MINISTRY OF ENERGY AND MINES

GEOLOGY AND MINERAL RESOURCES OF LAO PDR.

Department of Geology and Mines

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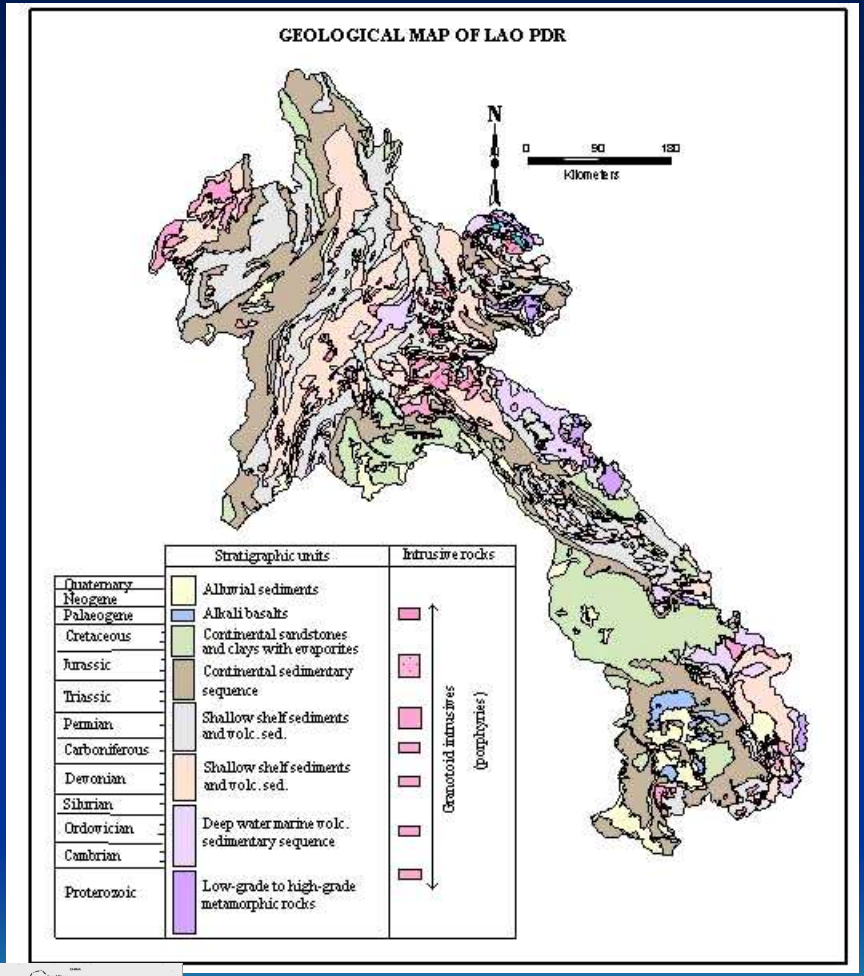
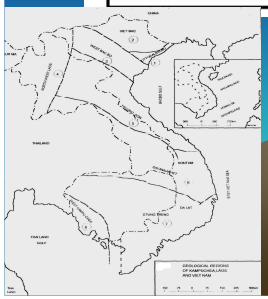
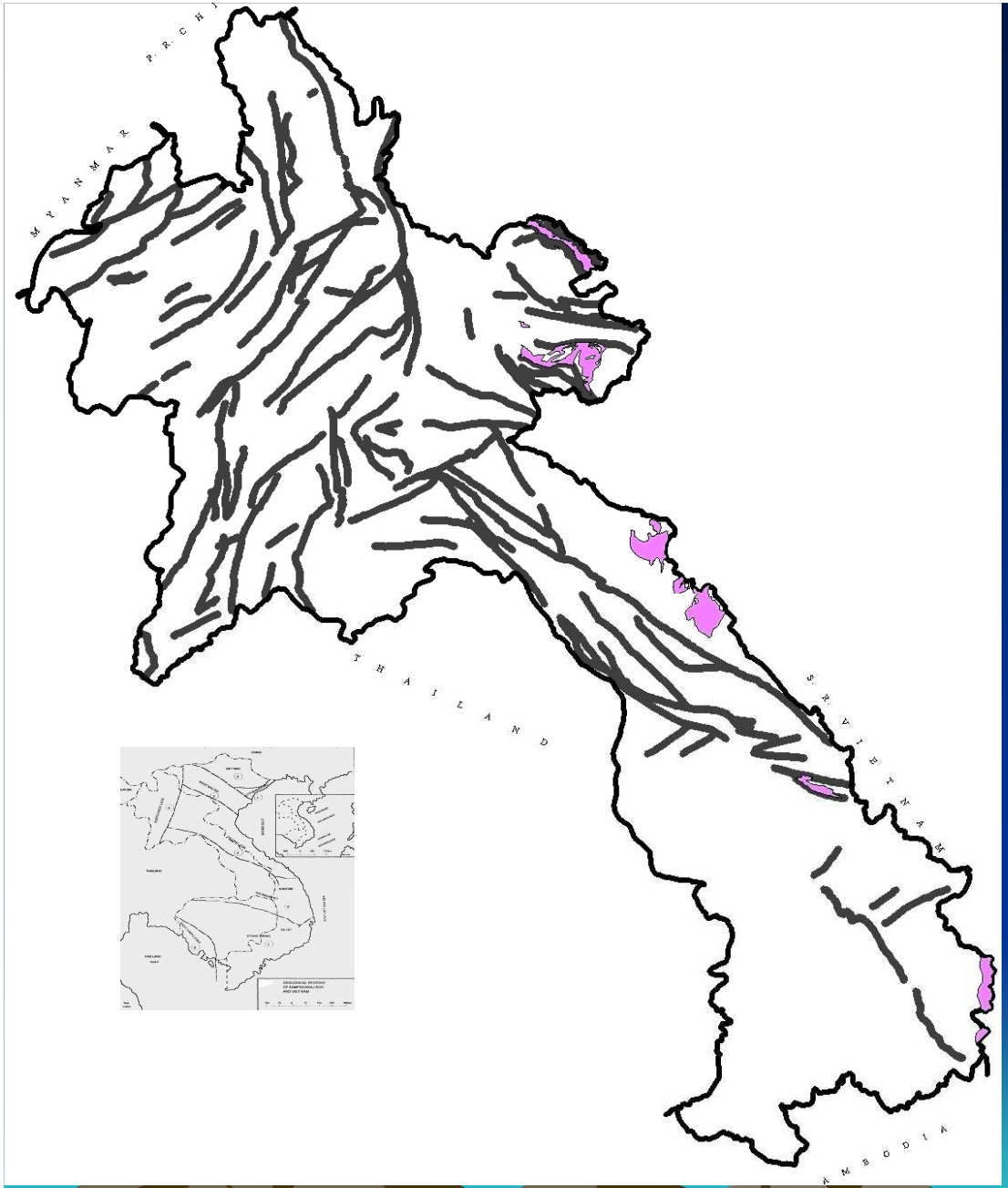
I. GENERAL GEOLOGY OF LAO PDR:



