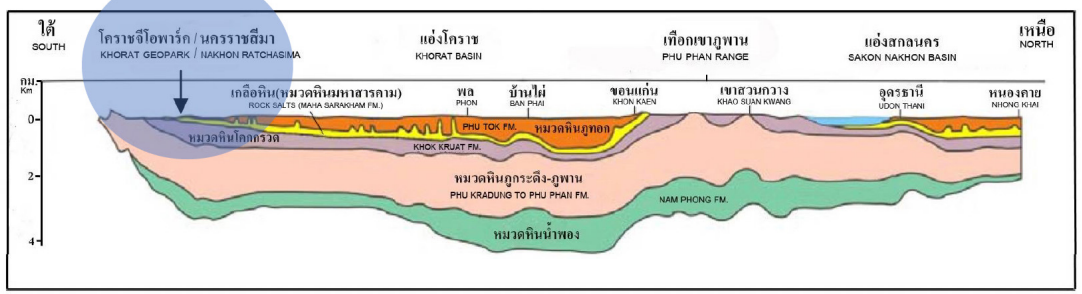
5.4.3 Sung Noen Sandstone Historical Quarry

Red sandstone, approximately 110 million years old, in this quarry was used by the people of Sri Chanasapura Kingdom or the Khmer Empire to carve Buddha images, wheels of dharma, bai sema or boundary stones, Buddhist hospitals, and stone sanctuaries. These carved structures can be found in Sung Noen, Mueang Nakhon Ratchasima, or Phimai districts dating from approximately 1,300 to 800 years ago. The red sandstone is not only of archaeological significance, but also has ecological and geological significance because it is the source of the sandy soil on which the natural plants of the deciduous dipterocarp forest grow, and the source of dinosaur and associated animal fossils found scattered.

5.5 Rock Salts in the area of Maha Sarakham Formation

ภาพตัดขวางทางธรณีวิทยาจากนครราชสีมา-ขอนแก่น-หนองคาย (ปรับปรุงจาก Sattayarak,1990)

Geologic cross-section from Nakhon Ratchasima, Khon Kaen Province to Nong Khai



Modified after Sattayarak, 1990

Kham Tale So Rock Salt Value

No.	Site name	Area (km^2)	Reserves (million ton)	Price of mineral (TB/ton)	Value (million bath)
5	Phandung Salt Dome 1	9.24	2,125.24	1,100	2,337,764
19	Phandung Salt Dome 2	2.58	592.62	1,100	651,882
22	Bung Ao Salt Dome	2.04	469.43	1,100	516,373
33	Nong Suang Salt Dome 1	0.68	156.15	1,100	171,765
34	Nong Suang Salt Dome 2	0.60	137.89	1,100	151,679
Total		**15.14**	**3481.33**	**1,100**	**3,829,463**













Salt products from Kham Tale So Community Enterprise























5.7 Petrified Woods in the Quaternary Terraces

- Although petrified wood can be found in almost every province of NE-Thailand but extraordinary found in Nakhon Ratchasima (in area of 20 districts) during 1956 – 1958. There was the construction of Friendship Road and other roads in NE-Thailand.
- The constructions took a lot of gravels from sites in Khok Kruat and Suranaree subdistricts, Mueang district, Nakhon Ratchasima where were discovered to be the 2 largest sites of petrified wood of the province. Without the good conservation plan, thousands large logs of petrified wood have been sold to be the private property inside and outside the country.
- Therefore, around 1995 the petrified wood conservation master plan has been proposed to establish the petrified wood museum on their site.
- Petrified wood found in Nakhon Ratchasima have gemstone quality such as opal, carnelian, agate, and jasper. Thailand's largest log of opal petrified wood was found in Suranaree subdistrict where the museum is located.
- Their age is about early Pleistocene (800,000 years ago).











Ban Pho Geotourism Community

- Phanom Wan Historical Sanctuary located in this community. There are interesting activities for tourists such as a group of Thone Phan Pee Drum. The drum made by the earth along Lam Boribun that is the tributary channel of Lam Ta Khong River, the main river of Khorat Geopark area.



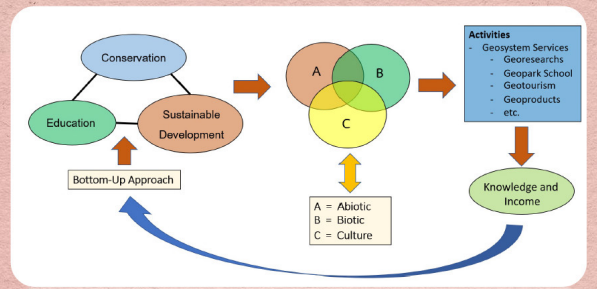
Ban Phon Sung Agrotourism Community



Educational Activities



Educational Activities



What can we share?



Thank you for Your Attention

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