NIGERIAN GEOLOGICAL SURVEY AGENCY (NGSA)

GOLD MINING OPPORTUNITIES IN NIGERIA

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The Nigerian Mining Roadshow, Australia

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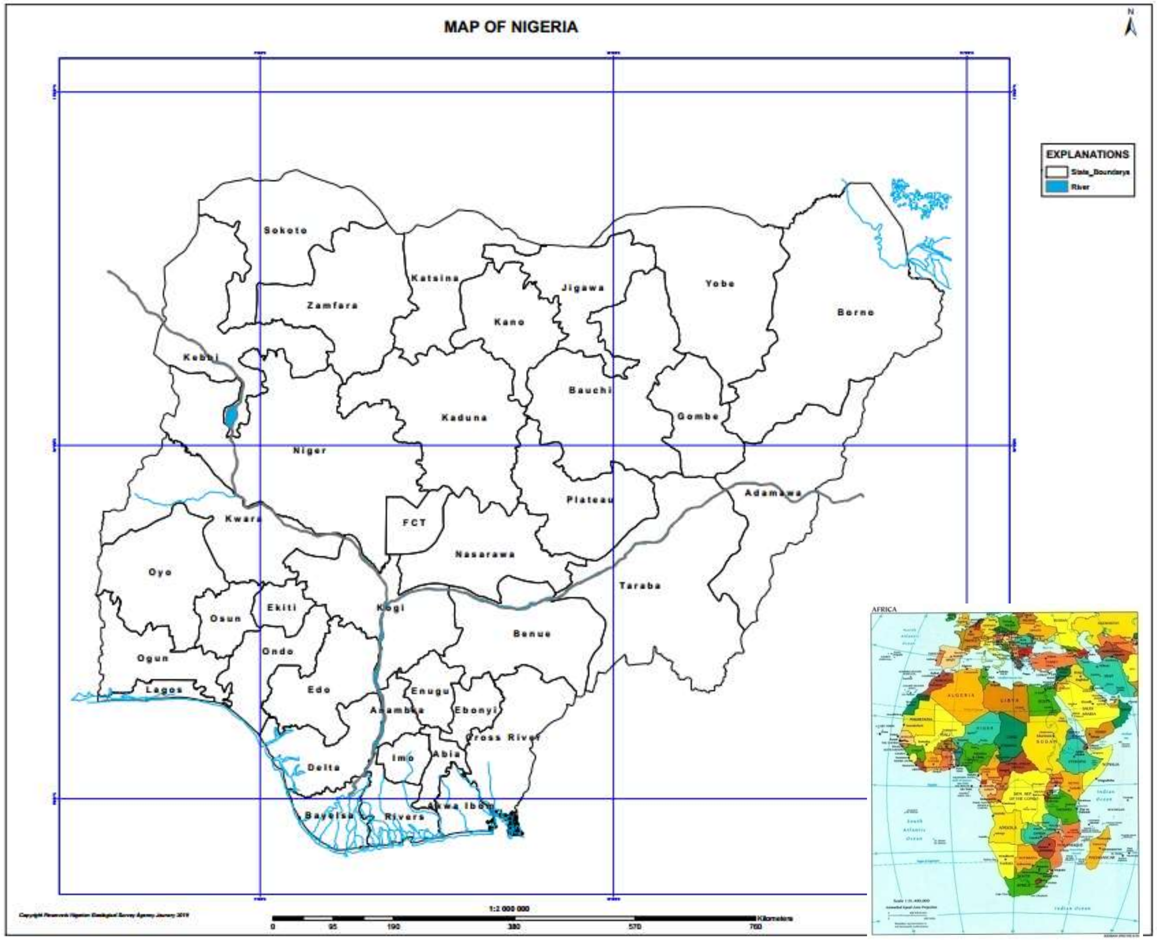
(NGSA)

Outline

- Introduction
- History of Gold Mining in Nigeria
- Geological Framework of Nigeria
- Gold Mineralization in Nigeria
- Gold Exploration
- Placer Gold prospecting
- Gold Occurrences in Nigeria
- Gold production in Nigeria
- Investment opportunities

