Lead-Zinc
Exploration opportunities in Nigeria
Lead-Zinc
Exploration opportunities in Nigeria
INTRODUCTION TO NIGERIA

Nigeria lies approximately between latitudes 4°N and 14°N, and between longitudes 3°E and 15°E. Nigeria has an estimated current population of about 140 million, making it the most populous country in Africa and the tenth most populous in the world. The country’s economy has witnessed increasing growth in recent years with the Gross Domestic Product increased by 6.1% from 2006-2008.

Nigeria has a long, but discontinuous history of mining and the country was a prominent exporter of tin, columbite and coal. Mining is administered through the Ministry of Mines and Steel Development, which is promoting private-sector led development and has initiated deep and wide ranging reforms of the mining sector.

These include:

1. A new mineral policy that will encourage greater private sector participation in an environment of orderly and sustainable development for the exploitation of solid mineral resources.

The focus of this new policy is to take full advantage of the increased international commodity prices and the global resurgences of exploration activities and:

- Achieve a substantial increase in GDP contribution by the minerals sector;
- Generate quality geoscience data;
- Formalise Artisanal and Small Scale Mining (ASM) operators;
- Achieve poverty reduction through ASM operations;
- Generate employment opportunities;
- Create wealth through value addition;
- Increase capacity of mineral based industries;
- Attract private investment capital;
- Facilitate capacity building opportunities in the solid mineral sector.

2. Signing into law of a new Minerals and Mining Act, 2007 to ensure security of tenure, competitive fiscal terms and the encouragement of an industry led by private investors

3. Establishment of the Mining Cadastre Office (MCO) to administer mining titles “with integrity and in a transparent manner on a ‘first-come first-served’ basis”.


CONDUCTIVE ENVIRONMENT

Certain basic facilities favourable for conducting business exist in the country.

These include

- A fairly developed infrastructure such as road network, deep ocean ports and jetties.
- Improved communication system
- Supportive banking institutions
- Relaxed foreign exchange for capital raising
- Existing joint venture opportunities
- A large community of skilled geoscientists and engineers
- A commitment to privatization
LEAD-ZINC IN NIGERIA

Lead-Zinc occurrences in Nigeria are associated with saline water intrusion in the sedimentary basins or fractured/shear zones in crystalline rocks. The mineralisation is often associated with minor to significant amounts of copper and silver, occurring in lodes filling the fractures within the sedimentary rocks in the Benue Trough as well as in crystalline basement rocks as shown in recent studies by Nigerian Geological Survey Agency.

The Trough, which is believed to have originated as a failed arm of an aulacogen at the time of the opening of the South Atlantic oceans during the separation of the African plate and the South American plate, is partitioned into the Lower, Middle and Upper region with Lead-Zinc mineralization occurring in almost the entire 800km Length.

The Lead-Zinc are localized along the Northeast-Southwest trending belt of slightly deformed volcanic and sedimentary Cretaceous sequences (Albian Asu River Group) which is about 500m thick, and they occur in the form of veins and veinlets associated with the host rock.

The Lead-Zinc is often associated with other gangue minerals such as marcasite, pyrite, quartz, barites e.t.c.

LOWER BENUE TROUGH LEAD-ZINC MINERALIZATION

The general geology of lower Benue Trough in Abakaliki area is made up of thick sequences (500m) of slightly deformed cretaceous sedimentary rocks made up of essentially of albian shales, subordinate siltstones of the Asu River Group. There is also the presence of Volcanic and Pyroclastic materials forming elongated conical hills in the cores of the anticlinal Structures.

The Abakaliki Lead-Zinc is believed to be of hydrothermal origin emplaced at a low temperature of about 140°C and it is made up of primarily four lodes namely Ishiagu, Enyigba, Ameri and Ameka in the lower Benue Trough located in Ebonyi State.
ENYIGBA PROSPECT

The Enyigba lode which appears to be the largest mineralized body in the lower Benue Trough section is up to 2km in length and has a width of approximately 30m. It occurs as open vein fillings of a series of steeply dipping N-S near vertical fault which cuts regional fold (Abakaliki anticlinorium). The Lode also extends southwards into Ameri lode.

AMERI PROSPECT

The Ameri lode which is located south of the Enyigba lode trends almost N-S which flanks the southeastern limb of the Abakaliki anticlinorium. It is also a vein/fracture infilling which appears to be a continuous extension of Enyigba.

