

# Exploring Timor-Leste – Minerals Potential

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and

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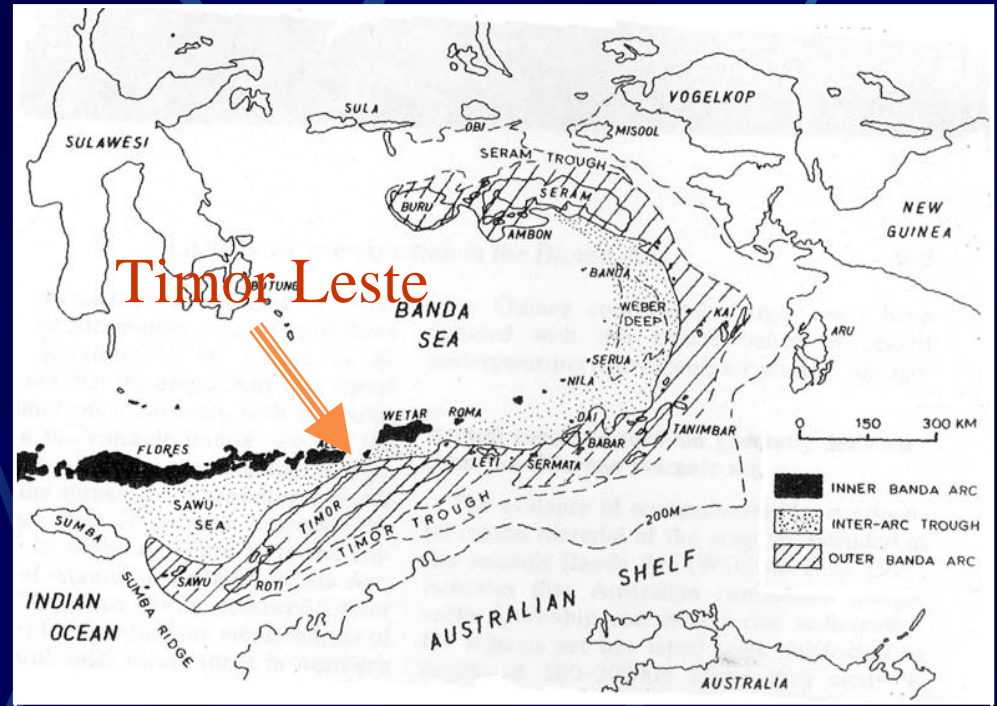
