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**Occurrence of Gypsum Deposit in the Yega and Gyinyemyaung Areas,
Minhla Township, Magway Region, Myanmar**

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Occurrence of Gypsum Deposit in the Yega and Gyinyemyaung Areas, Minhla Township, Magway Region, Myanmar

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Abstract

In Myanmar, over 54 occurrences of gypsum deposits have been recorded and are date back to the Tertiary Eocene, Oligocene to Miocene age formations and also in the Mesozoic units (Triassic Pannyo evaporites and Jurassic Thibaw Red Beds Northern Shan State, Hlaing Bwet area, Kayin State, and A Yu Chaung- Sin Phyu Taing area, Tanintharri Region). In the present research area, gypsum deposit of Yega and Gyinyemyaung ares, Minhla Township, Magway Region has not been recorded in the aforementioned occurrences and is found in the Miocene, Kyaukkok and Pyawbwe Formations of Pegu Group. This is the new occurrence of the gypsum deposit in the mudstone and sandstone of the Pyawbe and Kyaukkok Formations of Pegu Group (Oligocene to Miocene). The present research work reveals that the thickness of the gypsum layers in the mudstone and sandstone is about 9 m and the length is about 500 m and width is about 75 m respectively. The analyses of the selected representative samples from the study area indicate that average Specific Gravity of the gypsum is about 2.28 and the total reserve of the gypsum deposit is estimated about 769509.61 metric tons. The gypsum deposit in the study area and the associated mudstone and sandstone were probably be deposited in the high salinity condition and lagoonal environment.

Key Words: Gypsum, Pegu Group, Pyawbwe Formation, Kyaukkok Formation

မကွေးတိုင်းဒေသကြီး၊ သရက်ခရိုင်၊ မင်းလှမြို့နယ်၊ ရေခါးကျေးရွာနှင့် ဂျင်ရဲမြောင်ကျေးရွာ ဝန်းကျင်ဒေသတို့တွင် ဂေါဒန်ကျောက်ဖြစ်ထွန်းမှု ကွင်းဆင်းလေ့လာခြင်း

အောင်မင်း၊ ဒုတိယညွှန်ကြားရေးမှူး
ဘူမိဗေဒလေ့လာရေးနှင့် ဓာတ်သတ္တုရှာဖွေရေးဦးစီးဌာန

စာတမ်းအကျဉ်း

မြန်မာနိုင်ငံတွင် ဂေါဒန်ကျောက် သတ္တုသိုက်ပေါင်း (၅၄) ခု ကျော်ကို မှတ်တမ်းတင်ထားပြီး သက်တမ်းအားဖြင့် သက်နှောင်းကပ်မှ Eocene၊ Oligocene မှ Miocene သက်တမ်းနှင့် သက်လယ်ကပ်မှ (Triassic Pannyo Evaporites and Jurassic) သက်တမ်းရှိ ရှမ်းပြည်နယ်မြောက်ပိုင်း Thibaw Red beds များနှင့် ကရင်ပြည်နယ်၊ လှိုင်းဘွဲ့မြို့နယ်၊ တနင်္သာရီ တိုင်းဒေသကြီး၊ အယူးချောင်းဒေသ၊ ဆင်ဖြူတိုင်ဝန်းကျင်ဒေသများတွင် တွေ့ရှိရပါသည်။ ယခုသုတေသနဧရိယာသည် မကွေးတိုင်းဒေသကြီး၊ မင်းလှမြို့နယ်၊ ရေခါးဒေသနှင့်ဂျင်ရဲမြောင်ဒေသ၏ ဂေါဒန်သတ္တုသိုက်ကို အထက်ဖော်ပြပါ သတ္တု သိုက်မှတ်တမ်းများတွင် မှတ်တမ်းတင်ထားခြင်း မရှိသေးဘဲ ဂေါဒန်ကျောက်အား ပဲခူးအုပ်စု၏ Miocene သက်တမ်းမှ၊ ကျောက်ကုတ်နှင့် ပျော်ဘွယ်ကျောက်လွှာစုများတွင် တွေ့ရှိရပါသည်။ ကွင်းဆင်းဆောင်ရွက်မှုအရ (Oligocene to Miocene) သက်တမ်းရှိ ပဲခူးကျောက်လွှာအုပ်စုမှ ပျော်ဘွယ်နှင့် ကျောက်ကုတ် ကျောက်လွှာစုများ၏ ရွှံ့ကျောက်နှင့် သဲကျောက်များတွင် ဂေါဒန်သိုက် အသစ်တွေ့ရှိရခြင်း ဖြစ်ပါသည်။ ရွှံ့ကျောက်နှင့် သဲကျောက်များတွင် ဂေါဒန်အလွှာများ၏ အထူစုစုပေါင်းမှာ ၉ မီတာခန့် ရှိပြီး အလျား ၅၀၀ မီတာခန့်နှင့် အနံ ၇၅ မီတာ အသီးသီးရှိကြောင်း လေ့လာတွေ့ရှိရပါသည်။ ကွင်းဆင်းလေ့လာခဲ့သည့် ဧရိယာမှ ကောက်ယူထားသော ကိုယ်စားပြုနမူနာများ၏ ဓာတ်ခွဲစမ်းသပ်ချက်များအရ ဂေါဒန်ကျောက်၏ ပျမ်းမျှရေချိန်သိပ်သည်းဆမှာ ၂.၂၈ ခန့်ဖြစ်ပြီး ဂေါဒန်သိုက်၏ စုစုပေါင်းတန်ချိန်ပမာဏမှာ ၇၆၉၅၀၉.၆၁ မက်ထရစ်တန်ခန့်ရှိကြောင်း ခန့်မှန်းထားပါသည်။ ကွင်းဆင်းလေ့လာခဲ့သောဧရိယာရှိ ရွှံ့ကျောက်များနှင့် သဲကျောက်များအတွင်း ဖြစ်ပေါ်နေသော ဂေါဒန်သိုက်သည် ဆားငန်မှုန့်နဲ့ မြင့်မားသောပင်လယ်ရေ ဝင်ရောက်ခြင်းမှဖြစ်ပေါ်လာသည့် ရေကန်များတွင် အနည် ပို့ချမှုကြောင့် ဖြစ်ပေါ်လာကြောင်း ယူဆရပါသည်။