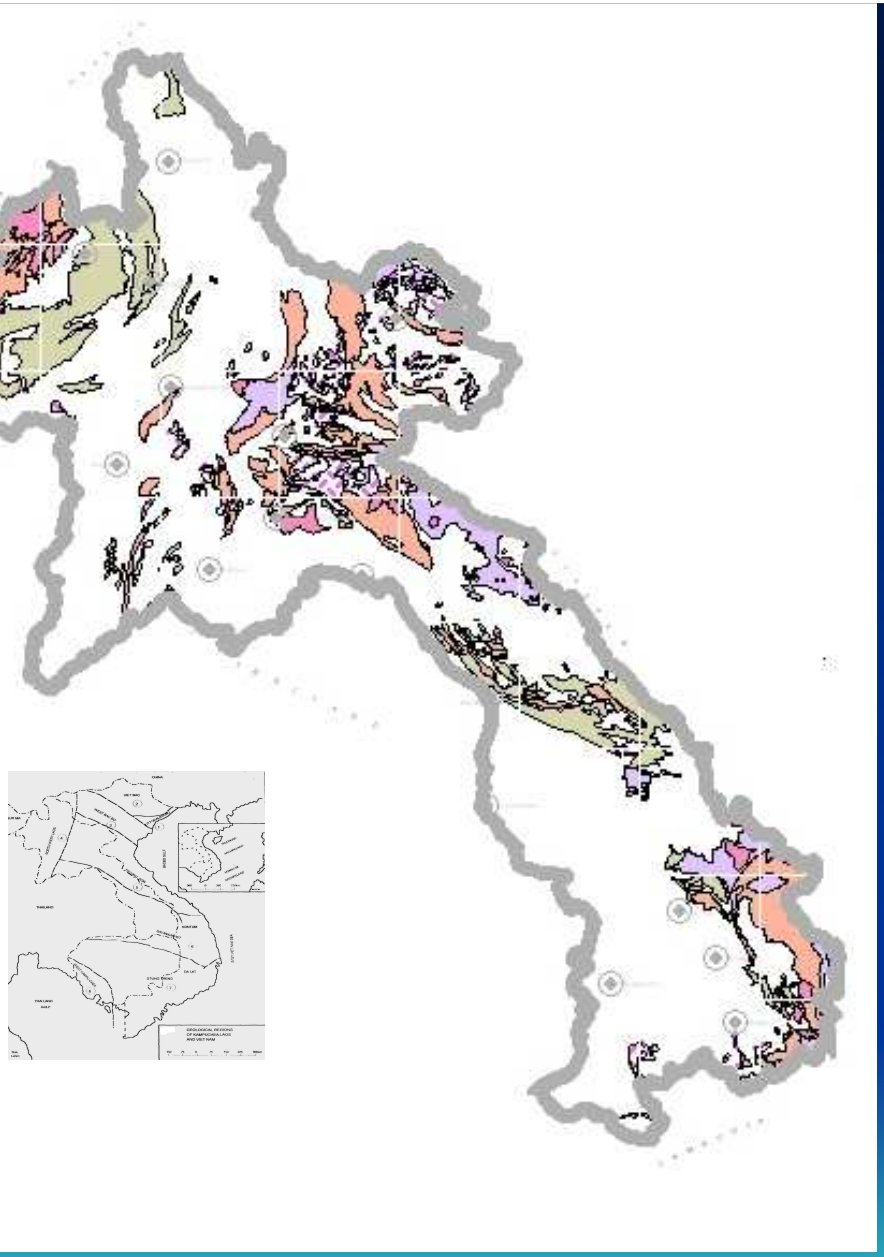
- Metamorphic rocks are believed to be Proterozoic outcrop in northwest and in eastern Lao PDR .
- Palaeozoic and Mesozoic rocks consisting of continental fluvial and shallow to deep marine sediments dominate throughout the country
- The numerous granitoid plutons comprising grannodiorites, monzonites and quartz porphyries during the Devonian to Triassic. Permo-triassic acid extrusive rocks comprising rhyolites and dacites are frequently seen especially in the southern part of Lao PDR





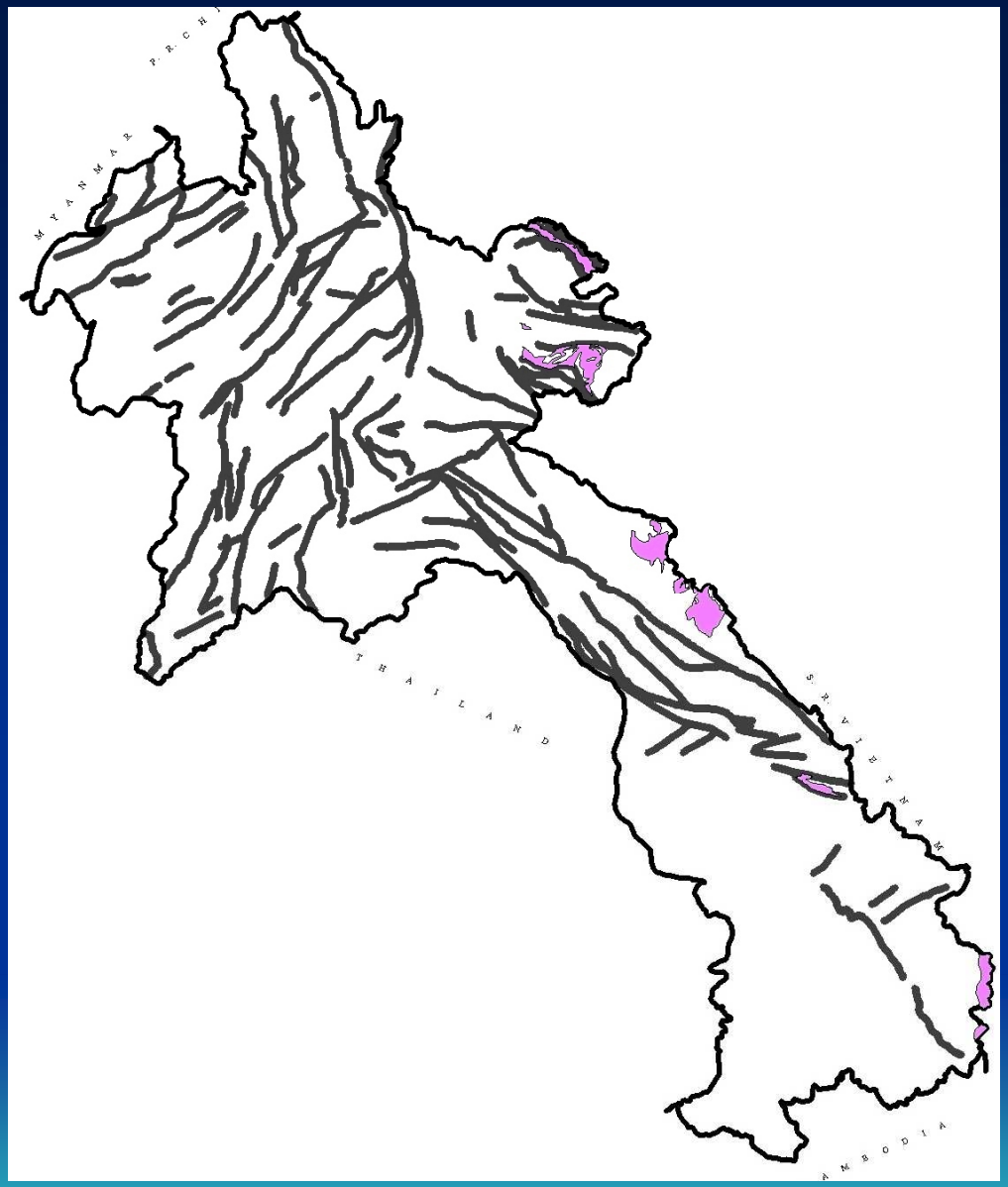
PRECAMBIAN

- Proterozoic migmatitic and granitoid gneisses exposed in the SE of the country
- Medium to high grade mica schists with garnet, cordierite, sillimanite, kyanite or graphite
- ultramafic rocks occur as part of an ophiolite belt near Sam Neua where they mark a major suture oriented parallel to the NW-SE striking Song Ma system



PALEOZOIC

- PZ1: These rocks accumulated in a NW-SE striking deep-water basin (the Truong Son belt) consist mostly of mudrocks interbedded with sandstones, wackes, mafic to intermediate and silicic lava flows, and black limestones.
- PZ2: sedimentary basin and volcanic arc (the Louangphabang belt) developed, extending NNE from Paklay and further north towards Phongsaly
- Pz3 Local early Indosinian extension caused rifting to form a NW-SE striking continental trough in Houaphan
- Intermediate and mafic volcanic rocks were extruded from vulcanoplutonic centres situated in the continental block margins