Director of Energy and Minerals  
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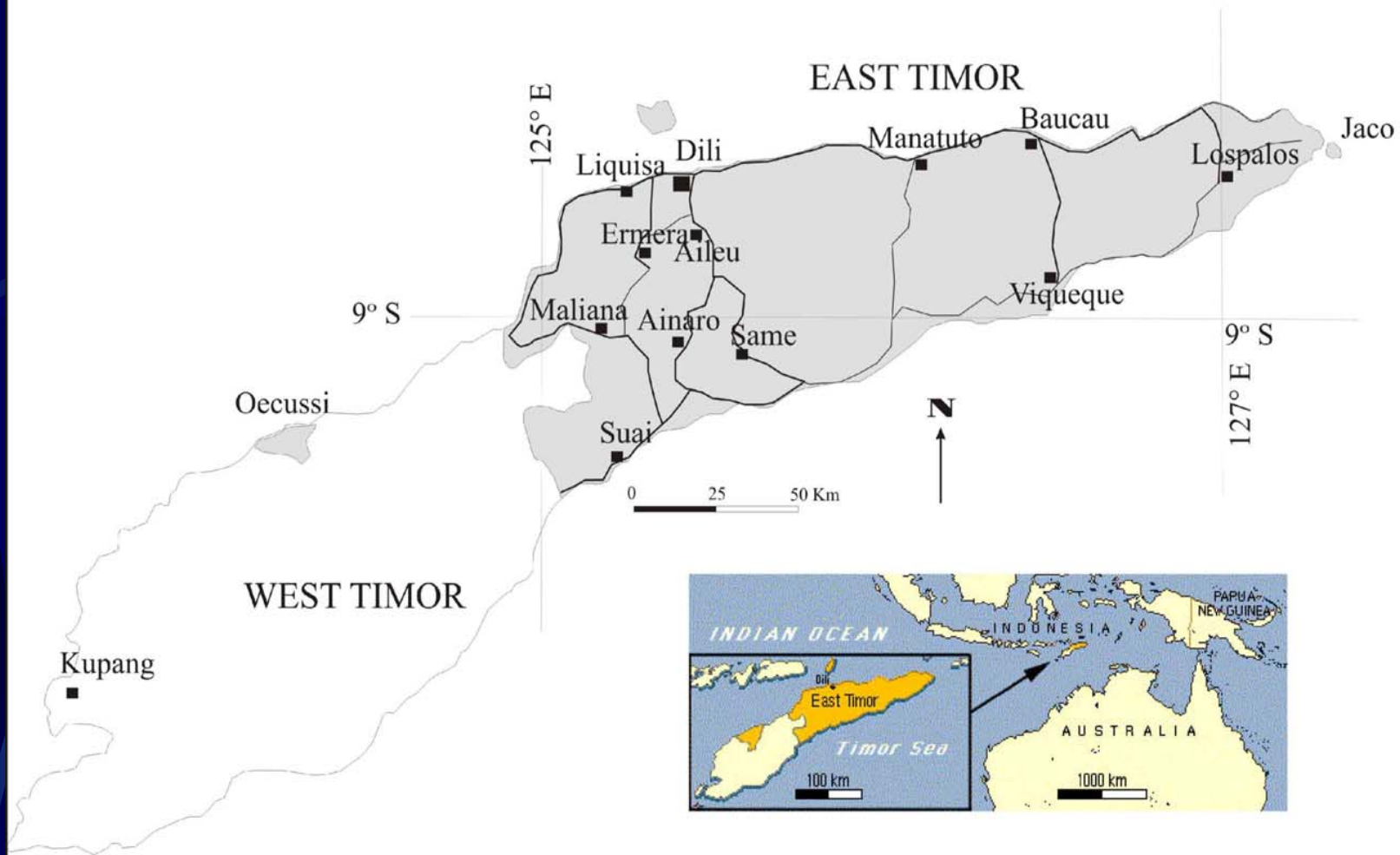
PACIFIC ECONOMIC COOPERATION COUNCIL  
PECC MINERALS NETWORK