Occurrence of Gypsum Deposit in the Yega and Gyinyemyaung Areas, Minhla Township, Magway Region, Myanmar

1. Introduction

Gypsum is an industrial raw mineral that is essential in the agricultural industries and also in the cement production, construction works such as gypsum board, plaster, fire resistant construction, and also in the paper and textile, art and sculpture and also in the medicinal purposes such as dentistry, POP and also in the Oil and gas industries. It is deposited from the lake and sea water as an evaporite deposits in the sedimentary rocks. In Myanmar, over 54 occurrences of gypsum deposits have been recorded (DGSE, 2017) so far (Fig. 1), the present study area, Yega which is located about 7 km south of Minhla and Gyinyemyaung which is about 10 km southwest of Minhla have not been recorded in the aforementioned occurrence (Fig. 2) This is the new occurrence of the gypsum deposit which occur as thin layers of gypsum intercalated with mudstone and sandstone of the Pyawbe and Kyaukkok Formations of Pegu Group (Oligocene to Miocene). The present research work reveals that the thickness of the gypsum layers in the mudstone and sandstone is about 9 m and the length is about 500 m and width is about 75 m respectively. The analyses of the selected representative samples from the study area indicate that average Specific Gravity of the gypsum is about 2.28. and the average tonnage of the gypsum deposit is about 769500 metric tons (Aung Min et al., 2024).

2. General Geology

The study area is located at the western bank of the Irrawaddy River, and which is a hilly region where the hills generally run NW-SE and the western part is higher than the eastern part. The highest peak is about 387 meter and located at the 4 km south of Gyinyemyaung village. The Konegyi stream is the major stream which start from Taung U village and flow from west to east and join into the Irrawaddy River near the Malun city. In the research area, Padaung Formation, Okhmintaung Formation, Pyawbwe Formation and Kyaukkok Formation and Obogone Formation of Pegu Group (Oligocene to Miocene) and Irrawaddy Formation (Miocene to Pleistocene) are exposed (Fig. 3).

Padaung Formation is mainly composed of greyish blue to bluish black, mudstone and clay stones forming the interbedded layers. Moreover, thinly laminated silt stone and shales are also interbedded and less exposed in the study area especially at the Daungboke village. The age of this Formation is regarded as Middle Oligocene (Mitchell, 2018), (Aung Khin and Kyaw Win, 1969) (Table 1).

