Geological outlook, Survey of Myanmar's Minerals & Resources

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Regional Tectonic setting of Myanmar as a result of collision between Indian and -Asian plates
Record in Myanmar and the Andaman Sea for the Cenozoic oblique convergence of India along Sundaland

GIAC (Geodynamics of India Asian Collision) Project work in this region during recent decade.
Central Magmatic Belt
Rakhine Coastal Strip
Hukaung Basin
Jade Mine belt
Mogok Metamorphic Belt
Tagaung-Myitkyina belt

Shan–Thai Block includes Precambrian to Cretaceous rocks with Slate belt and Mogok Metamorphic belt to the west. This province is southeast continuation of Tibet Plateau.

Central Tertiary sedimentary basins with oil-gas and coal occurrences. The N-S trending Central Magmatic Belt at the centre.

Western Ranges-fold-thrust belt with Chin flysch. Western Ranges and Central Lowlands includes northern continuation of Sunda arc.

GENERALIZED GEOLOGICAL CROSS-SECTION ACROSS MYANMAR, APPROXIMATELY ALONG LATITUDE 21° N

Dr. U Thein, 1992

GENERALIZED GEOLOGICAL CROSS-SECTION ACROSS MYANMAR
Three modes of earthquake generation in the Andaman Sea
(Schematic tectonic cross-section along Lat 11°N)

W

ANDAMAN SEA

INDIAN OCEAN

Volcanism
Subduction
Earthquakes
Earthquakes
Active spreading and transform faulting (TF)

E

THAILAND

Sunda Trench
Subducting Slab
Melting (to form magma)
Over-riding slab (Basalt)

Earthquakes

ASTHENOSPHERE

STATUS OF GEOLOGICAL MAPPING

Area extent of Myanmar – 261227 sq miles
Geological mapping area(on ground) ~70%
Geological mapping(by the aid of Aerial Photos & RS-GIS techniques) ~30%
In Myanmar, Mineral occurrences include

1. **Metallic ore minerals**  
   Iron & metals for steel alloys - Fe, Mn, Cr, Ni, Mo  
   Base & non-ferrous metals – Pb, Zn, Cu, Sn, W, Sb & Ti  
   Precious & rare metals - PGM, Au, Ag, Nb, Ta

2. **Industrial minerals & non-metallic raw minerals**  
   Chemical & fertilizer minerals - Barite, fluorite, Gypsum, rock salt  
   Ceramic & refractory minerals - clay, limestone, dolomite, feldspar, quartz, glass sand  
   Construction & building materials - Decorative stones, road materials, limestone for cement

3. **Precious & semi-precious Gemstones**  
   Ruby, Sapphire, Jade, Diamond, etc

4. **Fuel minerals**  
   (oil, natural gas, oil shale, coal,
**Lead-Zinc-Silver Deposits**

- more than 100 occurrences of Pb-Zn-Silver mineralization in Myanmar

- mineralization occurs as five different styles

1. Volcanogenic massive sulphides type (VMS) at Bawdwin mine

2. Massississippi valley type deposit at Bawsaing mine

3. Cavity filling vein-type in Yadanatheingi mine

4. in veins and skarn type near the contact between granitic rock and marble at Phaungdaw mine

5. Zinc carbonate deposit (secondary deposit) at Long Hken mine
Phaungdaw

Bawdwin

Panwa

Bawsaing

Yadanatheingi

Lead deposits

zinc deposits

The Largest Lead-Zinc-Silver Mine in Myanmar

Bawdwin Mine
Main shaft and underground mine

Bawsaing Pb-Zn Mine, Southern Shan State
**Tin-tungsten Deposits**

-one of the most important mineral resources in Myanmar

-occurs along the granitic belt in SE Asia peninsula (distributed over more than 1200 Km in Myanmar with more prominent in Tungsten toward the north,

-passing through the Tanintharyi Division, Kayin, Mon, Kayah & Shan states and east of Pyinmana.

-Tin-tungsten ores occur in close association with granitoids and related pneumatolytic rocks emplaced during Jurassic, Cretaceous and possibly Triassic. The country rocks of these intrusive masses consist of the clastic Mergui Series, Taungnyo Group, Mawchi Series and Lebyin Group.

-Most of the cassiterite is mined from placers while tungsten is mined from hard rock veins.
Sn-W deposits, mainly associated with granitic intrusions along the Tanintharyi and western margin of Shan plateau.

Sn-W occurrences = 480

- Redachuaung (Primary)
- Heinze (Placer)
- Kanbauk (Primary/Placer)
- Alwin Bokpyin (Placer)
- Mawchi (Primary)
- Hermyingyi (Primary)
- Heinda (Placer tin deposit)
- KyaukmeTaung, Pagaye (Placer)
- Theindaw (Placer)
- Manawfro (Placer)

Tin-Tungsten occurrences = 480

Sn-W deposits, mainly associated with granitic intrusions along the Tanintharyi and western margin of Shan plateau.