Brisbane, Queensland  
17-18 November 2003

# REGIONAL SETTING

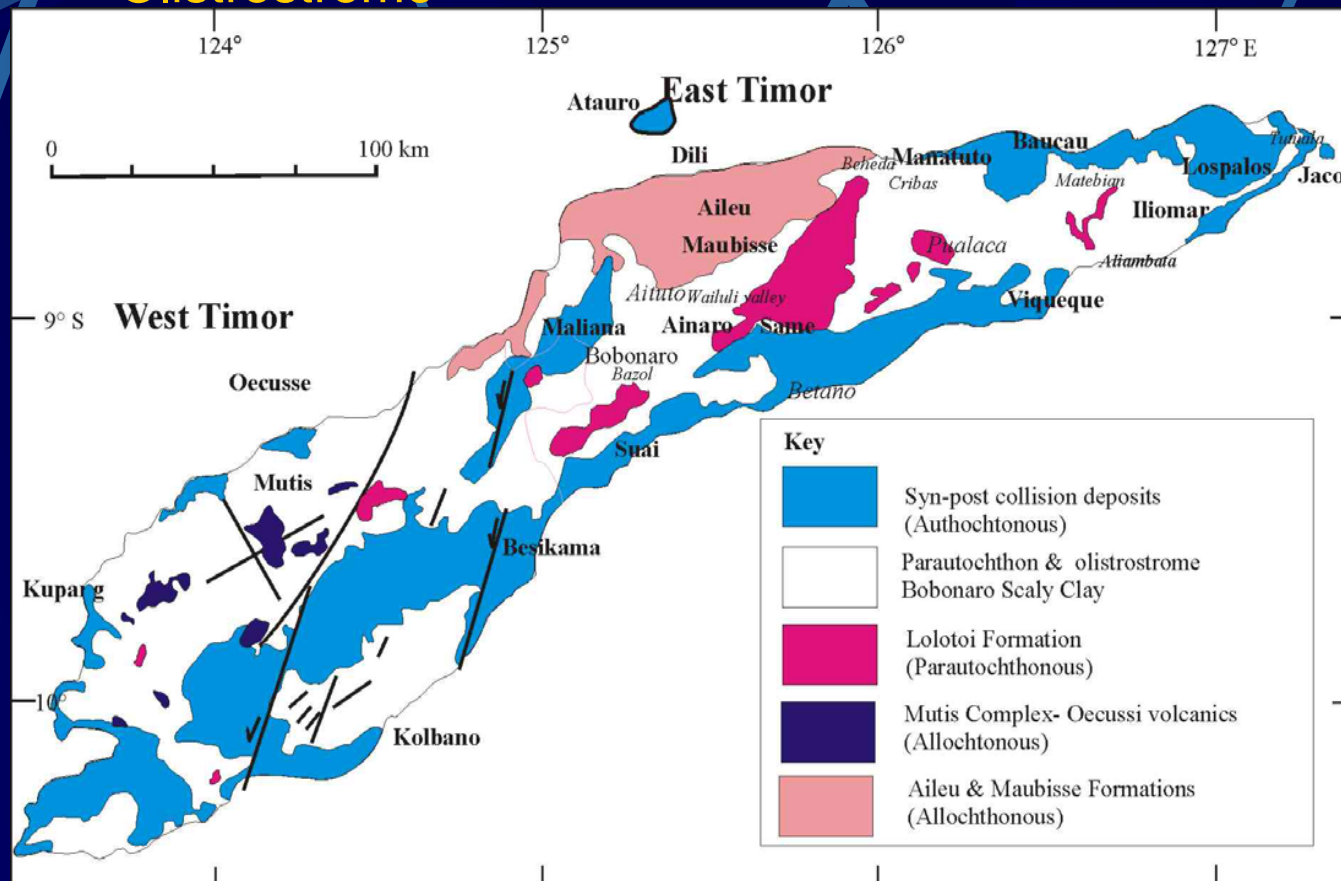
- Part of Outer Banda Arc
- The arc is non volcanic
- To the North – Banda Inner Arc (Volcanic), e.g Flores, Atauro, Wetar
- To the south lies 3 km deep trench – TIMOR TROUGH
- Plate Boundary : Australia & Banda Arc (Asia) plates
  - =>Collision – Late Neogene





# GEOLOGY

- Four distinctive tectonostratigraphic units
- Authochthonous; Parautochthonous; Allochthonous; and Olistrostrome



Modified geological map of Timor based on Audley-Charles (1968), and Charlton (2002).