Okhmintaung Formation is mainly composed of buff to light grey coloured, medium to coarse grained, thick bedded to massive sandstones and in some places, silt stone and gravel beds are intercalated. This Formation is mainly exposed at the east of Yawthit and south of Thakekelgyin villages. Generally, the trend of this Formation is NW-SE and dipping to the east with 40°- 45°. The age of the Formation is Upper Oligocene (Mitchell, 2018).

These two formations of Lower Pegu Group are unconformably overlain by the Upper Pegu Group of Pyawbwe and Kyaukkok Formations and are also overlain unconformably by the Irrawaddy Formation.

The Pyawbwe Formation is mainly composed of grey to bluish grey coloured, thinly laminated mudstone and thin layers of yellowish brown, fine-grained, sandstone are intercalated in it. The general trend of this Formation is NW-SE with 20°- 25° dipping to the east. This Formation is mainly exposed near Yega village and west of Gyinyemyaung village.

The age of this Formation is Lower Miocene (Mitchell, 2018) or Early Miocene (Aung Khin and Kyaw Win, 1969).

Kyaukkok Formation is mainly composed of buff to yellowish brown, fine to medium-grained, thick bedded to massive gritty sandstone which intercalated with fossiliferous sandstone, greyish mudstones. The age of this Formation is Lower Miocene (Mitchell, 2018) or Early Miocene (Aung Khin and Kyaw Win, 1969).

Middle Miocene age (Mitchell, 2019), (Aung Khin and Kyaw Win, 1969), Obogon Formation is mainly composed of buff to yellowish brown, fine- to-medium-grained, thin to medium bedded, sandstone which are interbed with greyish shales. The general trend is NW-SE and dipping to the east with 30°- 40°.

Upper Miocene to Pleistocene age (Mitchell, 2018) or Late Miocene to Pliocene age (Aung Khin and Kyaw Win, 1969), Irrawaddy Formation is mainly composed of yellow to brownish coloured medium to coarse grained sandstone with cross-bedding and gritty sandstones in some places. Generally, the beds are trending N-S and dipping to the east with 20°- 50°. It is best exposed at the west of Magway-Minhla car road.

Structurally, the study area comprises step faults, cross faults and syncline and anticline where an anticline near Htangaing village, 15 km, SW of Minhla has now been operated for oil production.

3. Occurrence of Gypsum Deposit

In Myanmar, the gypsum deposits are date back to the Tertiary Eocene, Oligocene to Miocene age formations and also in the Mesozoic units (Triassic Pannyo evaporites and Jurassic Thibaw Red beds in Northern Shan State, Hlaing Bwet area, Kayin State, and A Yu Chaung- Sin Phyu Taing area, Tanintharyi Region). In the present research area, gypsum deposit is found in the Miocene, Kyaukkok and Pyawbwe Formations of Pegu Group.

In the study area, the occurrences of gypsum deposit can be divided into two blocks and the total reserve of the gypsum deposit was estimated about 9.61 and 769500 metric tons.

At the Yega deposit, the gypsum is found in the buff to yellowish brown, fine to medium grained, thick bedded to massive sandstone interbedded with fossiliferous sandstone and grey mudstone of Pyawbwe Formation. At this deposit, a thin layer of gypsum is intercalation with mudstone with the average thickness about 0.5-1 cm (0.1525 meter) (Fig. 4, 5). At this deposit, the thin gypsum layers are found about 1 meter depth from the surface. Four test pits were carried out for the length and width of the gypsum deposit at Yega area and there are two blocks of gypsum deposits: the block (1) has about 200 meter in length, 10 meter in width and 0.1524 meter in depth and the block (2) has about 200 meter in length, 15 meter in width and 0.1524 meter in depth (Fig. 6A). The total reserve of the Yega deposit was estimated about 9.61 metric tons.

At the Gyinyemyaung deposit, the gypsum is found in the buff to yellowish brown, fine to medium grained, thin to thick bedded sandstone and mudstone of Kyaukkok Formation. At this deposit, six thin layers of gypsum were recorded with the intercalation with the sandstone (Fig. 7, 8). Four test pits were carried out and which reveal about about 500 meter in length, about 75 meter in width and about 9 meter in depth (Fig. 6B). The total reserve of the gypsum deposit was estimated about 769500 metric tons.

