Geology and Mineral Resources of Madagascar

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2- LOCATION OF MADAGASCAR
3- HISTORY AND AVAILABLE DATA

1937 -1970 :
Madagascar Geological Survey in charged of Henri Besairie with BRGM activities produced:

- 452 geological maps (1/100 000) covered all of Madagascar within 93 provisional maps

- 1964: Synthesis map at 1/1.000.000
- 1970: Synthesis map 1/500.000

These synthesis based on lithology and stratigraphy
2002: PGRM revised some area in Madagascar: A, B, C, D, E, F

2008: 114 geological maps updated (1/100,000)

2008: JICA Madagascar project carried out Some area in the south of Madagascar

2011: 8 Geological maps updated (1/100,000)
PGRM
JICA projects
COMING SOON

New synthetic and coherent global vision of the crystalline basement (1/ 1 000 000) will be available on June 2012
Magnetic survey and gamma-spectrometric of geological area (1/100.000 and some part of C area: 1/500 000) by PGRM

**Magnetic maps:** A – B – C – D – E – F

**Radiometric maps:** B – C – D – E – F

**Gamma-spectrometric maps:** B – D – E – F, partie de la zone C (1/500 000)
4- GEOLOGY AND STRUCTURE RESULTS

2008: After different university researches based in the first interpretation, with tectono – metamorphic data. The last geology interpretation of geology of Madagascar (PGRM, 2008):
Two geological entities:
- 2/3: The Precambrian crystalline formations (the 'crystalline basement') composed of five blocks (PGRM, 2008)
- 1/3: the Phanerozoic, non-metamorphosed sedimentary formations (the 'sedimentary cover').
Sedimentary cover

The extreme south of the island (in three areas: Ambilobe, Majunga and Morondava, the latter being a very small area close to the eastern coast); and areas of Neogene sediments away from the coast (including Ankay-Alaotra, Antanifotsy, Sambaina and Vinanikarena).
Antongil block, comprising: early Archaean granites, granodiorites, migmatites and gneisses, Non affected by panafrican orogeny

Antananarivo block: Late Archean gneiss and migmatite, granitoids, greenstone belts: Maevatanana, Andriamena, Befandriana, Alaotra and Brickaville regions
I trek mo – Ilkalamavony – Taolagnaro block, comprising: quartzite, schist, carbonate, mafic gneiss and metamorphosed equivalent

**Bemarivo belt:** comprising neoproterozoic calc-alkaline volcanics, intrusives, sedimentary rocks and clastic rocks

**Vohibory Unit:** Graphite and Androyan Sequences granulite, charnockite, marble, and undifferentiated amphibolite facies rocks.
B- STRUCTURE

The main structures:

- Angavo-Ifanadiana shear-zone.
- Bongolava-Ranotsara structure (after gamma spectrometry and magnetic data, Bongolava – Ranotsara not defined like a fault
- Three shear-zones in the south (Ampanihy, Voronkafotra, and Tranomaro).
5- GEOLOGY IN THE JICA MADAGASCAR STUDY AREA

2 domains:
- Androyan domain (west part)
- Anosyan domain (East part)

-Separated by Voronkafotra shear zone
Androyan domain:
affected by 2 orogenies: 620-610MY and 570-520MY

Lithology:
Leptynites rich in graphite and garnet, gneisses with amphibole, amphibolite, marble, quartzite

Characterised by 2 anorthosites massives (Ankafotia, Saririaka, Volovolo).

Anosyan domain:
Affected by 570-520 MY orogeny

Lithology:
Leptynite with garnet and cordierite, pyroxenites, marble, quartzites

Important granitisation (Anosyan granite)
6 Base metal knowledge of Madagascar
Mineralization in the JICA Madagascar study area

Ampanihy sz: garnet, sillimanite
The intra sz: garnet, graphite
Voronkafotra sz: phlogopite
East Voronkafotra sz: sillimanite, cordierite, monazite, zircon, thorianite, gold, phlogopite
Black tourmaline, corundum, beryl, and crystal

Unknown mineral
Actual context of mining sector, Legal framework and Regulations

- We have a vast, untapped mining potential
- Madagascar legal-regulatory environment is extremely investor friendly
- Our public-private partnership are designed to jumpstart new exploration and value added
INVESTOR-FRIENDLY LEGAL AND REGULATORY FRAMEWORK

With Our Mining Code

- All investors on equal footing;
- Progressive licensing (prospecting, exploration, mining);
- Licenses withdrawn only for non-payment of fees;
- Mining licences grant based on the principe “First come first served” managed be The Mining Cadastre Bureau with a computerized and transparent system.
INVESTOR-FRIENDLY LEGAL AND REGULATORY FRAMEWORK

An another advantage : LARGE SCALE MINING INVESTMENT LAW

- Tax incentives : 5 years moratorium followed by reduced income taxes for mining operations (25%) and processing operations (10%)
- International arbitration clause
- Duty-free equipment imports...
Main Hydrocarbon and Mining Companies

**Recent investments**

- **RIO TINTO**: 1 Bn $US
- **AMBATOVY PROJECT**: 5.5 Bn $US
- **WISCO**: 8 Bn $US

**Construction completed on 2010**

**Production started since 2009**
9 KEY MESSAGES

MADAGASCAR MINING SECTOR IS WAITING FOR YOU,

BRING YOUR EXPERIENCE, AND WE WIN TOGETHER

MADAGASCAR NEW HORIZON FOR MINING
THANK YOU FOR