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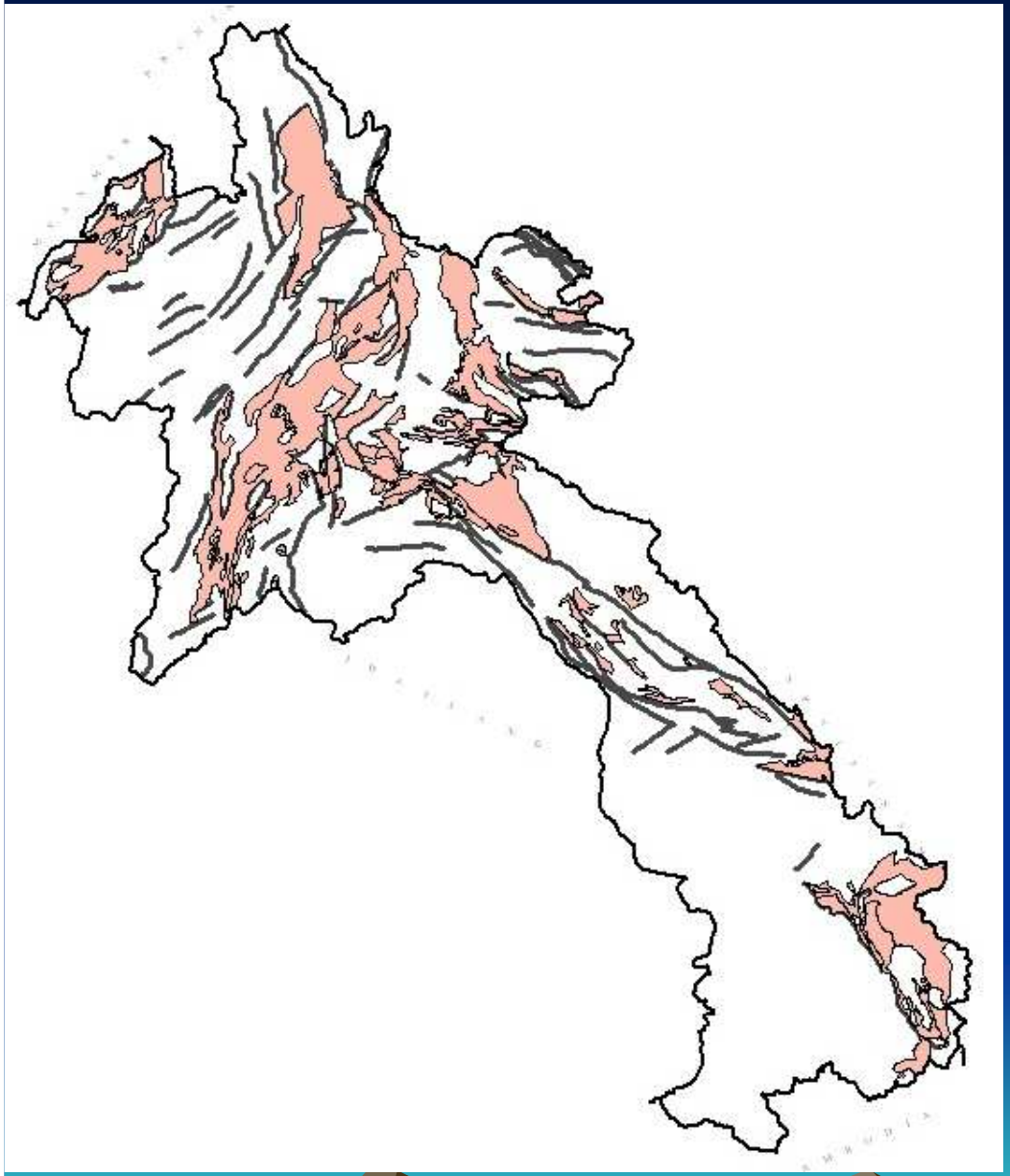

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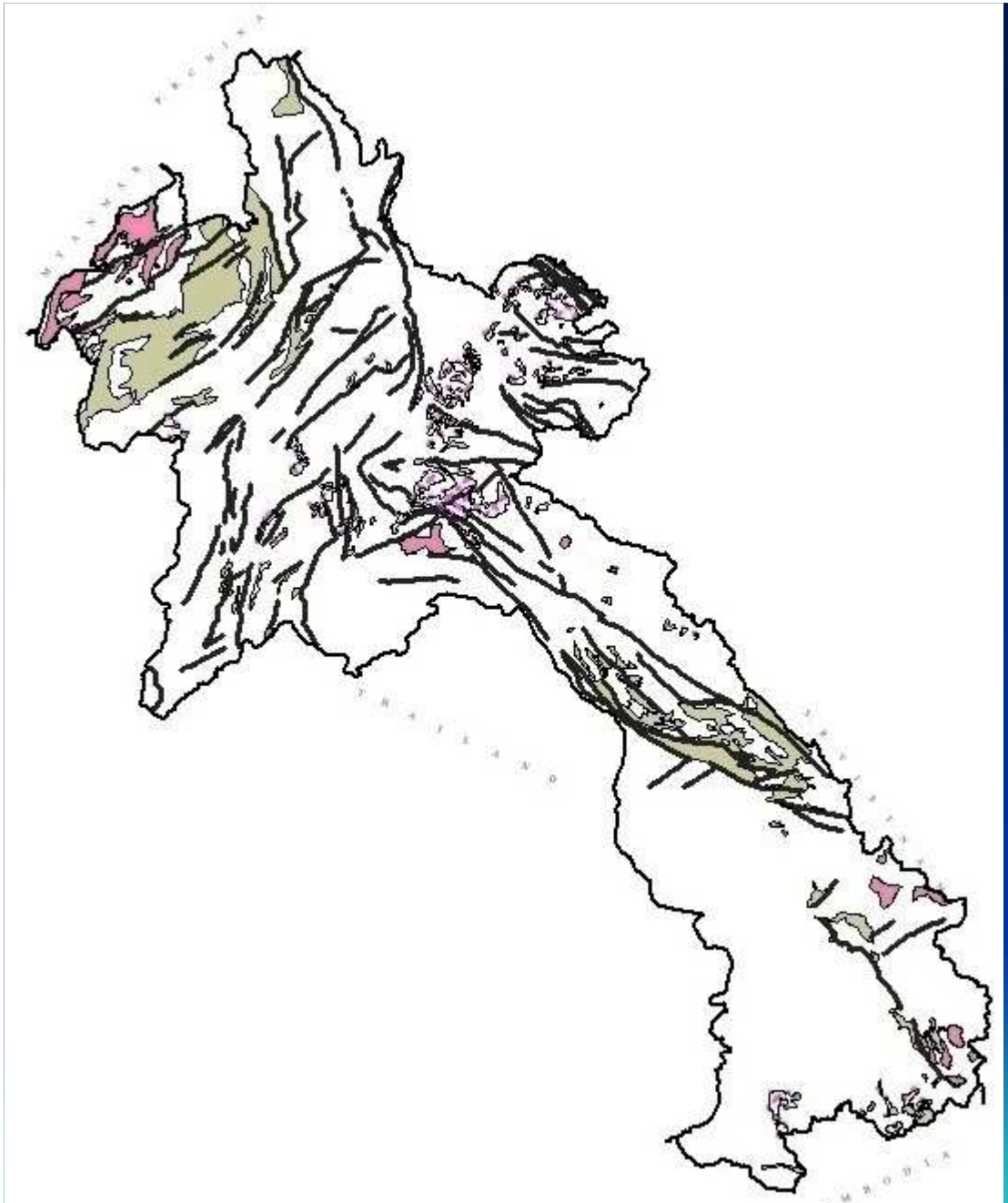