4. Results and Discussion

The physical properties of gypsum from the present study area show that grayish white colour, fibrous fracture together with intersecting one perfect and one distinct cleavage. It shows pearly luster and white streak. Eight samples (5 samples from Yega and 3 samples from Ginyemyaung) (Fig. 9) were collected and analysed at the Department of Geological Survey and Mineral Exploration Chemical Laboratory. The results show that CaSO_4 % range from 60.30 to 71.42 % (Table 2).

The sandstone of Pyawbwe and Kyaukkok Formations were deposited in alluvial, deltaic, and near-shore marine environments (Wandrey, 2006). Ridd and Racey (2017) interpreted that the Kyaukkok Formation is more arenaceous than the Pyawbwe Formation and similarly has a marine Miocene mollusc fauna less rich than the Pyawbwe Formation. They also suggested that the associated foraminiferal faunas reflect the shallowing-upwards environment, open marine at the base to very shallow/brackish in the upper part of the formation.

Aye Aye Aung (2012) interpreted that the depositional environments around Minbu area are shallow marine, deltaic and tidal marine based on the facies and facies association study. Moreover, she also interpreted that during the Miocene time started with an episode of marine transgression which was followed by the regressive condition and then recurrence of a transgressive event took place. Aye Aye Aung (2012) regarded the gypsiferous layer in the Pyawbwe Formation as a gypsiferous shale facies and was deposited in the high salinity condition, and associated fauna and benthonic foraminifera revealed that deeper shelf environment, intertidal lagoon or offshore environment. She also designated the depositional environment of the Pyawbwe Formation as shallow marine including tidal flat to offshore area. Besides, she also assumed the depositional environment of Kyaukkok Formation as the fluvial dominated delta to shallow marine condition.

The gypsum was deposited in hypersaline condition during the dry season where the area had undergone an arid climate (Reineck and Singh, 1980).

The occurrence of gypsum in the mudstone and sandstone reflects the original sediments were deposited in the high salinity condition. It can be interpreted that the gypsum deposit in the study area and associated mudstone and sandstone were probably deposited in the high salinity condition, lagoonal environment.

5. Conclusion

The new occurrence of gypsum deposit in the mudstone and sandstone of Miocene, Kyaukkok and Pyawbwe Formations of Pegu Group (Oligocene to Miocene) reflects the original sediments were probably deposited in the high salinity condition, lagoonal environment. Gypsum is important for the cement manufacturing and agricultural industries in Myanmar. So, the new occurrence of gypsum deposit in Yega and Ginyemyaung areas which will be effective as a fertilizer mineral to promote the production of agricultural products in Magway Region where is essential area for cooking oil supporter in Myanmar.

6. Acknowledgement

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Table 1. Stratigraphic sequence of the study area. After Aung Khin and Kyaw Win (1969) and Mitchell (2018).

Aung Khin and Kyaw Win (1969)		Stratigraphic Unit	Mitchell (2018)	
Age			Age	
Late Miocene-Pliocene		Irrawaddy Fm.	Pleistocene, Pliocene & Upper Miocene	
Miocene	Middle	Obogon Fm.	Miocene	Middle
	Early	Kyaukkok Fm.		Middle
		Pyawbwe Fm.		Lower
Oligocene	Late	Okhmintaung Fm.	Oligocene	Upper
	Middle	Padaung Fm.		Middle
	Early	Shwezettaw Fm.		Lower

Table 2. Chemical analyses of gypsum from the Yega and Ginyemyaung gypsum deposit.

Sr. No	Sample No	CaSO ⁴ (%)	Sp.gr
1	SMG-1	60.30	2.24
2	SMG-2	60.30	-
3	SMG-3	68.44	-
4	SMG-4	71.15	-
5	SMG-5	71.15	-
6	SMG-6	67.37	-
7	SMG-7	67.05	-
8	SMG-8	71.42	2.28