AMEKA PROSPECT

The Ameka lode is to the southeast of the above two lodes and is bounded in the north and south by siltstone. The fracture/vein in filling displaces the siltstone border and the Abakaliki anticlinorium.
MIDDLE BENUE TROUGH LEAD-ZINC MINERALIZATION
The middle Benue Trough veins are located mainly in Akwana and Arufu. This mineralization is hosted in silicified limestone sequence and also belongs to the Asu River Group. Dips of these veins are generally steep to vertical with a width of between 0.5m-10m and length of approximately 100m along the strike length of the bodies.

Contacts with wall rocks are sharp and ore grades vary from 3% to 5% combined Lead and Zinc. Vein constituents include galena, sphalerite, tetrahedrite and occasionally native silver. At Azara, the veins are rich in barites with occasional cubic galena.
Limestone wall rock at Arufu and Akwana is highly silicified, which appears to be related to the mineralization processes as the intensity of the silicification decreases away from the vein.

UPPER BENUE TROUGH LEAD-ZINC MINERALIZATION
The Upper Benue Trough is made up of sedimentary sequences represented by medium to fine grained sandstone which is divided into Bima sandstone (Upper Albian age) and Yolde sandstone (Cenomanian age), shales of Yolde formation which underlies the alluvium which is associated with the sandstones as intercalations. These mineralizations are located in and around Isamiya, Diji and Gidan Dari in Bauchi State.

Isimiya Prospect
Two parallel quartz veins striking N-S host the mineralization being worked around this settlement. The quartz veins are hosted by sandstone and the veins dip at 36°W.
The separation between the two veins varies between 300m and 500m and the veins are between 4m-5m wide. In the same vicinity, there are three other less prominent veins approximately 2m-3m wide hosted in sandstone.

Diji Prospect
In this area of multiple phase mineralization, a major vein located SE of Diji is accompanied by other veins aligned at right angle. Exposed sections of the vein show boulders of quartz with massive Lead-Zinc (Pb/Zn) mineralization. The vein is hosted by Bima sandstone.
Gidan Dari Prospect

A 100m long and about 2m wide vein is located 300m SE of Gidan Dari. The vein is hosted in a grey shale member of the Yolde Formation.

NEW EXPLORATION INFORMATION ON LEAD-ZINC MINERALIZATION IN NIGERIA

During the period between May 2004 and October 2008, the Nigerian Geological Survey Agency (NGSA) embarked on commodity exploration and assessment projects. A key commodity given priority in exploration consideration during the period was lead/zinc. Several locations within NW parts of the country, Federal Capital Territory (FCT) and unexplored parts of middle Benue trough in which there were either insufficient or no information but with geological setting favouring a successful predictive exploration were targeted.

Previously most Nigerian geologists were of the view that Pb-Zn mineralisation were restricted to the Benue Trough. However recent exploration activities by Nigerian Geological Survey Agency have shown that there exists lead/zinc/copper mineralization in the rocks of crystalline basement complex in Anka, Abare, Dutsen Dan Kwakwara, Dutsen Haladu, Dutsen Gwamna, Tamani and Sunke areas in Zamfara State and Ibabban Tsauni area near Izom in FCT.

Karim Lamido, Wukari and Ibi prospects

The areas investigated by the Nigerian Geological Survey Agency in Taraba State are, Karim Lamido, Wukari and Ibi, located at the western part of the state and situated along the River Benue. The area investigated falls within the middle part of the Benue Trough and shows that lead-zinc mineralization is hosted in sedimentary limestone/mudstone/siltstone beds in the three Local Government Areas explored in the state. In Didango area in Karim Lamido LGA, lead ore (galena) is hosted in limestone occurring within a sandstone bed, while in Wukari LGA, the host rock is calcareous mudstone, which outcrops around Arufu and Akwana. In Ibi Local Government Area, very minor occurrences were noted within siltstone beds.
Estimate of resource from the limestone host rock in Didango, shows 675 tonnes of ore grading <20% lead, 0.06% zinc and 4ppm silver, while in Arufu 33.7 tonnes of ore graded 3.7% lead, 0.18% zinc and 7.7ppm silver. In Akwana, 7.8 tonnes of ore graded 8% lead, 0.67% zinc and 8ppm silver.

**Dutsen Haladu and Dutsen Gwamna prospects**

Lead mineralization in Zamfara state occurs in veins and as stringers in wall rocks in a variety of rocks like quartz-schists, quartzitic-phyllitic schists within the N-S trending Anka schist belt of northwestern Nigeria.