# Minerals Potential

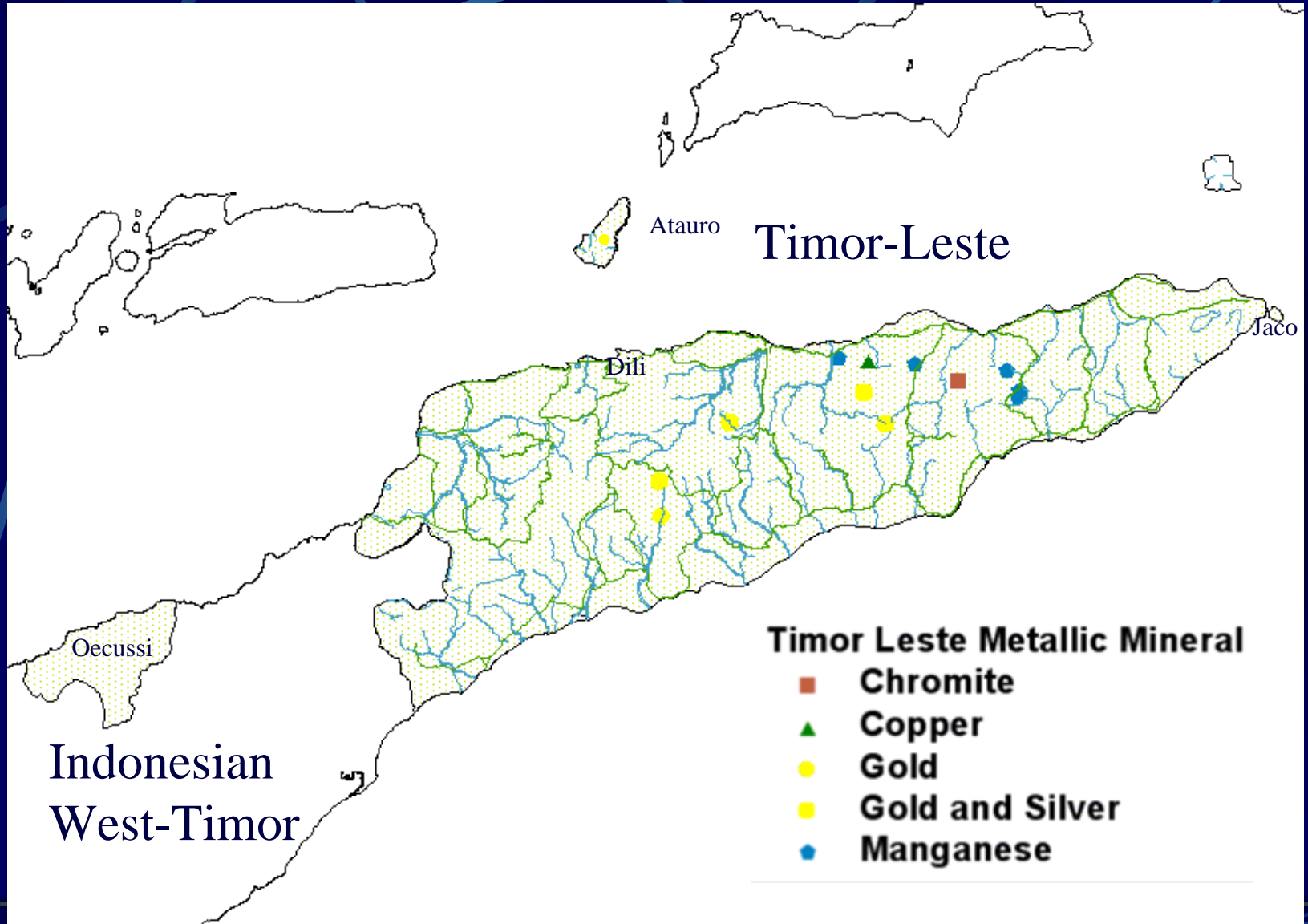
## Metallic Minerals

- The most attractive metallic minerals potential of Timor Leste are copper, gold and silver.  
=>Occur as massive sulfide, epithermal gold and placer gold.
- Lesser extent : chromite and manganese.
- Minor occurrences : lead, zinc and iron sand.