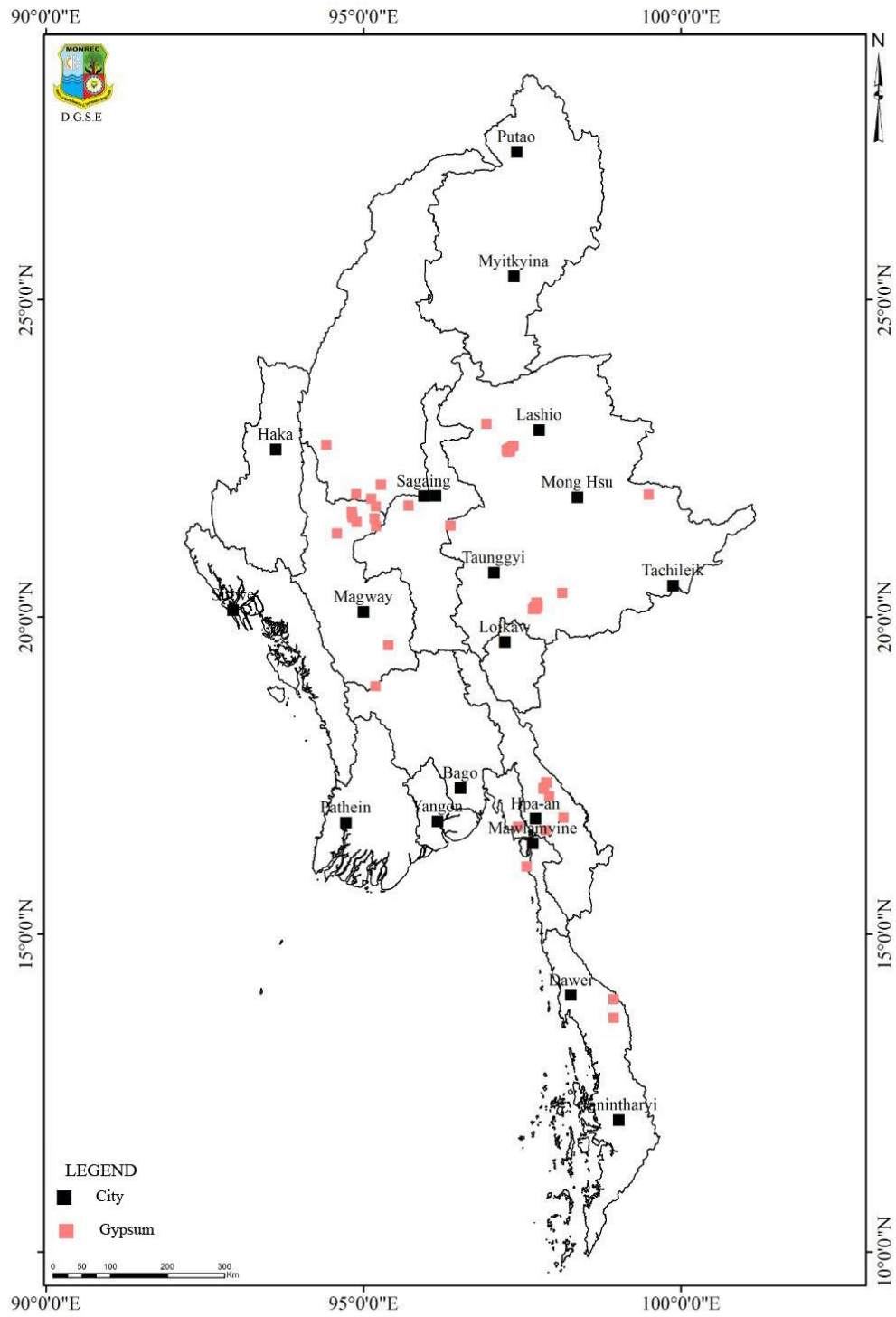


Fig. 1. Gypsum occurrences of Myanmar (After D.G.S.E, 2017).

Location Map of the Study Area (Yega & Gyin Ye Myaung), Minhla Township, Thayet District, Magway Region, Myanmar