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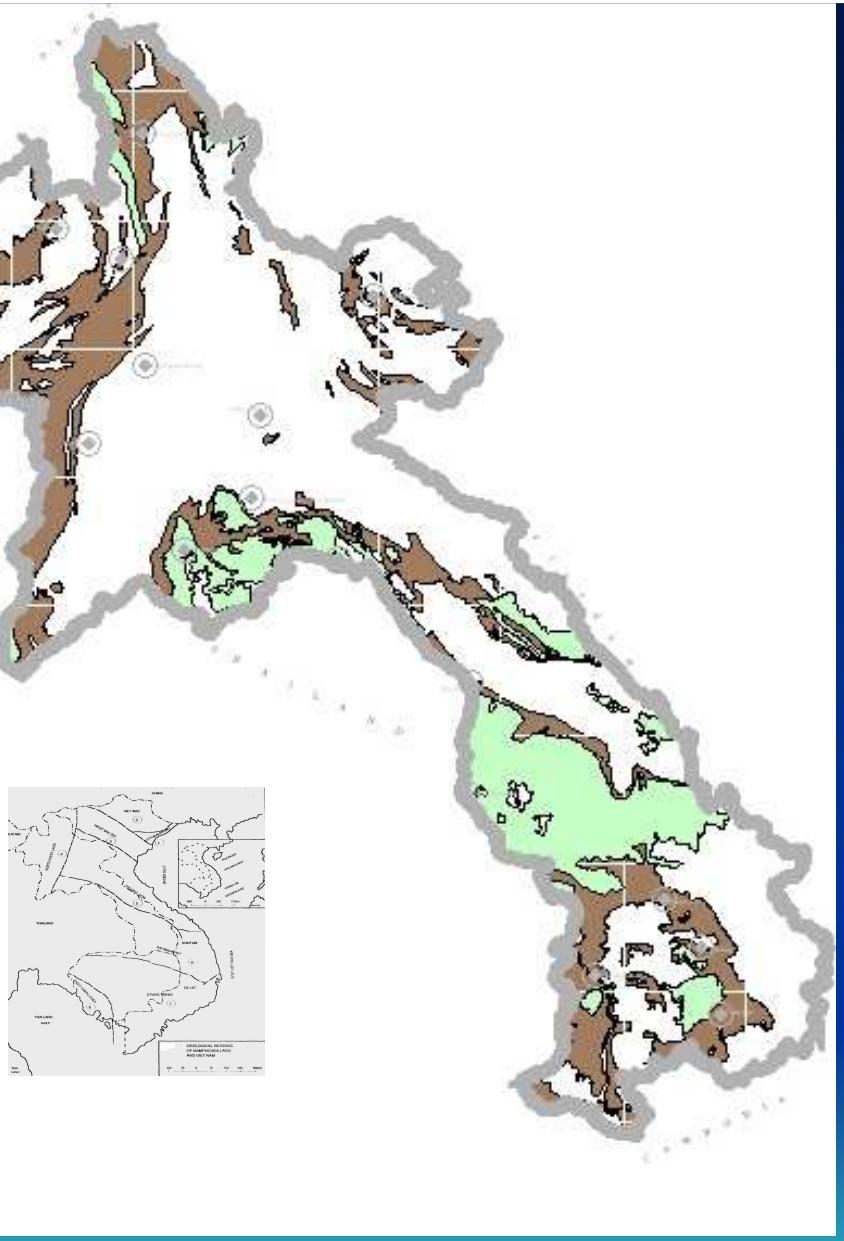
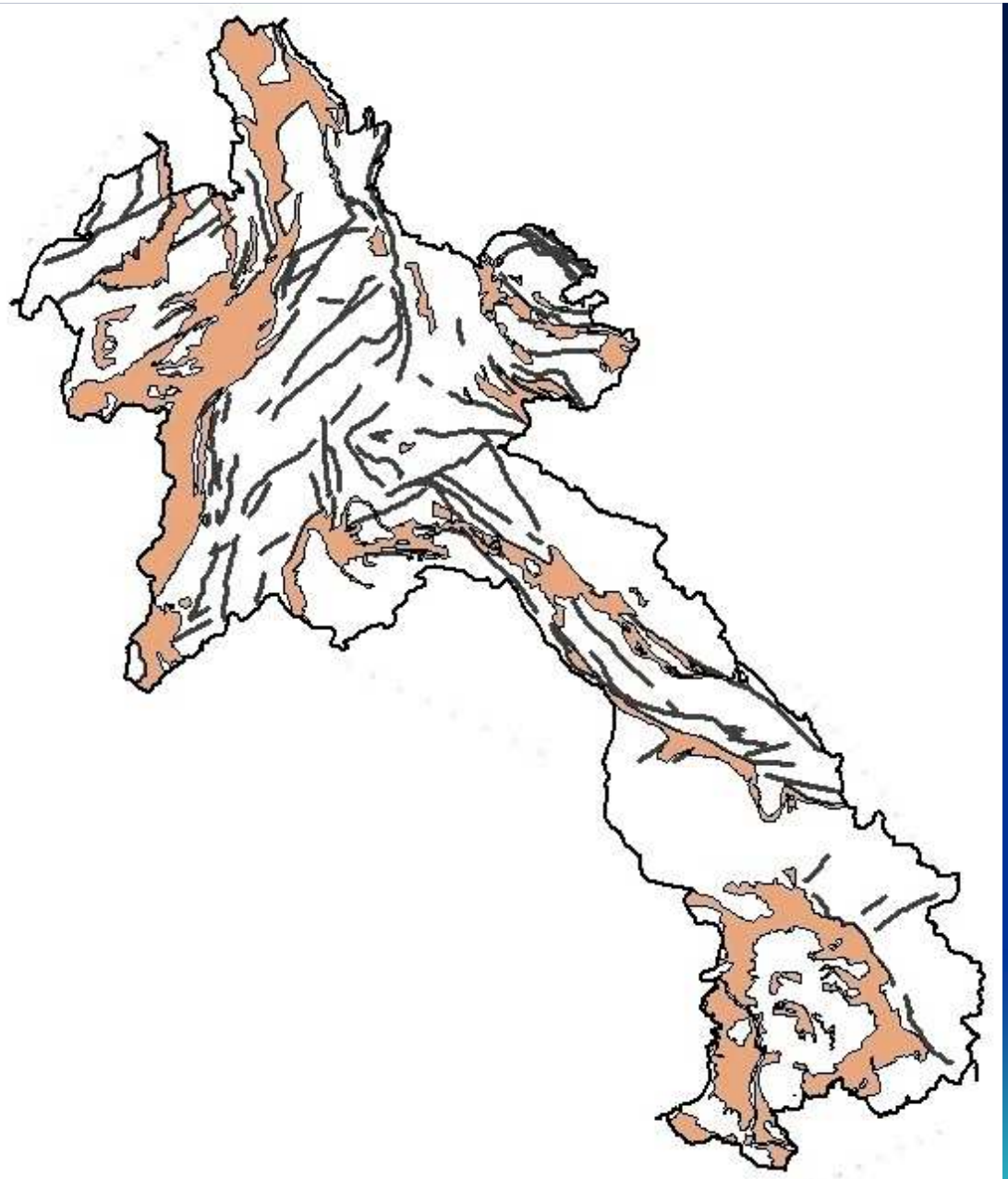


MESOZOIC

- $\underline{Mz_1}$:During the mid-triassic time, shallow shell sea conditions prevailed in the south, in the TruongSon belt and in the Muang Xai belt, with the deposition of the limestones, clay and sand as emergence took place over most areas up to mid-Jurassic time
- $\underline{Mz_2}$:Deposition of continental red sands (Indosinias Superieres) continued from mid-Jurassic to Cretaceous times, the upper part of the sequence. Mudstones and evaporitic sequences developed in shallow lagoonal basins limited to the crotonic area during the late Cretaceous and these are seen in the Vientiane and Savannakhet basin areas



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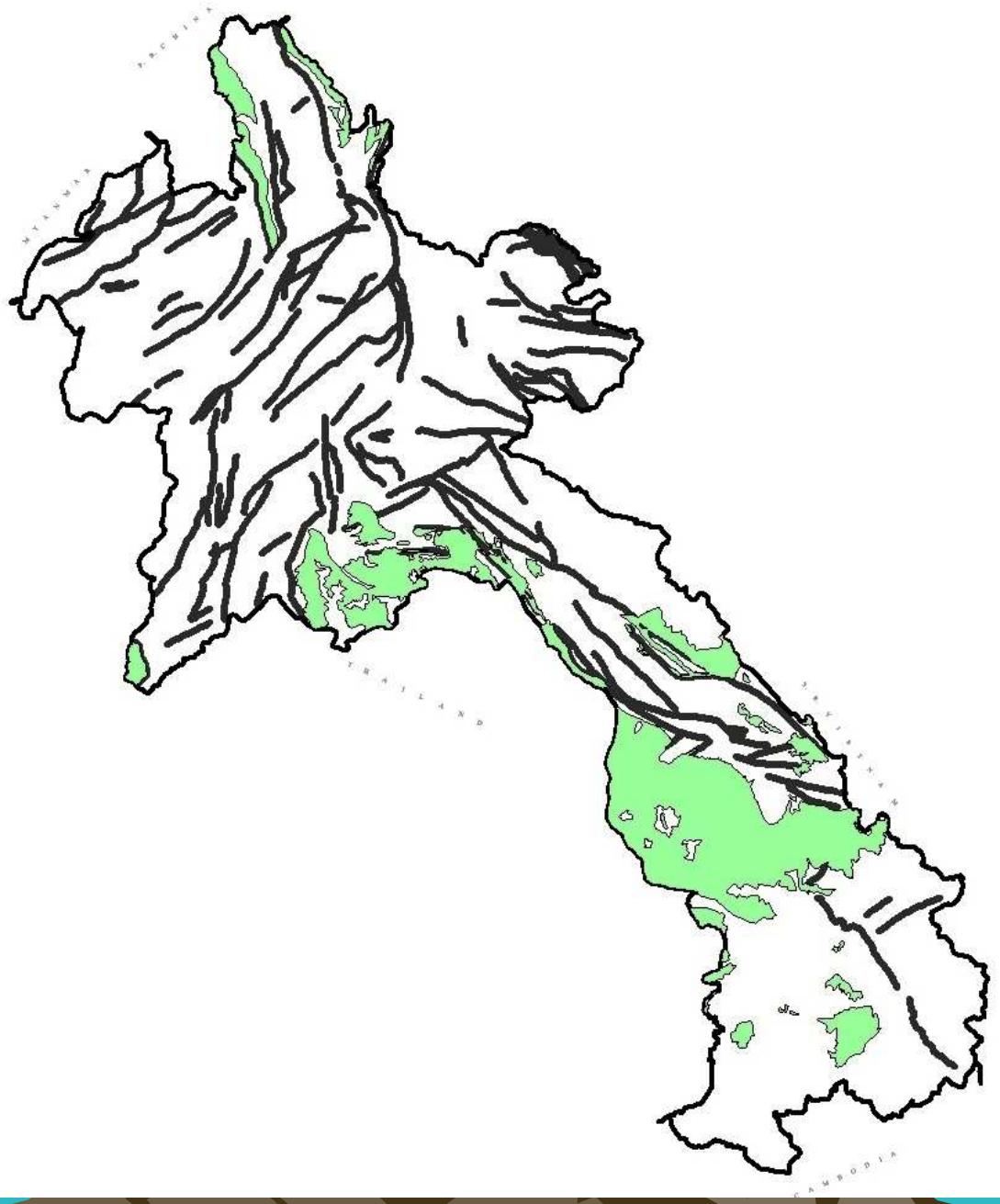