INTRODUCTION-NIGERIA



Statistics

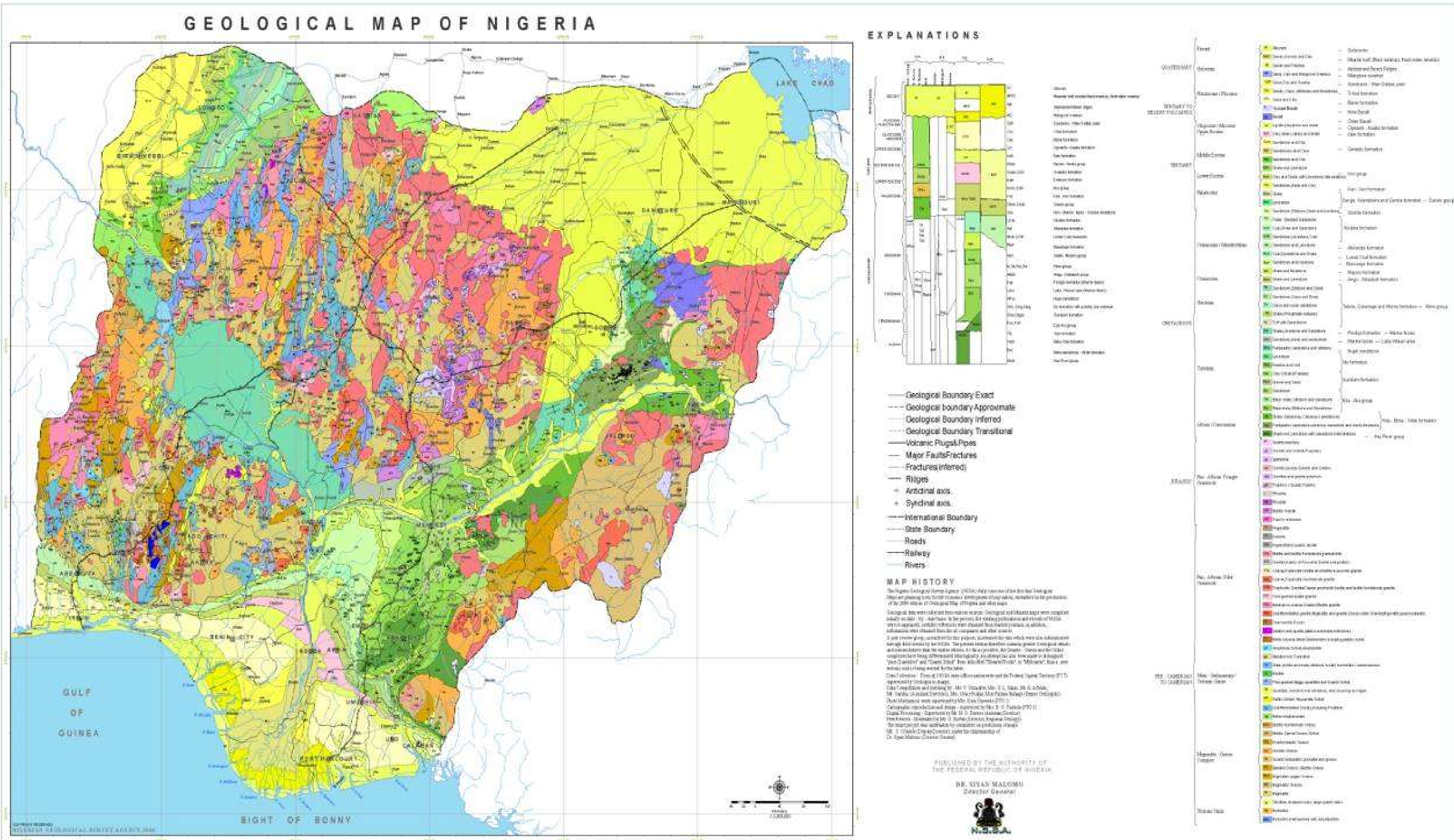
Total Area = 923,768 km^2 (356,669 sq mi)

Population = 2017 estimate190,886,311

2006 census = 140,431,790

Density = 215/km^2 (556.8/sq mi)