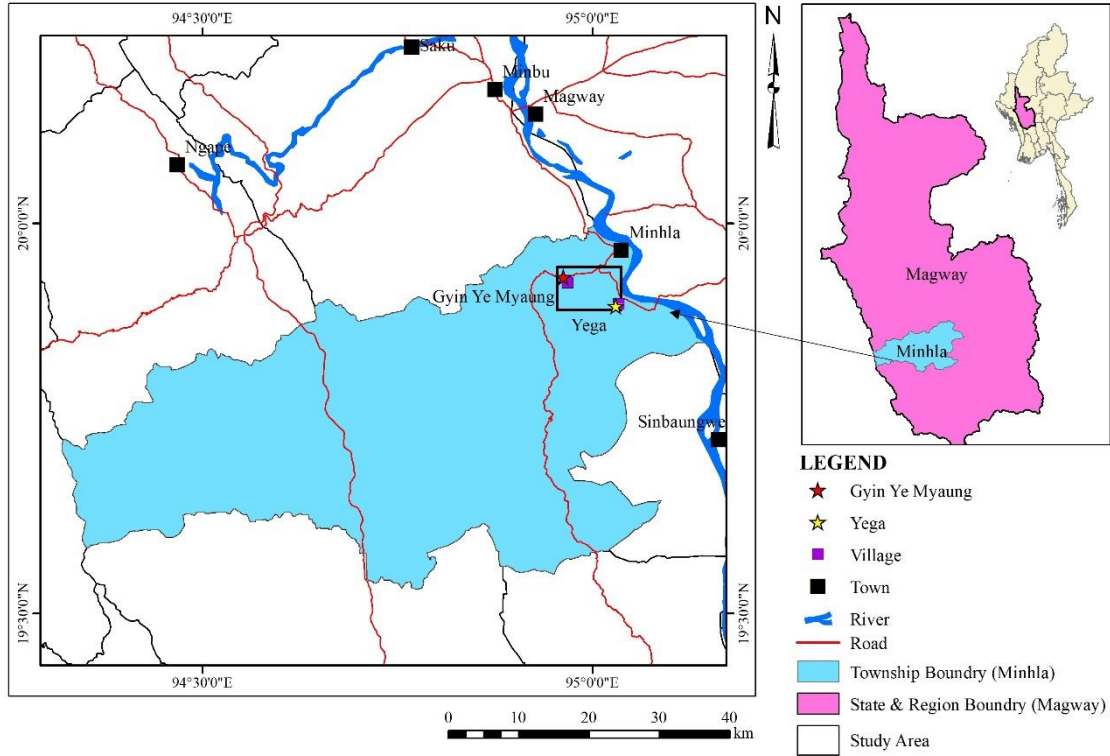


Fig. 2 Location map of the study area

GEOLOGICAL MAP OF MINHILA & MALUN AREA, MINHILA TOWNSHIP, MAGWAY REGION

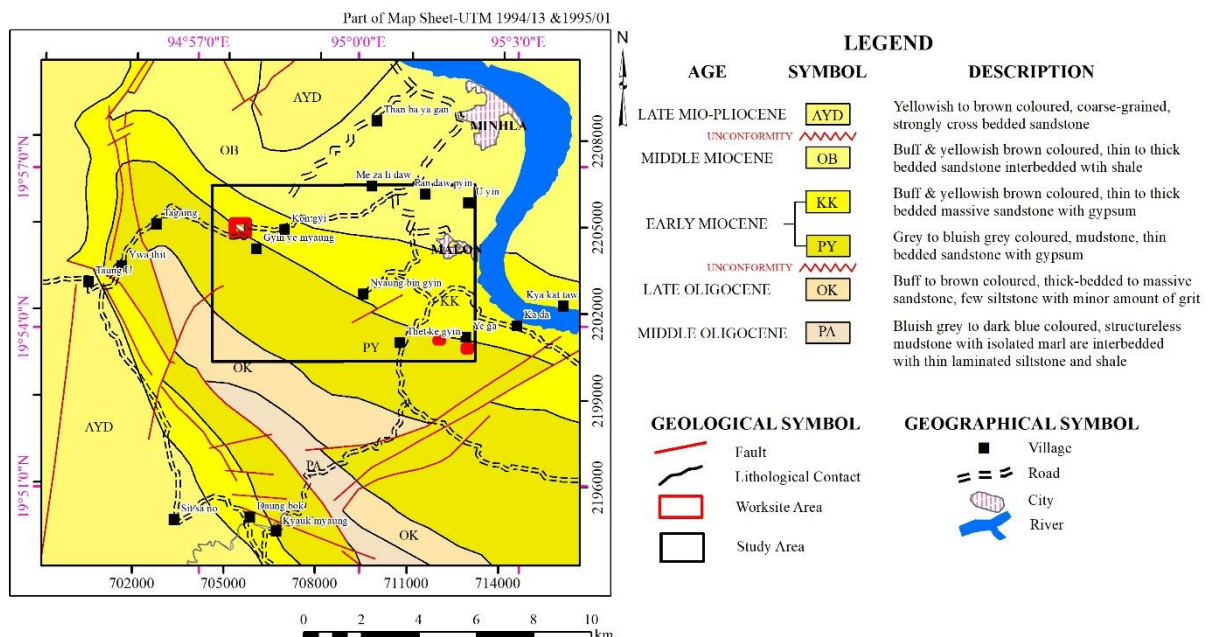


Fig. 3. Geological Map of the study area (after Aung Min, et al., 2024).