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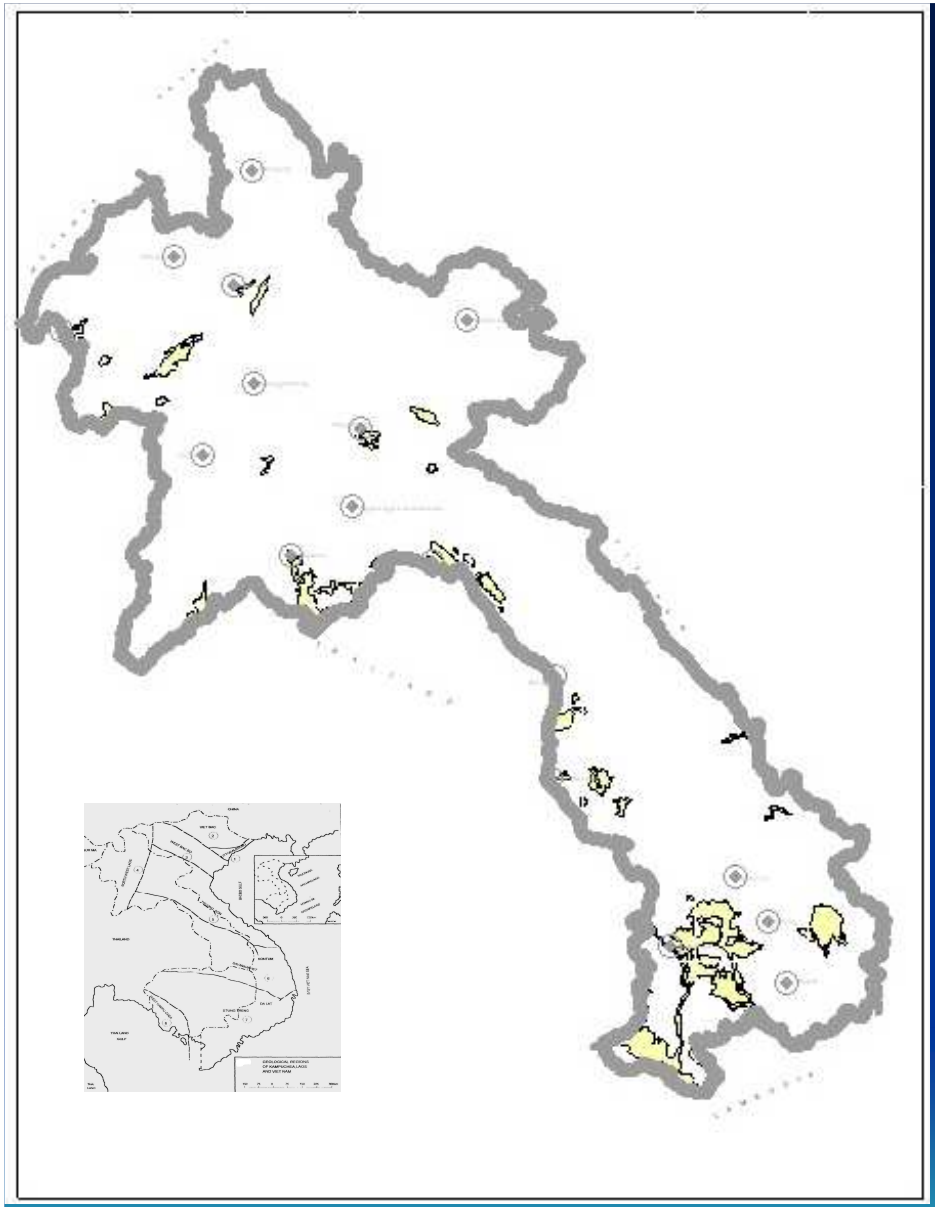
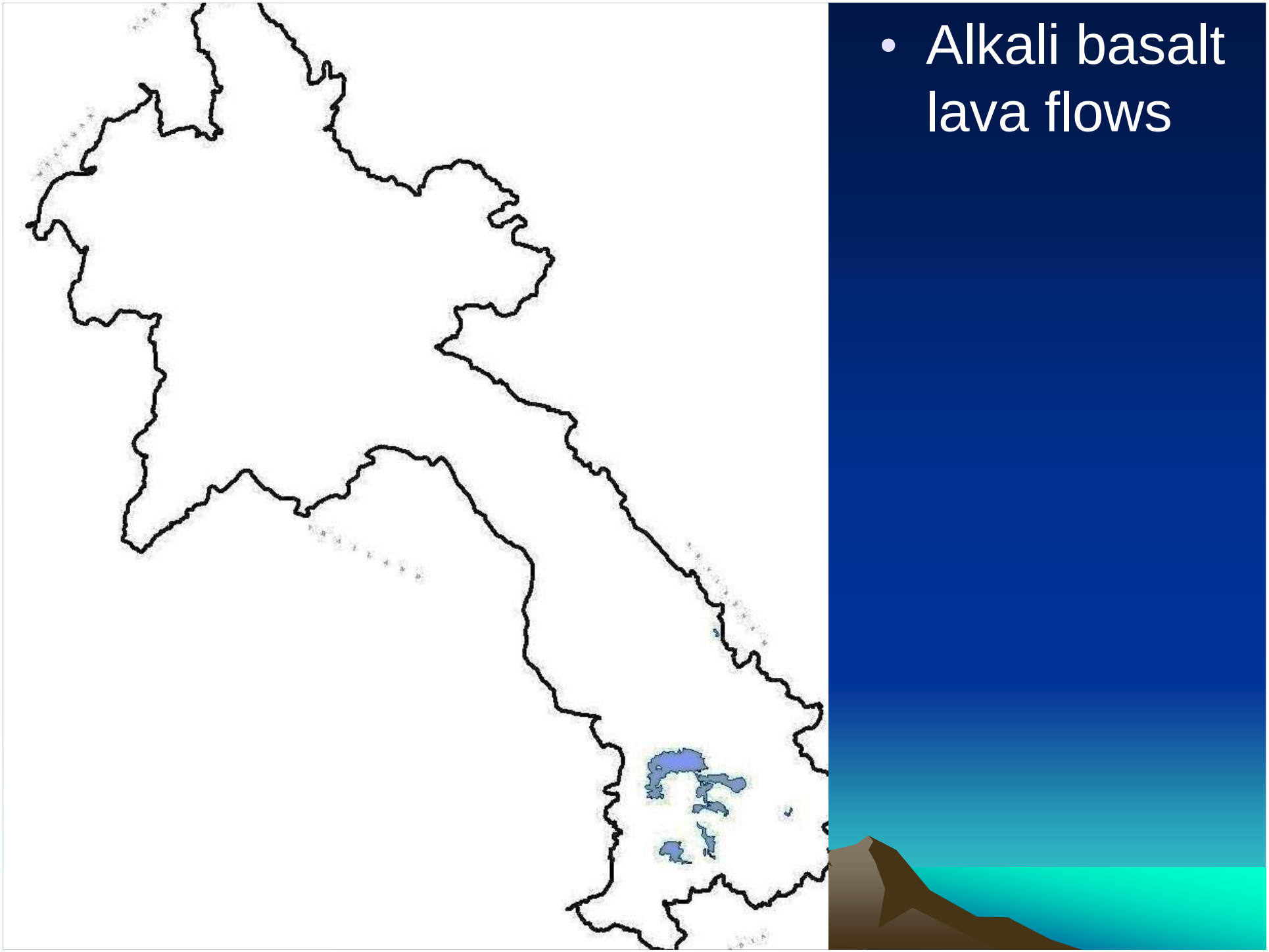
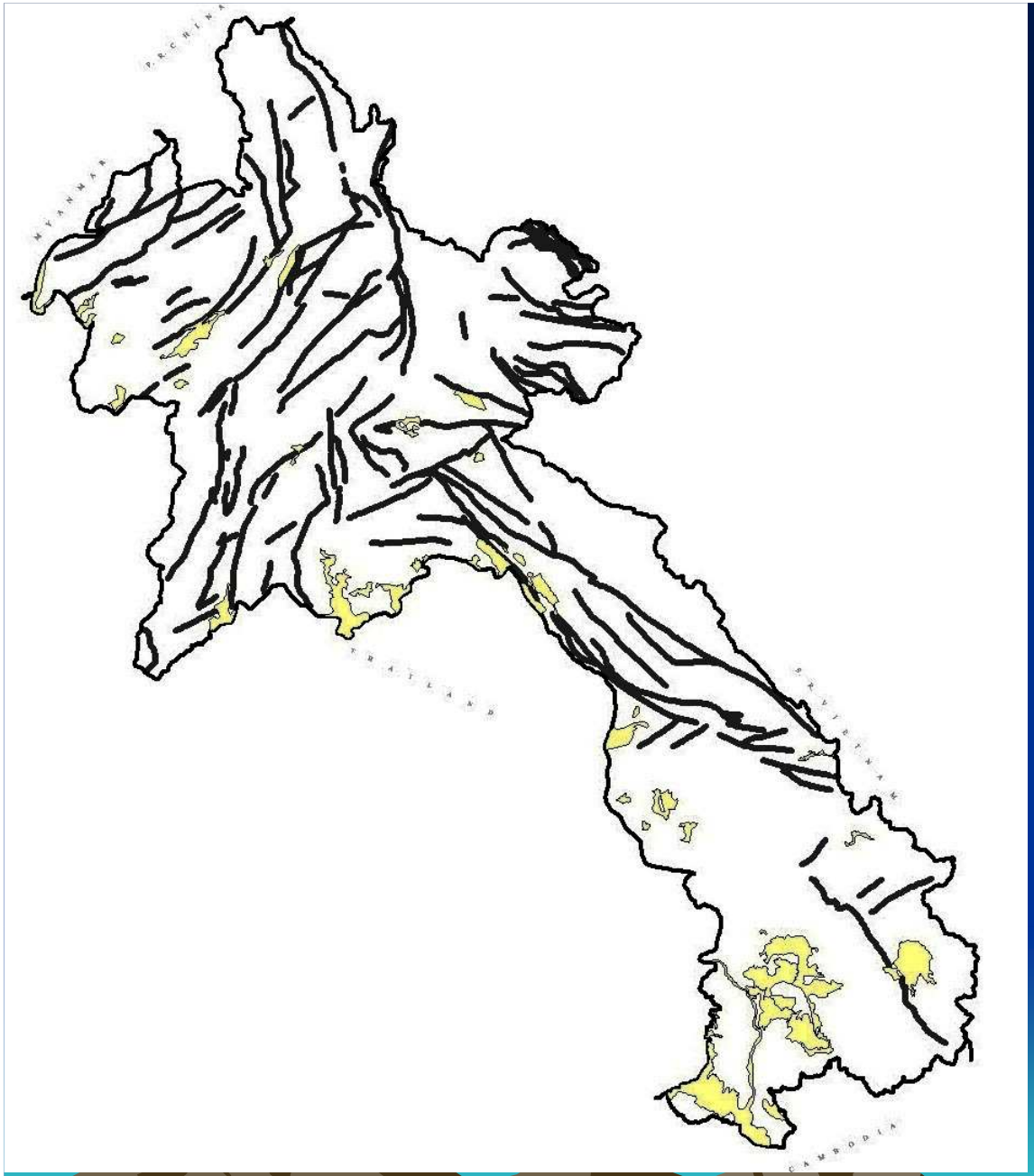