Hermyingyi Sn-W mine, Dawei
Heinda mine, Dawei

Bucket Dredger in Tin-tungsten mining

Mawchi Sn-W mine, Kayah State
Mineralized vein, Mawchi mine (Loc: Level-4, vein no.15)

DISTRIBUTION OF COPPER DEPOSITS

- Shangalon
  
  Cu - 0.23 %
  
  9 million (Possible)

- Kyesin Taung
  
  Cu - 0.77 %
  
  66.5 million (Possible)

- Sabe Taung & south
  
  Cu - 0.7 to 1.01 %
  
  27.86 million (Possible)

- Letpadaung
  
  Cu - 0.4 %
  
  147.8 million (Possible)

- Sabe Taung
  
  Cu - 1.51 %
  
  0.88 million (Possible)

- Laymyetna
  
  Cu - 0.8 to 2 %
  
  0.28 million (Possible)

- Sinbo-Nankesan

- Parmakut Manna

- Panpwe Kyauk Taung

- Kweezaun Taung

- Potential area

- more than 50 occurrences copper mineralization in Myanmar

- The copper mineralization within the central volcanic arc started from Mt. Popa and passes through lower Chindwin area where the volcanics are hosted to the porphyry copper deposits at the Sabe Taung, Kyesin Taung, & Letpadaung Taung, Monywa.
Monywa Copper Mine
(open-pit mine)
Cathode Copper from Monywa

DISTRIBUTION OF GOLD-PLATINUM DEPOSITS

<table>
<thead>
<tr>
<th>Location</th>
<th>Gold (Primary)</th>
<th>Copper (Possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shadusuik (Kachin)</td>
<td>Pt + Pd</td>
<td></td>
</tr>
<tr>
<td>Ngayyan (Kachin)</td>
<td>Pt + Pd</td>
<td></td>
</tr>
<tr>
<td>Shangalon (Sagaing)</td>
<td>Au = 1.4-12 ppm</td>
<td>0.02 million</td>
</tr>
<tr>
<td>Moedi Taung (Mandalay)</td>
<td>Au = 15-27 ppm</td>
<td></td>
</tr>
<tr>
<td>Shwegyin (Bago)</td>
<td>Au = 0.1-0.35 gm/yard</td>
<td>1.2 million Cu. yd.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Location</th>
<th>Gold (Placer)</th>
<th>Copper (Possible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kyaukpahto</td>
<td>Au = 3 ppm</td>
<td>6 million tons</td>
</tr>
<tr>
<td>Kwinthonse (Mandalay)</td>
<td>Au = 2-4 ppm</td>
<td>1.4 million</td>
</tr>
<tr>
<td>Phayaungtaung (Mandalay)</td>
<td>Au = 4 ppm</td>
<td>3.7 million</td>
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<td>Meyongyi (Mon State)</td>
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(1) Mesothermal gold-quartz lode, porphyry style Cu-Au & its related Epithermal Au along the central magmatic arc.

(2) Sediment-hosted epithermal Au mineralization along the Sagaing fault zone.

(3) Mesothermal and epithermal gold mineralization in Tagaung Myitkyina belt

(4) Au(Cu) skarn & Mesothermal veins in marble, gneiss and granite within the Mogok metamorphic belt

(5) Slate belt style Mesothermal gold-quartz veins in Chaung Magyi & Mergui Groups.
stockwork quartz veining in massive sandstone, Kyaukpahto mine

banded quartz vein in gritty sandstone, Kyaukpahto mine

silicified breccia ore, KPD-3, 11.6-m depth

quartz vein in clay-altered sandstone

Geologic cross-section, 10375 mN Line, Kyaukpahto mine

Gold distribution, 10375 mN Line
Moditaung gold mine

Segment of Au-bearing quartz vein on 950m level at Htongyitaung, 40cm@11 g/t, looking SE.

- Coarse visible gold commonly present in veins assaying over 30g/t Au
- Gold not encapsulated in pyrite.
- Gold is frequently observed in hand specimens in both the oxide and sulphide zones.