Geological Map of Nigeria

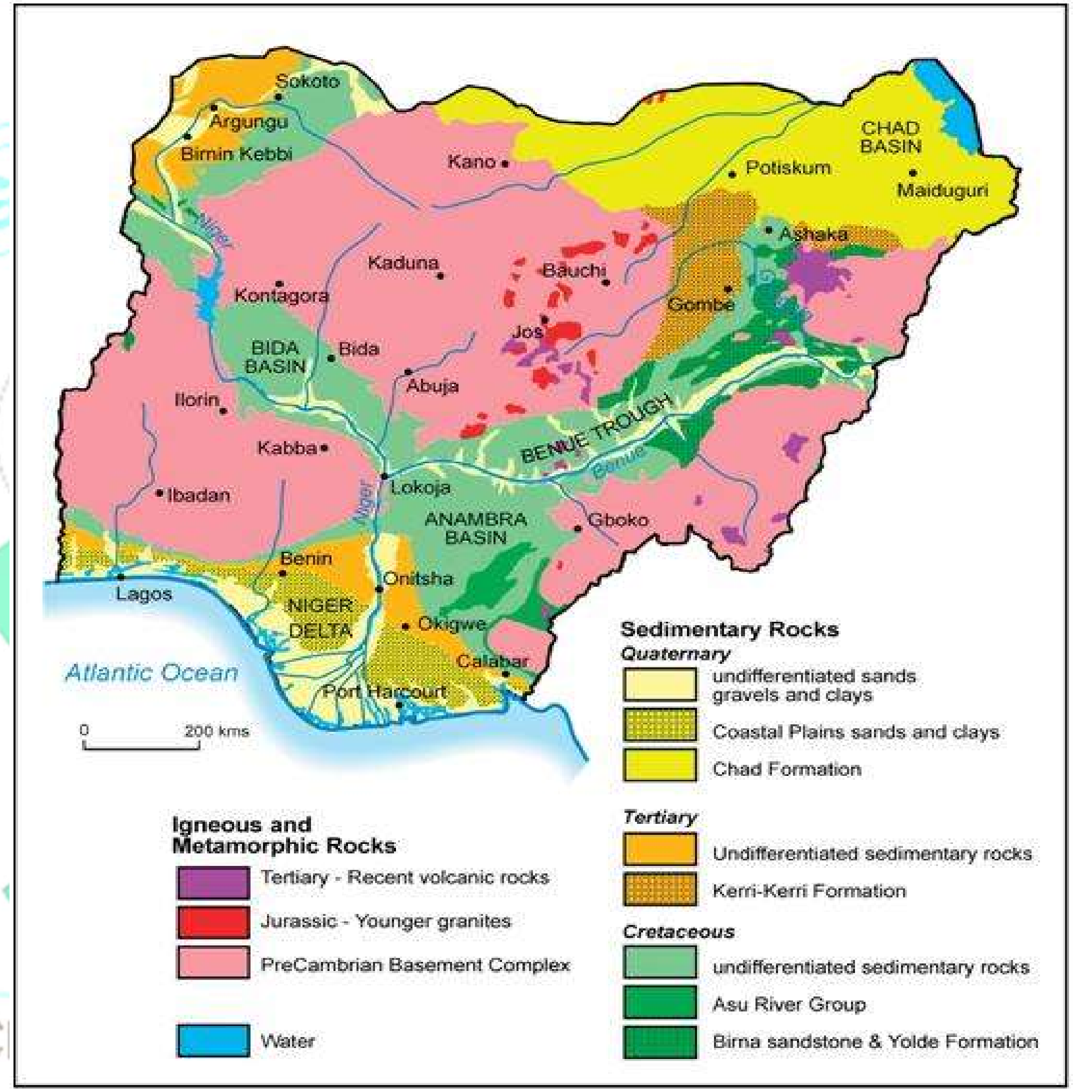


WEALTH CREATION & SUSTAINABLE DEVELOPMENT

GEOLOGY AND MINERAL RESOURCES

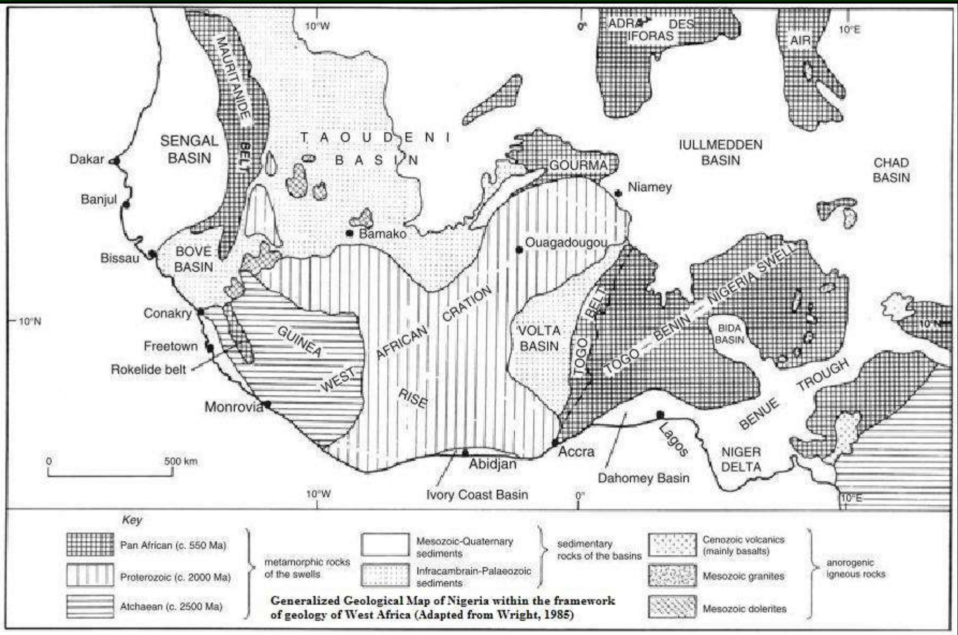
Geology of Nigeria comprises of the following lithologic units:

- The Basement Complex
- Younger Granites
- Sedimentary series
- Tertiary and Recent volcanics.