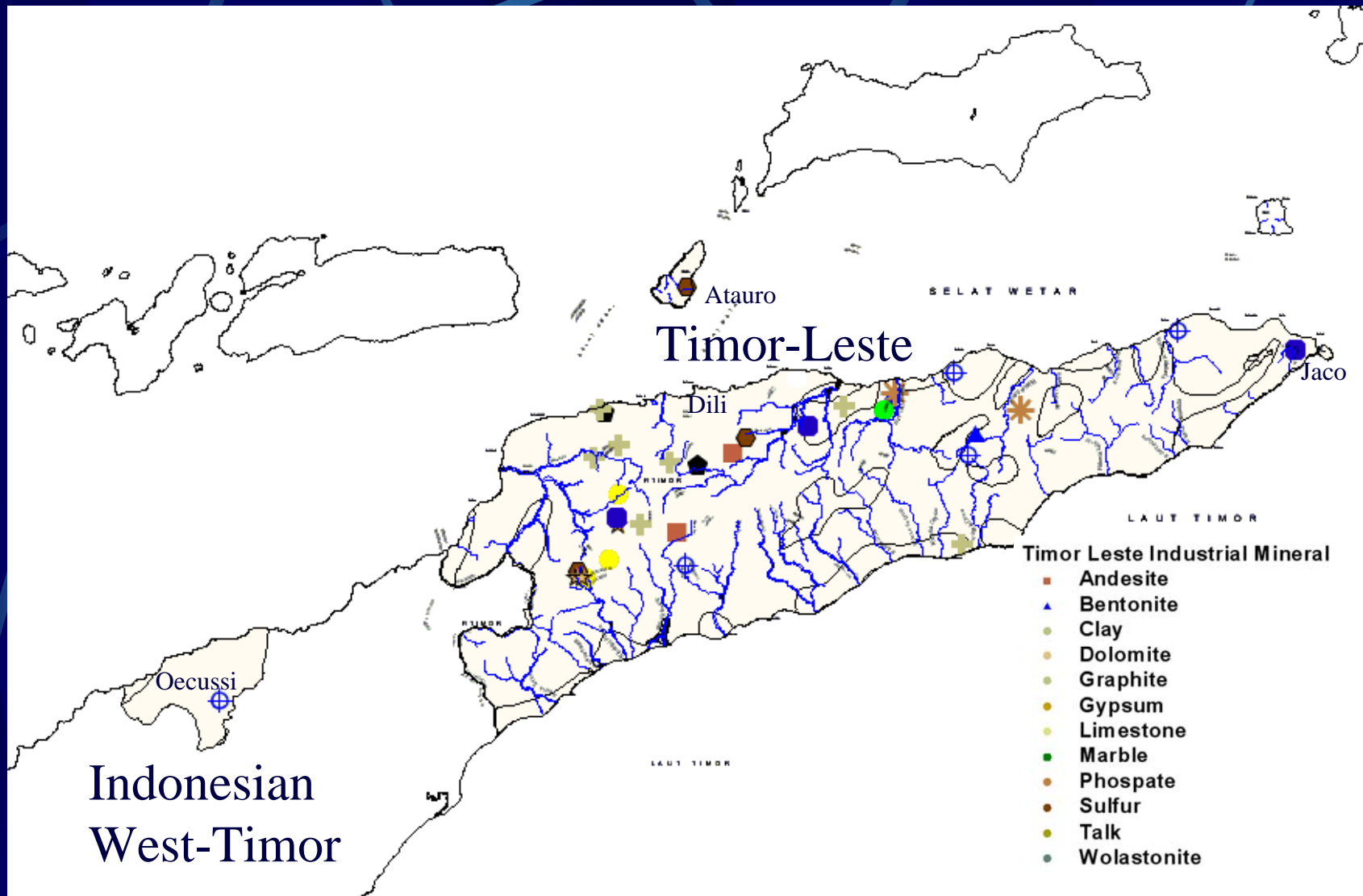
# Non-metallic Minerals

- Sand and gravels for construction materials  
⇒ Presently, most commonly exploited
- Marbles for ornaments
- Clay and bentonites
  - ⇒ Clays are widely distributed
- Gypsum
- Limestone and dolomites, etc.