IRON

Manganese

INDEX

- Iron

- Manganese
### DISTRIBUTION OF IRON DEPOSITS

- **Lamaung (Kachin)**  
  Fe: 51.54%  
  8.9 million (Probable)
- **Karhaing Taung (Kachin)**  
  Fe: 50.56%  
  223 million (Probable)
- **Sanleik (Kachin)**  
  Lim: 10 million (Potential)
- **Kyakawmye, Inya (Mandalay)**  
  Fe: 54%  
  3.7 + 4.5 million (Probable)
- **Minlun Thansaul, ShweGyi (Bagu)**  
  Fe: 28-56.5% (Lim.)  
  75.53 million (Possible)
- **Konnaw Island (Tanintharyi)**  
  Fe: 36%  
  21.2 million (Probable)
- **Khos Island (Tanintharyi)**  
  Fe: 48.95%  
  7.6 million (Probable)
- **Kantawyan (Kachin)**  
  Fe: 49-69%  
  2.354 million (Probable)
- **Taungkhaton Taung (Kachin)**  
  Fe: 37-45%  
  2.3 million (Possible)
- **Taungkho Taung (Kachin)**  
  Fe: 40.7%  
  18.9 million (Potential)
- **Haemauung (Kachin)**  
  Fe: 48.93%  
  1.1 million (Potential)
- **Mongkarnwe (Shan East)**  
  Fe: 39-66%  
  21.5 million (Potential)
- **Pinpet (Shan South)**  
  Fe: 56.4%  
  80 million (Possible)
- **Minlan Thanseik, ShweGyin (Bago)**  
  Fe: 28-56.7% (Lim.)  
  75.53 million (Possible)
- **Kyatwinye, Inya (Mandalay)**  
  Fe: 54%  
  3.7 + 4.5 million (Possible)
- **Pinpet (Shan South)**  
  Fe: 56.4%  
  80 million (Possible)
- **Mongkarnwe (Shan East)**  
  Fe: 39-66%  
  21.5 million (Potential)
- **Haemauung (Kachin)**  
  Fe: 48.93%  
  1.1 million (Potential)
- **Mongkarnwe (Shan East)**  
  Fe: 39-66%  
  21.5 million (Potential)
- **Monpyin (Shan South)**  
  Mn: 6.6%  
  0.65 million (Possible)
- **Wansaw-Wanpaing (Shan East)**  
  Mn: 12.53%  
  4.95 million (Possible)
- **Areye (Shan East)**  
  Mn: 25%  
  1 million (Possible)
- **Wansaw-Wanpaing (Shan East)**  
  Mn: 12.53%  
  4.95 million (Possible)
- **Wansaw-Wanpaing (Shan East)**  
  Mn: 12.53%  
  4.95 million (Possible)
- **Powel Island (Tanintharyi)**  
  Mn: 27%  
  2.8 million (Probable)
Ni-Cr mineralization occurs in close association with ultramafic igneous rocks emplaced during Late Cretaceous-Early Eocene.

At Mwetaung & Taung Taung, the deposits have formed as a result of tropical weathering of ultramafic rocks (Ni laterite deposits).

Chromite deposits are of widespread occurrences in Myanmar being related to N-S trending ophiolite lines.

Nickel Occurrences = 14
Antimony deposits
- More than 140 occurrences of stibnite and other sb-bearing minerals are known in Myanmar.
- The majority of antimony mineralization occurs in the late Paleozoic carbonates (Triassic to Permain in age) & also in the late Paleozoic clastic sediments of the Mergui series.
- Generally found in veins or lenses, or both.
- So far, the best known antimony deposits are at Thabyu, Kayin State, near Thai Border. The ore is reported to be of high grade.
Antimony mine, Hopone area, Shan State

Over 300 Coal occurrences were being found. 184 Coal deposits were being estimated to be 485 mt.
Mogok gemstone tract: Ruby, sapphire, and spinel occur as primary minerals in marble, calc-silicates and as well as obtained from placers in eluvial and alluvial sediments.

Jade mine area: Jadeite-albite dykes and veins intruded into serpentinite bodies at the Tawmaw-Lonkin area,

Burmese amber (Burmite): The major occurrences are located in the Hukwng valley -
- other ruby occurrences are Nayaseik and Pyinlon.

Jade sale in mid. Year Emporium, 2009
Jade mine site, Phakant

Jade mine (Aerial View)
RUBY from Mogok
Gemstone Tract

Mongshu Ruby Mine site
MINERAL OCCURRENCE IN MYANMAR

- Phakant Jade
- Nama - Kangoon Gold
- Salisbury Copper
- Myanmar Gold
- Pyukong Gema
- Mogok Area
- Bawdwin Lead - Zinc - Silver
- Kimberlite
- Nga Pyo Gme
- Heuauk Opahm
- Yalaungtungluw Lead - Zinc - Silver
- Phayangtungluw Gold
- Pyin - Oo - Lwin Iron - Baris
- Waiyangluw Limestones
- Mogok Gem
- Kyauk Kapi Limestones
- Bawdwin Limestone - Geytio
- Noho Baris
- Pampot Tin
- Lemyin Antimony
- Waiyangluw Gem
- Minch MYungpon
- Meneauzolal
- Myanmar - Meyergig Gold
- Kauk Klimbant
- Panab Gme
- Kavatul Tin
- Memyangk - Tin - Yangon
- Kyaukmyndawrym Tin
- Horia Tin
- Pyeeth"
- Nashala Tin
- Thanbaw Diamond Tin
- Thayabon Limestones
- Rock Tin
- Myawun Tin
MINERAL POLICY

- To boost up present production
- To invite participation in terms of technical know-how and investment from sources within the country and abroad
- To fulfill the domestic requirements and to increase export by producing more mineral products;

Conclusion

Myanmar - within the complex tectonic zone of active oblique convergent between Asian and Indian plates exhibits the great diversity of geology, Physiography, structural deformation and as well as episodic mineralization events and various mineral commodities.

The mineral resources include Sn-W, base metals to precious to rare metals, industrial raw minerals, jade & gemstones, and as well as coal, oil & gas. But most of them are needed to be explored and proved systematically.

We hope there’ll be more cooperation between Myanmar and Your Country in the near future.

Thank You