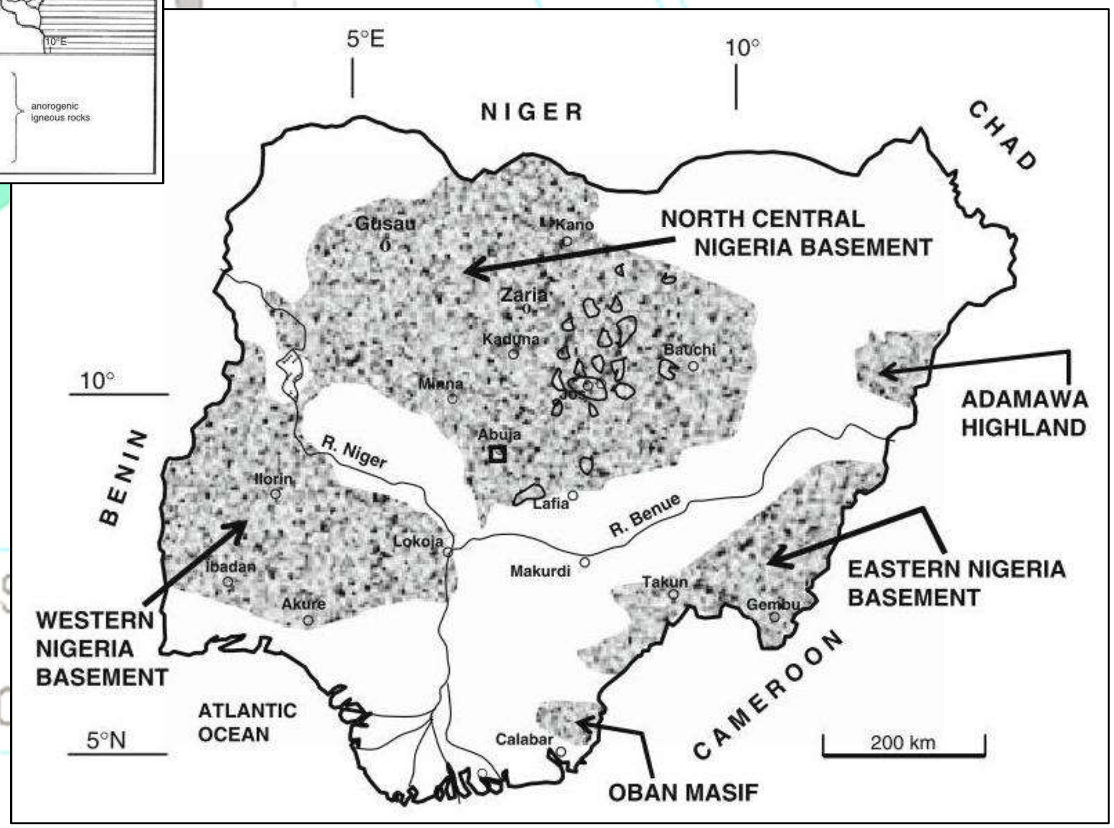


Geological Framework of Nigeria

- Nigeria Gold is associated with the Basement complex of Nigeria which is a part of the Pan-African mobile belt that lies between West African and Congo Cratons and south of Tuareg shield (Black, 1980).
- The NBC was affected by the 600 Ma Pan-African orogeny



Generalized Geological Map of Nigeria within the framework of geology of West Africa (Adapted from Wright, 1985)



The Nigeria Basement Complex (NBC)

- **The Migmatite-Gneiss Complex (MGC)**
- **The Schist Belt (Metasedimentary and Metavolcanic rocks)**
- **The Older Granites (Pan African granitoids)**
- **Undeformed Acid and Basic Dykes**

Geology of Nigeria (cont'd)

▪ The Basement Complex

- The Basement Complex of Nigeria occupies the central part of the Pan- African mobile belt, which lies between the West African and Congo cratons. It occupies about half the surface area of Nigeria. It is composed of four major rock packages:

✓ The migmatite-gnesis complex.

✓ The schist belts composed of meta-sedimentary and meta-volcanic rocks.