The mineralization is spatially related to the two regional fault systems of the schist belt-the Anka and the Kalangai faults with subsidiary or conjugate sets. These discontinuities are believed to have developed during the waning stages of the Pan-African Orogeny, which paved way for the generation and migration of mineralizing/hydrothermal fluids. The mineralizing fluids possibly of crustal origin consequently precipitated poly-metallic association, Pb-Ag-Cu-Au observed in these areas. It is also evident that Zn is conspicuously absent in the analyzed samples. Two prospects namely Dutsen Haladu Prospect and Dutsen Gwamna Prospect, have been identified.

**Dutsen Haladu Prospect**

Dutsen Haladu prospect comprises the occurrences at Dan Kwakwara, and that of 1km north of Tungan Mairakunma.

The total mapped length of the vein outcrop at Dutsen Haladu prospect is about 680m and its exposed depth is about 20m. It trends in N10°W and dips from 87°E to 89°E. The width of the vein is approximately 7m with galena concentrated mainly at the core of the sheared quartz vein associated with limonitic quartz fragments while malachite ore are seen associated with quartz in the alteration zones. The lead (Pb) content of the lead ore is 19% and shows a very strong metallic luster. Estimated resource size of lead (Pb) is about 3,281 tonnes.
Occurrence of Lead in Quartz-Schist at Dutsen Haladu

**Dutsen Gwamna Prospect**

The prospect is south of Tungan Mai Rakumma (Pb) mineralization but north of Tamani and Sunke occurrences. The lead (Pb) mineralization is within quartz-schists, quartzitic - phyllitic schists and is about 350m long and 12m deep; the vein trends N10°W and dips 76°W. Lead (Pb) mineralization is associated with gold, silver, and copper. The average lead content of its ore is 44.27%. Estimated resource size of lead (Pb) is about 2,324 tonnes.
Ibabban Tsuani Prospect

Detailed geological/geophysical mapping of the Federal Capital Territory embarked upon by the Nigerian Geological Survey Agency in 2004, and 2007 identified the northwestern area as one of the promising areas of Lead mineralization, in the vicinity of Ibabban Tsuuni near Izom. This area is one of the prominent Pb-Zn mineralization within the Nigerian Crystalline Basement Complex, consisting of a suite of pegmatised migmatite, migmatitic gneisses, amphibolites, ultramafites, pegmatite and silicified rocks and quartzo-feldspathic veins, with multiple deformations, and jointing systems dominantly trending in the NNE-SSW, NNW-SSE and NW-SE directions.

Investigations reveal that galena is the predominant sulphide mineral in the area and is hosted in the migmatite, associated with quartz-veins and pegmatite, which often form low hummocky reliefs. The Lead sulphide is believed to be of epithermal origin.

Four modes of occurrence are characteristic of the lead/sulphide mineralizations which are both lithologically and structurally controlled, namely:
- Cuboid crystals almost in its pure state;
- Disseminated and in association with other sulphide minerals;
- Brecciated along shear zones; and
- Lenses within the quartz veins/pegmatoids

Mining activity in Ibabban Tsuuni area is currently in progress and is evidently an old industry inherited from the colonial era. The Lead ore is about 0.1 to 1.05 meters thick.

Both field and laboratory studies have shown that the Lead ore of Ibabban Tsuuni area occurs in association with Silver, Zinc and Copper.
EMERGING INVESTMENT OPPORTUNITIES

Investment opportunities abound in the following areas

1. Applying for mineral titles with a view of wholly owning the mining rights for the Lead-Zinc deposit
2. Partnering with existing title holders for detailed exploration as consultants and specialists
3. Partnering with existing title holders in joint venture agreement to explore, mine and market the Lead-Zinc resources of areas of interest.
4. Legal transaction in Lead-Zinc won in quarries and operations for export.
For Further Enquiries, Please Contact:

Director General
NIGERIAN GEOLOGICAL SURVEY AGENCY
31 Shettima Monguno Crescent
Behind Julius Berger Office, Utako District
P.M.B. 616, Abuja, Nigeria.
Email dgoffice@ngsa-ng.org

CUSTOMERS SERVICE CENTRE
NIGERIAN GEOLOGICAL SURVEY AGENCY
+234 (0) 8053000184, 234 (0) 8065901938
E-mail: customer-enquiries@ngsa-ng.org
Contactus@ngsa-ng.org

Supported by
World Bank Assisted
SUSTAINABLE MANAGEMENT OF MINERAL RESOURCES PROJECT
(SMMRP)
No 6, Marte Close,
Off Misau Crescent,
Garki II,
Abuja

MMSD 2010