TERTIARY AND QUATERNARY

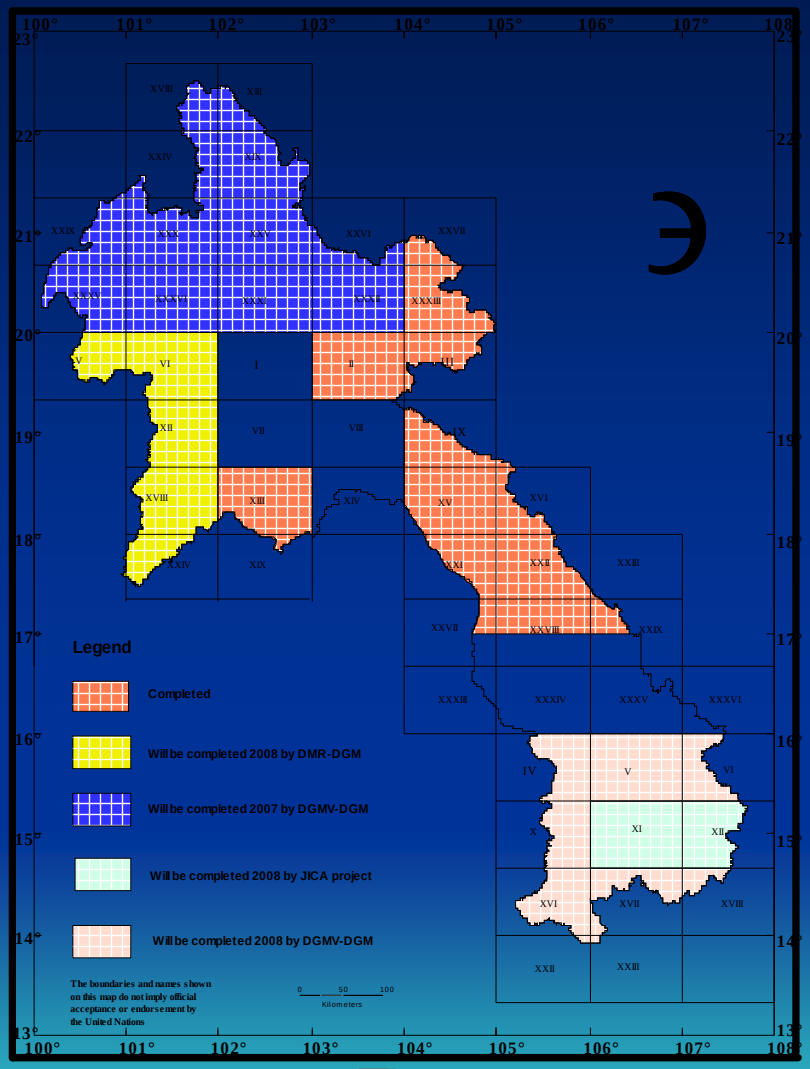
- Pg and Ng periods were characterized by non-deposition over all the areas during the Himalayan orogeny. Alkali basaltic lava flows were extruded, and small intrusions of gabbro, monzonite and silicic rocks were emplaced. Extensional movements of Late Neogene age produced small intermontane? "pull-apart" basins which became filled by fresh-water sequences with occasional limestones and lignite beds at this time.
- Q Sedimentation continued within the Tertiary basins an is represented by alluvium in the present river system and regional loess cover. A few post-Pleistocene lava flows and tuffs were erupted


• Alkali basalt lava flows



- alluvium in the present river system and regional loess cover

II. GEOLOGICAL MAPPING



Source: DGM 2006

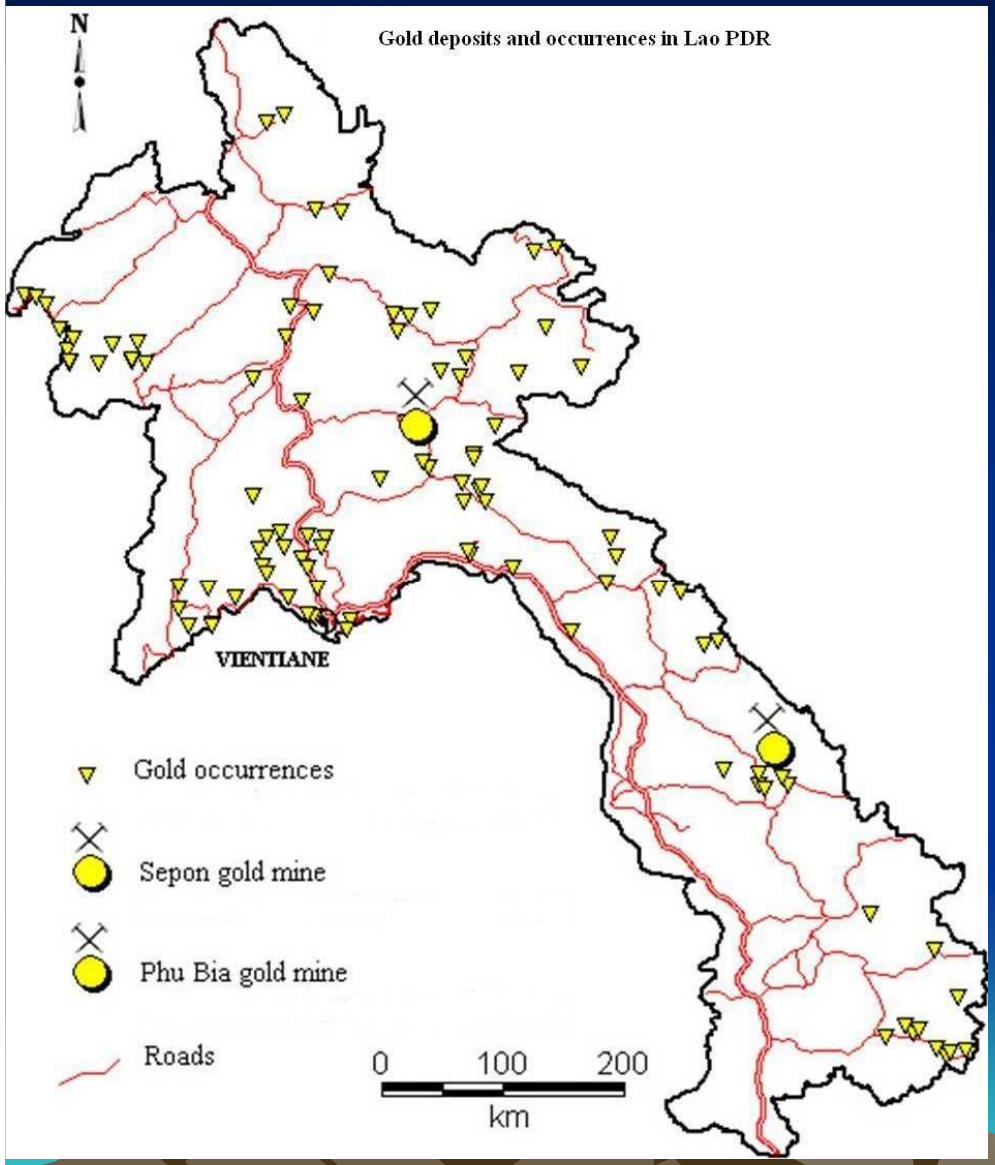
Geological mapping at scale 1:200,000 in some areas of Vientiane, Khangkhay, Houaphan, Northern, the central area and Southern of Lao has been completed under Lao Vietnamese cooperation program in geology. From 2001, mapping in the northern part of the country. 12 sheets of the northern area will be completed by 2007. 9 sheets of the southern area will be finished by 2008.