Fig. 4. Nature of gypsum layers intercalated with mudstone and shale of Pyawbwe Formation, (UTM-1995/01,712076 E / 2201014 N), Yega Area, Minhla Township, Magway Region.



Fig. 5. Nature of gypsum layers intercalated with mudstone and shale, (UTM-1995/01,713238 E / 2202319 N), Yega Area, Minhla Township, Magway Region.

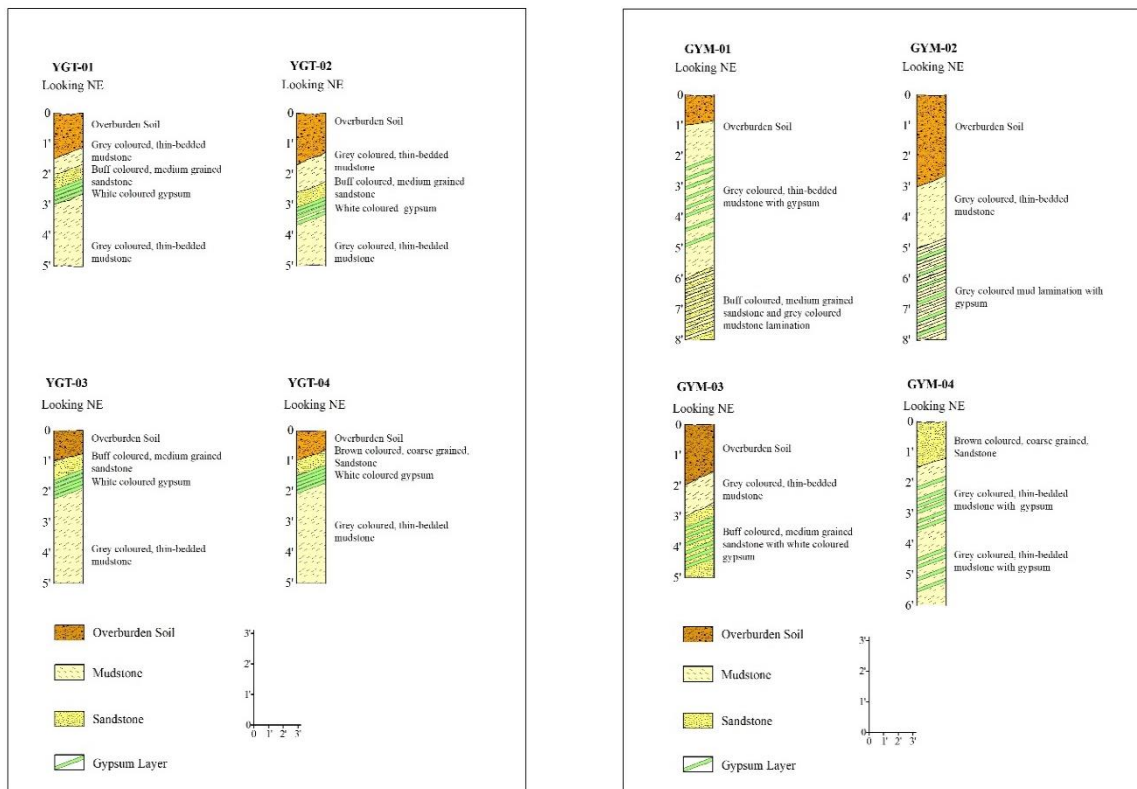


Fig. 6 A, B. Test pit profile of A. Yega and B. Ginyemyaung gypsum deposit.



Fig. 7 Nature of Gypsum layer in the Kyaukkok Sandstone, (UTM-1994/13, 705417 E / 2204848 N), Ginyemyaung Area, Minhla Township, Magway Region.



Fig. 8. Outcrop nature of gypsum layer with mudstone and shale of Kyaukkok Formation, (UTM-1994/13,705374 E / 2204981 N), Gyinyemyaung Area, Minhla Township, Magway Region.



Fig. 9. A, B. A. Gypsum samples, CaSO_4 71.75 %, (UTM-1994/13,705417 E / 2204848N); CaSO_4 – 71.42%, (UTM-1994/13,705374 E / 2204981N) from the Gyinyemyaung Area, Minhla Township, Magway Region.