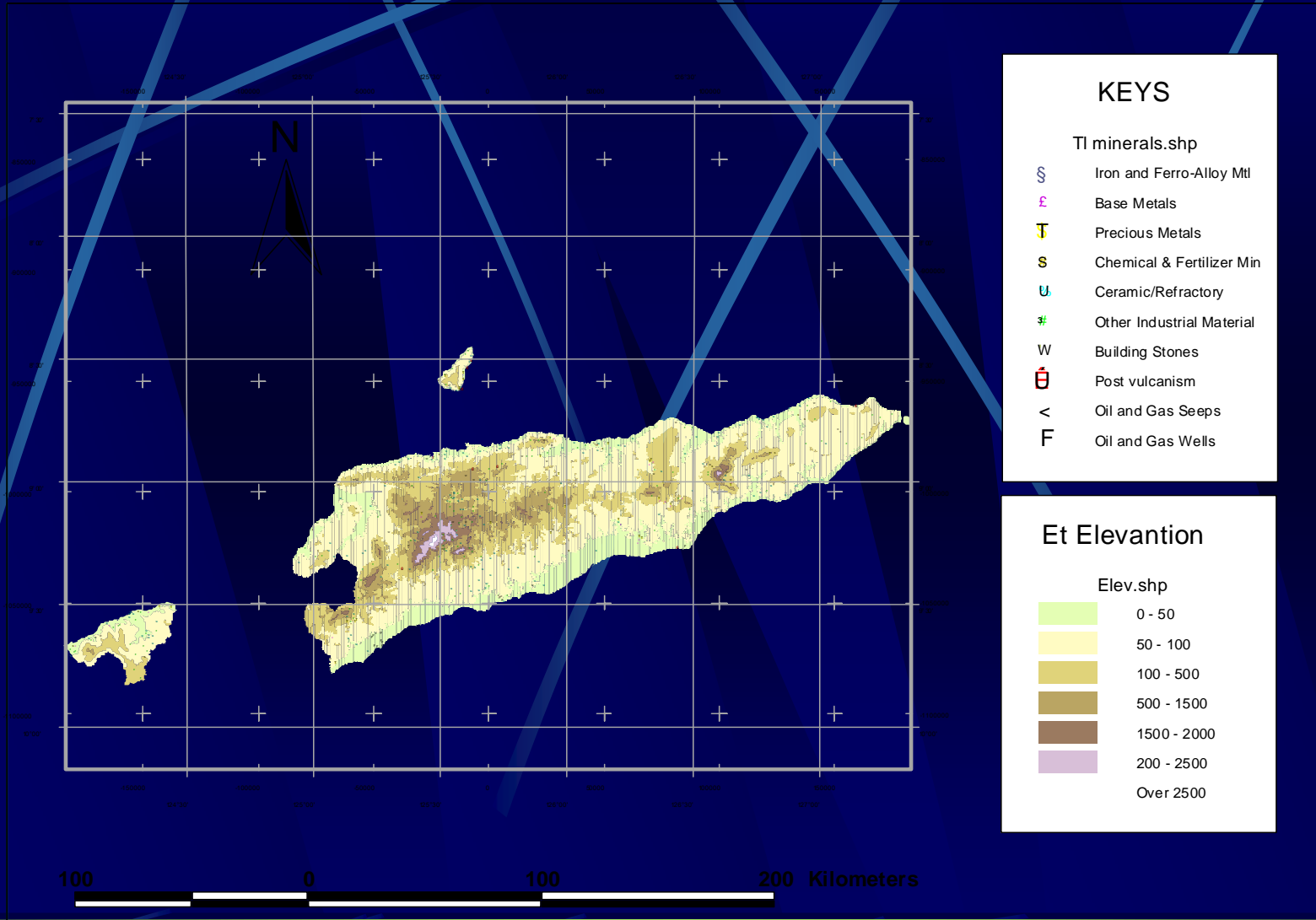
# Mineral Occurrences







# Compiled Timor-Leste Minerals



Source : Lorenzo

# A brief summary of minerals occurrence

## Copper

The mineralisation occurs as massive sulphides, the veinlets containing chalcopyrite and pyrite in the ultra basic units, with extensive serpentinites alteration and with evidence of intrusive diorite/diabase.

In the Ossuala area (Baucau district) sampling by Allied Mining Company (Wittouck, 1937) returned values of 10% Cu, 3 g/t Au and 170 g/t Ag

## Gold

The gold mineralisation has been observed in several forms as quartz, quartz-calcite and calcite veins hosted by shale/slate or schist. The vein are pyritized and mineralized with gold. In Hilimanu area the mineralisation occurs in the metamorphosed igneous rock. The mineralisation are associated with quartz veins ( 0,5 – 12 m wide) containing chalcopyrite, limonite and calcedony. Some samples analysed indicates average grade of 0,5 g/t Au and 50 g/t Ag.