Sheet areas in the western part are under mapping under the cooperation program between the Department of Geology and Mines of Lao PDR(DGM) and the Department of Mineral Resources of Thailand and 2 sheet-areas in the southern part under the JICA assistance project

III. Mineral Resources Potential in Lao PDR:

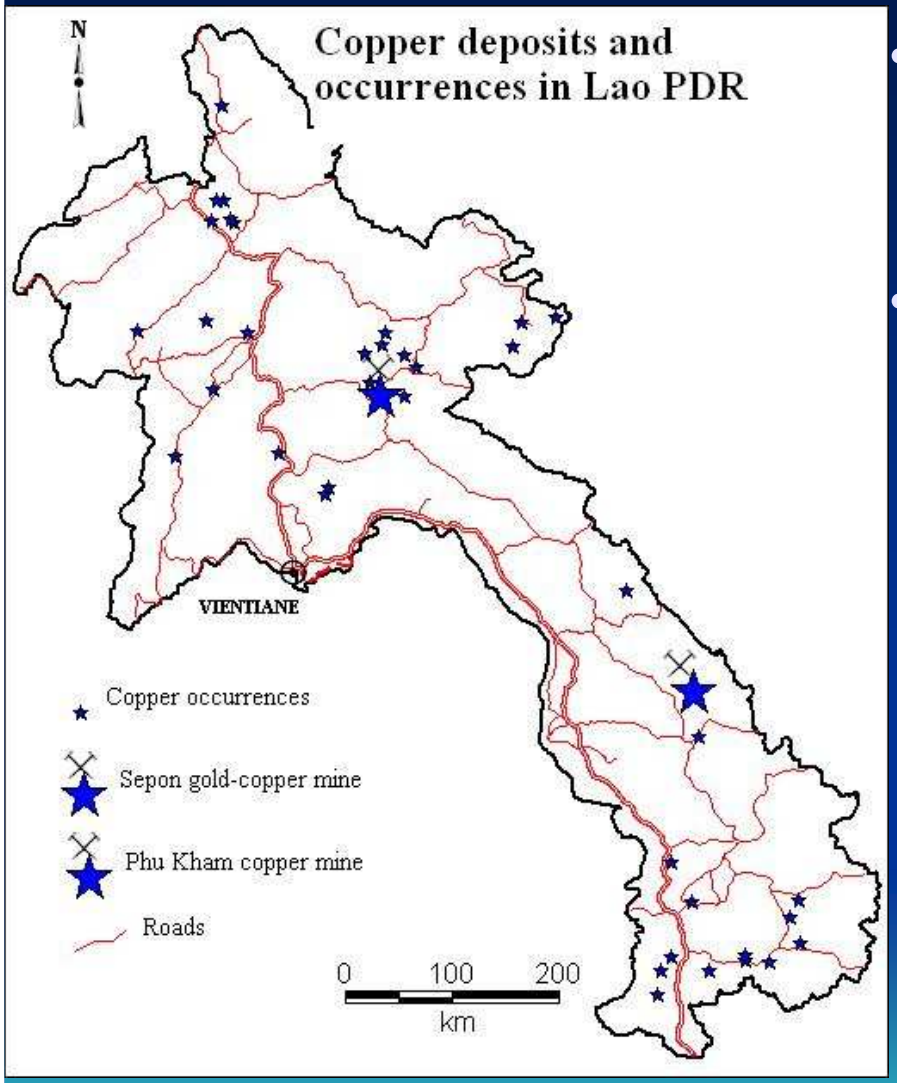
Lao PDR is well-endowed with mineral resources such as gold, copper, lead-zinc, iron, coal, potash and tin. which are important for Lao economy. Geological features, mineralization and mineral deposit types, and mineral potential zones have also been identified on the maps

Gold



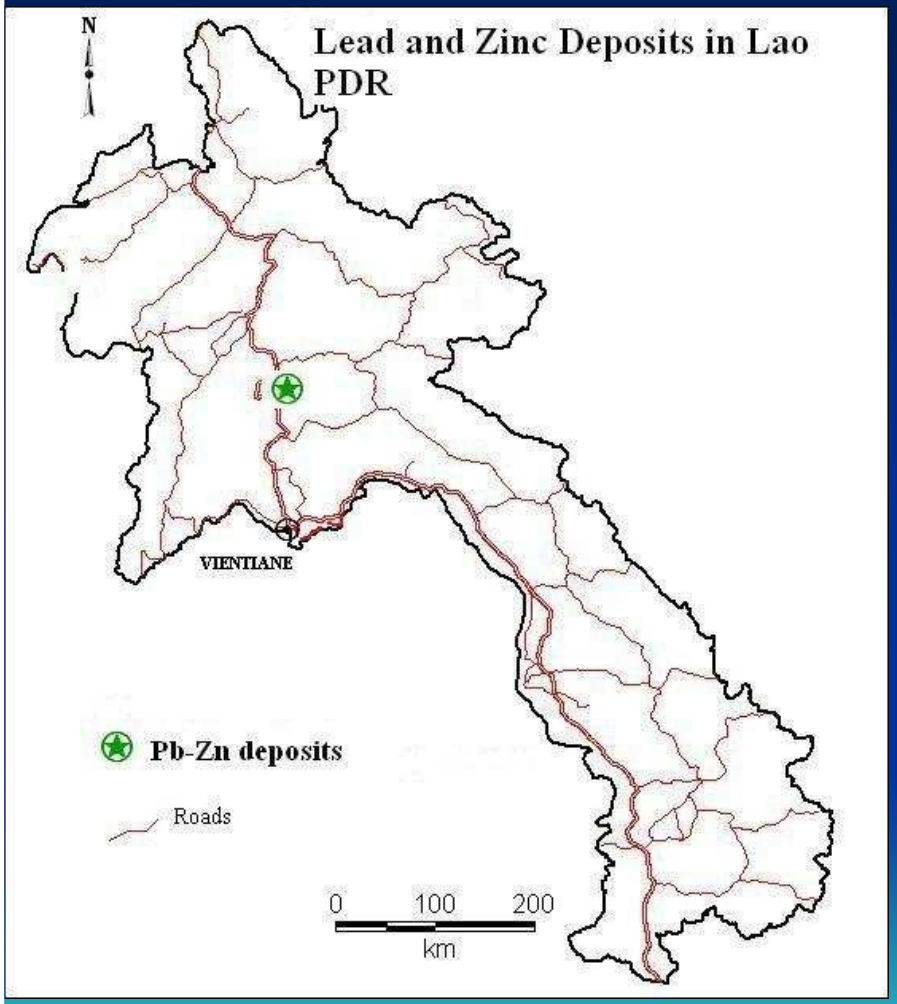
- Ore reserve of the Sepon mine amounts to 14.2 million tons with 3.43g/t Au and 5.68g/t Ag .
- The Phu Bia Gold Project comprises three deposits: the Phu Kham deposit; Long Cheng Deposit; and Ban Houayxai Deposit with a minimum ore reserve of 350,000 ounces
- Other gold occurrences are found in northern part (Houei Xeng, and in Xieng Kok) and many locations of the country such as Vientiane Province, Special Zone Saysom-boun, Oudomxay & Attapeu
- Gold anomalies in central part of Lao PDR (Nam Kata, Nam Pheo, Na Kadok, and Nam Ke) have been outlined by a joint Vietnamese - Lao exploration project in these areas.

