Gold-Copper Resources and Recent Exploration in Indonesia

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**Abstract**

Indonesia is the world’s largest archipelago that extending roughly from $6^\circ$N to $10^\circ$S and from $95^\circ$E to $142^\circ$E for about six thousand kilometers, its contains more than 17,000 islands. The 5 major islands are grouped into: Java-Bali-Nusa Tenggara, Sumatra, Kalimantan, Sulawesi and Eastern Indonesia. The gold-copper resources in Indonesia mostly associated within the major magmatic arc of Late Cretaceous to Pliocene ages: (1) Sunda-Banda, (2) Central Kalimantan, (3) North Sulawesi-Sangihe, (4) Halmahera, (5) Medial Papua, (6) Aceh, (7) Sumatra-Meratus. The largest gold and copper about 58% are produce from deposit along from Medial Papua arc, follow by Sunda-banda arc 21%, Central Kalimantan arc 9%, North Sulawesi arc 9%, and Halmahera arc 2 % respectively (Fig.1).

Historical gold production in Indonesia mainly from epithermal type, such as Lebong distrik in Bengkulu-Sumatra, Cikotok-Cirotan distrik in West Jawa, Gunung Pani distrik, and Mesel-Ratatotok, North Sulawesi. Followed by several copper-gold were produced from Erstberg skarn, Papua, Kelian-Mt. Muro district, central Kalimantan. Later more significant gold-copper are produce from Grasberg, in Papua, Batuhijau in Sumbawa, Pongkor, in Wes Jawa, Gosowong-Tagurachi in Halmahera North Maluku and Lerokis in Wetar-South Maluku. Recently several other mining are start for producing gold such as, Kencana in Halmahera North Maluku, Cibaliung in West Jawa, Riska and Toka Tidung in North Sulawesi, and Way Linggo in Lampung-Sumatra. Several other deposits are under development for production, such as Martabe and Dairi in North Sumatra.

During the last 25 years, where the mining law and mining climate were conducive and exploration are very challenging with limited infrastructures and illegal mining, many discoveries are notice mostly along the Sunda-Banda magmatic arc, Halmahera magmatic arc and North Sulawesi-Sangihe magmatic arc. Until around 2004, Indonesia is the fifth as world gold-copper producers country. However, since the new regulation of decentralization and new government era, the rank is drop up to seven largest gold-copper producer. Since the last four years the new regulation in mining, forestry and environment are launched, exploration challenges is facing with addition problems such: overlapping laws and regulations, overlapping mining concessions, forestry, security and environment issues. No significant new discovery was announce, numbers of companies are prefer to explore in Brownfield area rater than Greenfield region.

The gold-copper resources in Sumatra island mostly are located in west cost of the island and parallel along Sumatra fault zone. Those deposit is associated with Jurassic (rare) to Neogene (mainly) magmatic arc. Most of deposit types are low sulfidation epithermal system (Lebong Tandai,
Way Linggo), although, high sulfidation (Martabe), porphyry (Tangse), skarn (Muara Sipangi) and sedex (Dairi-Pb-Zn), Sihayo) types also existing. Jawa-Bali-Nusa Tenggara islands as part of Sunda-Banda magmatic belts is also rich in gold deposit. The exploration activities in the past most is mainly concern in western part for epithermal low sulfidation system. Gold is come from Cirotan-Cikotok, Pongkor, Cikidang, Cibaliung, Cineam (those deposits in western Java). However, since the discovery of Batuhijau in Sumbawa, finding the similar type or other types deposit is testing for explorations. Good results were obtained as several discovery for porphyry system such as Elang (Sumbawa), Selodong (Lombok), Tujuh Bukit (eastern Java), and Randu Kuning (Central Java). The occurrence of high sulfidation system in Tujuh Bukit district (east Jawa), Papandayan district and Ciemas district (west Java) were also notice.

Exploration activities for gold-copper in Kalimantan island are lesser compare to others islands. This island is well known for country largest coal, oil and gas productions. Kelian-Mt. Muro district was one of most gold production area, about 5.9 M oz gold was produced. Recent discovery in Seruyung and Jelay of north Kalimantan and Buduk and Beruang in west and central Kalimantan are expected to increased gold production from this region.

North Sulawesi-Sangihe island is country long history for gold exploration activities. The gold-copper deposit within the island is consist of several type: porphyry Cu-Au, porphyry Mo/Cu, LS & Hs epithermal, Sedex and Intrusion related Au. Mesel-Ratatotok district was largest production among the region. Total gold production is about 91t up to 2010, but not included from local miner. Now several new gold production is extracted from deposit in Riska, Toka Tidung, Lanut, and Doup. Others deposit are under intensive exploration programs. The gold rush is starting around in 2009 from Bombana region, however exploration within this region is still complicated due to local regulation and illegal mining problems.

Eastern Indonesia region, included, Papua, Halmahera, and Maluku island, is the largest contribution to the country gold-copper production. The copper-gold mainly comes from Erstberg-Grasberg district in Papua of skarn and porphyry systems. However copper-gold also obtained from Kalikuning-Lerokis in Wetar island, south Maluku is from Kuroko type deposit. Significant gold also extracted from Gosowong-Taguraci (27 t of gold at 27 g/t) and Kencana (70 t of gold at 41 g/t) of intermediate sulfidation deposit in Halmahera island. Exploration for gold-copper is still under progress in several area of eastern Indonesia such as Wabu district and Pegunungan Bintang in Papua, Kaputusan-Bacan island in Halmahera.

Although facing several problems occur during mining activities in Indonesia, such as mining law, forestry, environment, and security issue, but the country mineral resources still promising and interesting and increasing demand and high price of certain commodities will keep many company to do exploration in Indonesia.
Fig. 1 Major gold-copper district and other mineral commodities, deposit and prospects of the Indonesian region (ESDM, 2009).