## Chromite

The chromite deposits have been reported from Baucau, Hili Manu (Manatuto district) and Manufahi districts. The deposits were found as primary mineralisation in the serpentinites hosts. The chromite in the Manatuto districts is similar to chromite mineralisation in allochthonous ophiolite bodies found in the Circum Pacific belt in the Philippines, New Caledonia and Kalimantan, Indonesia. The quality of the chromite is good, with grades between 36% and 51%  $\text{Cr}_2\text{O}_3$ . As for grade, 80% of the world's major deposits have between 33% and 52%  $\text{Cr}_2\text{O}_3$ .

## Manganese

The manganese deposits were discovered in several places such as Vemmasse, Talamata, Venilale (Baucau district), Uato Carabau (Viqueque district). The deposits are interbedded within red shale and associated with the limestone of the Bobonaro Formation. The manganese deposits are mainly composed of pyrolusite mineral with the grade range between 84 – 94.5%  $\text{MnO}_2$ .

## Phosphate

The deposits are located in Daemena, Abo (Quelicae- Baucau district), and Laleia ( Manatuto district). The phosphate deposits occurs in the unconsolidated gravel - boulder material which similar age to the Ainaro Gravel. Analysis result of the samples taken from Abo area has revealed the significant assay ranging from 9.97 % to 31 % P<sub>2</sub>O<sub>5</sub>.

## Bentonite

Bentonite-clay deposits are interbedded of the claystone of Bobonaro Scaly Clay Formation and located at Venilale (Baucau district), Bobonaro (Bobonaro district). In Mulia-Quelica village (Baucau district), the swelling value was recorded between 371 up to 1829 x dry volume. The potential of mineral reserve is approximately of 115,570,000 cubic metres.

## Marble

The deposit has been recorded at Cablaci-Same (Manufahi District), Lacro (Manatuto district) and Builale (Viqueque district). In Lacro, the mineral reserve is thought to be at least 5.000.000 cubic metres.

## Gypsum

The gypsum deposits were found to be associated with claystone of the Bobonaro Scaly Clay Formation. The deposit is located at Laleia-Obrato (Manatuto district), result from pit test investigated area of 50 ha has revealed the mineral reserve is approximately of 400 tonnes.

# Gypsum



*Gypsum crystals scattered over the surface of the Bobonaro Scaly Clay. Location near the town of Laleia, Manatuto District.*

# Serpentinite



*Outcrops of fault-bounded blocks of serpentinite, schist and mélangé on the Dili-Manatuto road . Chromite occurs in the hills above this locality.*



# Quartz Veins



*The quartz vein stained with copper.  
Sample location in Baucau District.*

# Bentonite



*Field Photograph : Outcrop of bentonite in the Bobonaro Scaly Clay. The occurrence is located one km north of Venilale west of the Venilale-Baucau road (Baucau District).*

# LEGISLATION

# Mining Law

- To address global competition for private investment (e.g, one formal document-Mining License, ISA)
- The increased pressure to meet national and international social and environmental standards
- The increased demand from impacted regional, local and traditional communities – involve in national decision-making
- The greater share of revenues generated from mining activities
- A sustainable mining development

# Environment Protection

- Ecological base-line survey

⇒ Existing level of air, water, soil, rock, plant, animal, and cultural imprints prior to initiation of Advanced Exploration Activities

- Conducting Environmental Impact Assessment Study
- Establishment of a Mine Reclamation Guarantee Trust Fund

# Community Partnership

At Advanced exploration and mining work:

- Establishment of Sustainable Mining Development Authority
- Permission from local community authorities
- Local community education sessions
- Discuss with district and community most affected by mining activities.

# Conclusions

1. Geologically, mineral potential of Timor-Leste is very attractive for future mineral exploration and development activities.
2. The most attractive metallic mineral potential of Timor-Leste are copper, gold and silver.
3. The mining business of metallic mineral is high risk and high capital, so is best done by the private sector as it needs solid financial and technical resources.
4. Non-mettalic mineral such as marble, clay, sand, gravels, etc, have great potential in Timor-Leste.
5. The growth and development of a country's mining industry is determined not only by its mineral potential alone, but rather, by the policies of government in creating the right business climate to encourage investment.

Thank You