Copper



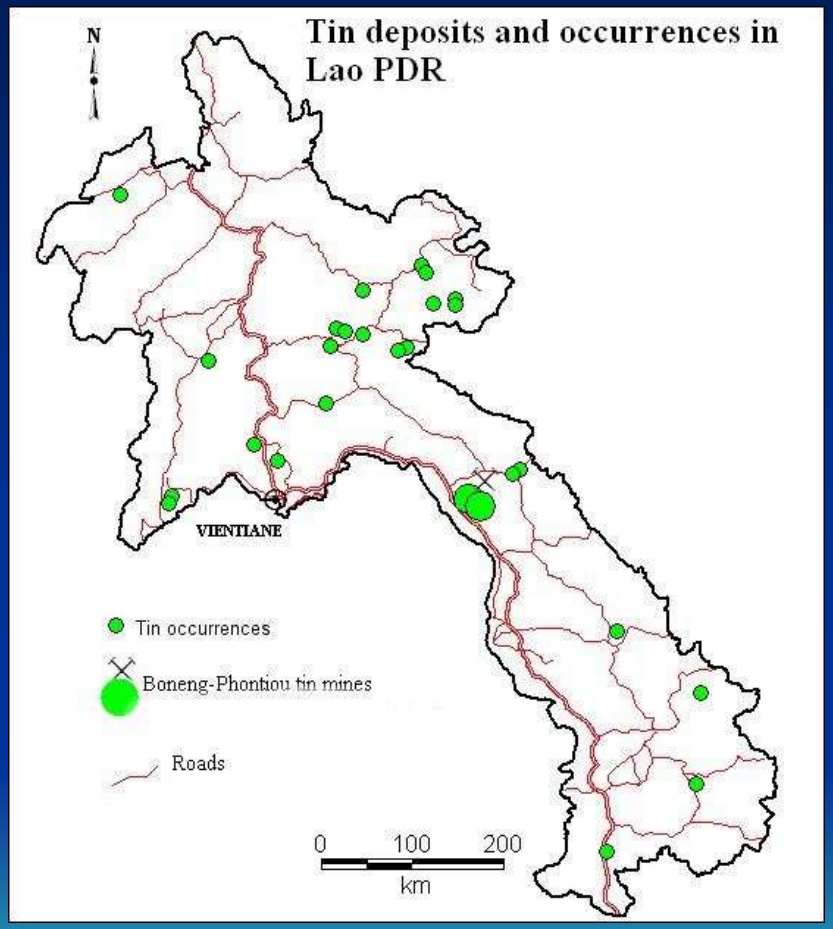
- The main copper reserve in Lao PDR come from Sepon Gold-Copper Mine and Phou Bia Mine
- From summarizing data from geological and mineral reports, there are 46 copper occurrences that are in disseminated form or vein originated from granodiorite intrusion. These occurrences are located in Phongsaly, Louangnamtha, Oudomxay, Xiengkhouang and Savannakhet Province.

Lead and Zinc



- There are 75 lead and zinc deposits and occurrences
- At present, the only zinc deposit developed in Lao PDR is the Kaiso deposit in Vientiane province with production ranges from 3,000 to 40,000 tons with 40 % Zn, zinc silicate in the part of the orebody is mined

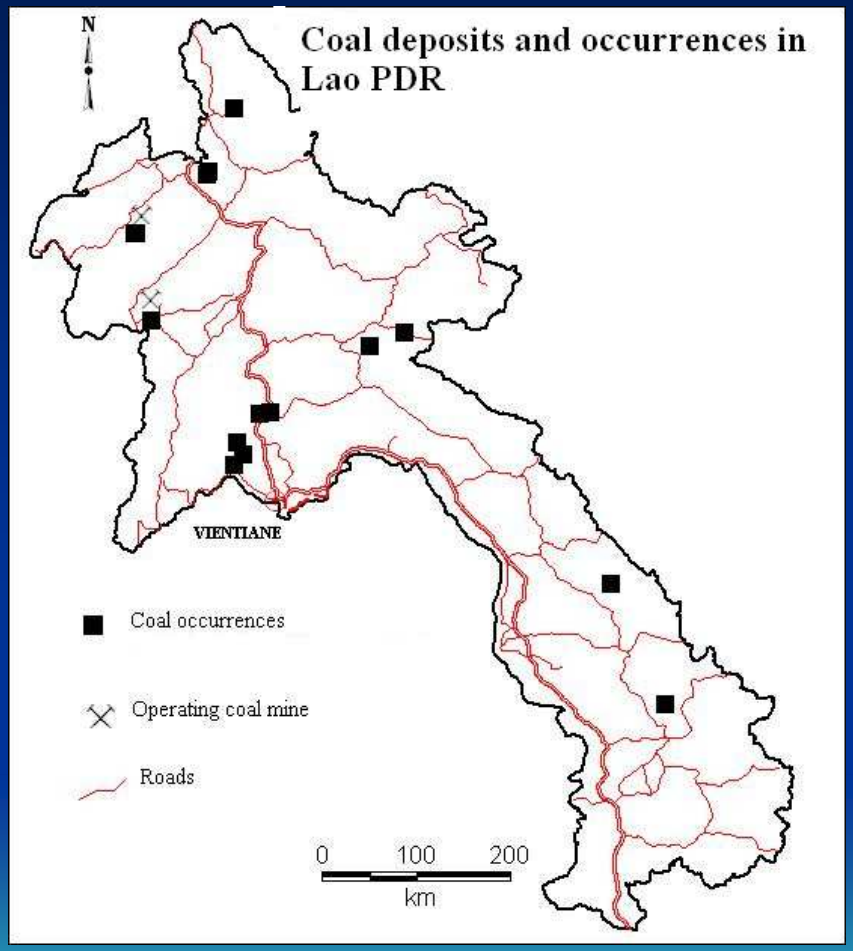
Tin



Alluvial tin deposits are found in Nampathene valley. They have been mined since 1970s until now.

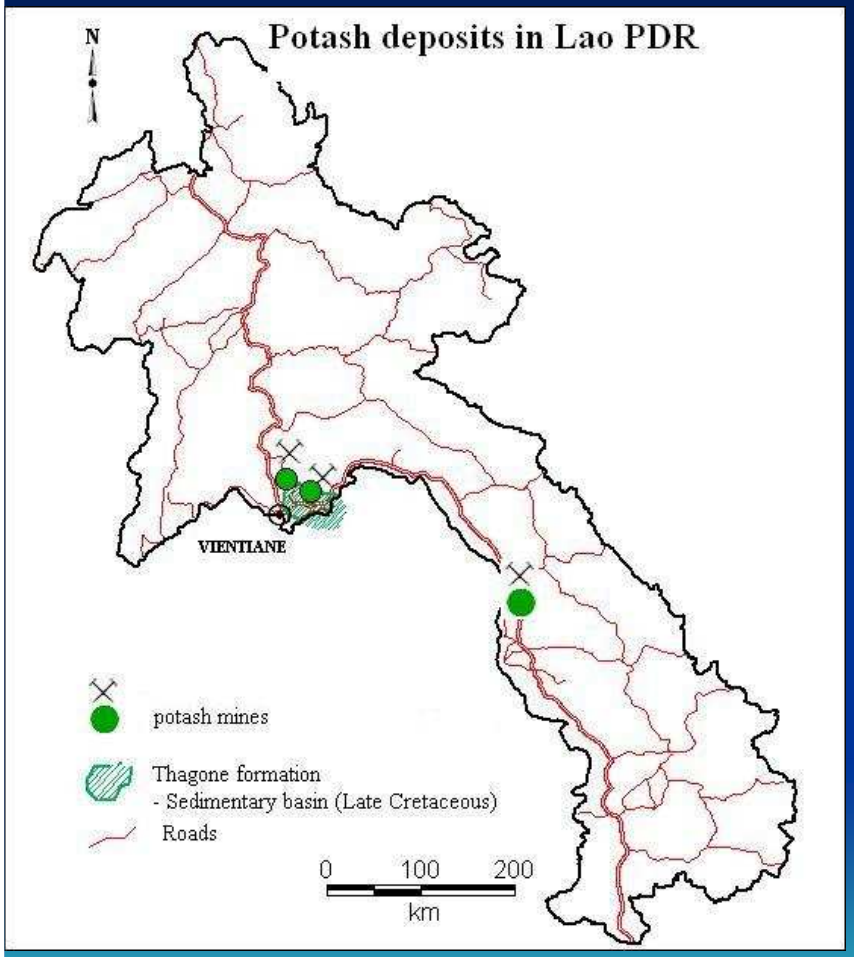
Other tin occurrences are distributed throughout the country.(Bolikhamxay, Houaphan, Louangnamtha)

Coal



- Coal occurrences and deposits are found in many locations of Lao PDR. Hongsa coal deposit with a reserve of over 400 ms tone is reserved for supplying to a power plant.

Potash



- Potash deposit, indicated in Vientiane plain (>50 million tons of potash) will begin into production in 2007.
- Nong Lom potash deposit, located in Thakhek district, Khammouane Province has a total estimated reserves and inferred resources in the area of 13,440 km2 amount to 450,000 million tons of sylvinite-carnallite.

Thank You