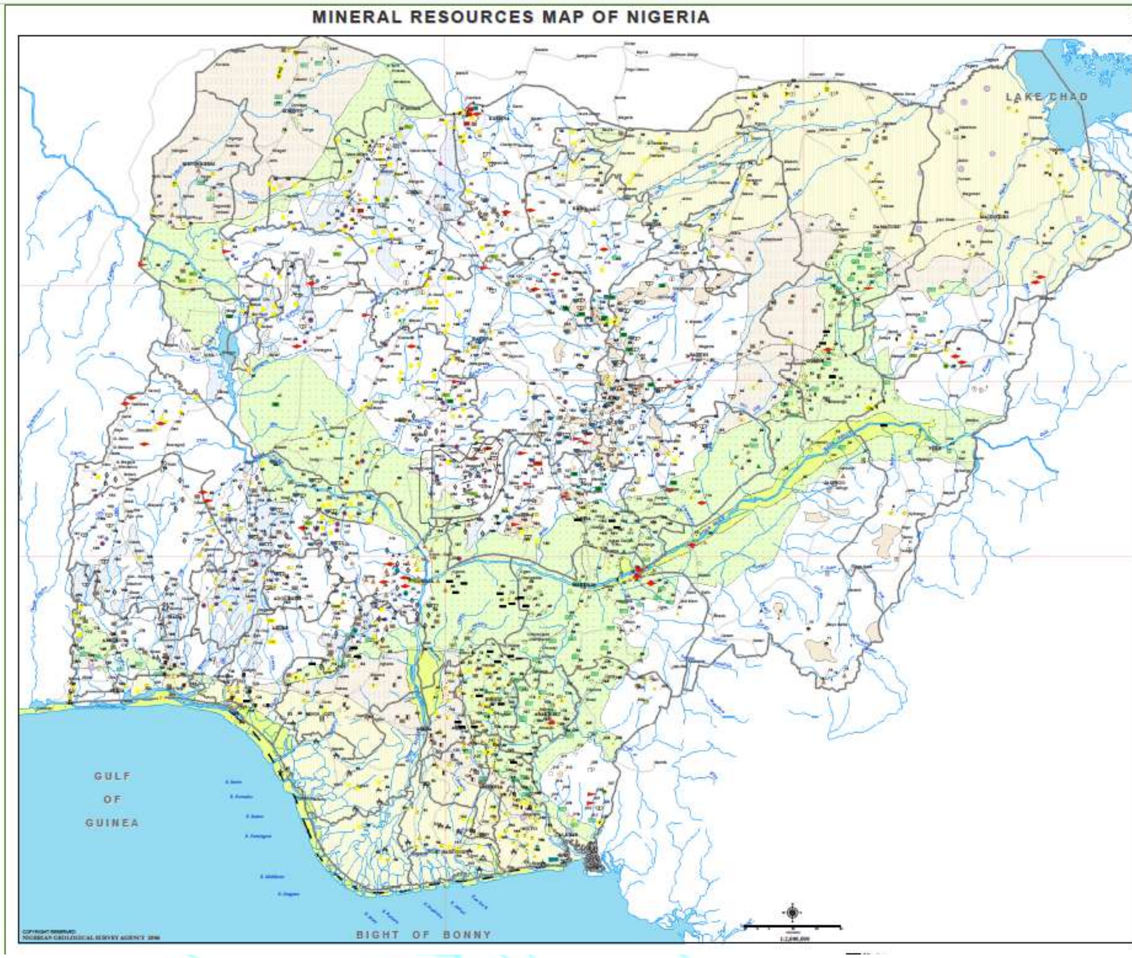
✓ The Pan-African Granitoids comprising the older Granites and associated charnockitic rocks.

✓ The undeformed felsic (Acid) and mafic (Basic) dykes

Geology of Nigeria (cont'd)

- **The Younger Granites**
  - ✓ They are distinct from the Older Granites
  - ✓ Has a high-level anorogenic volcanic and hypabyssal rocks emplaced within the Precambrian Basement Complex.
  - ✓ Characterized by arcuate to circular intrusions, representimg one of the classical occurrences of ring complexes in the world.
- **The Sedimentary Series**
  - ✓ The sedimentary rocks of Nigeria were deposited in seven basins surrounding the crystalline rocks.
  - ✓ Niger Delta, Bida, Benue, Anambra, Dahomey, Sokoto and Chad Basins
- **The Tertiary - Recent volcanic rocks**
  - ✓ Volcanic activity has taken place intermittently from tertiary to recent times.
  - ✓ The most extensive outcrops are in the Biu and Longuda plateaux of north-eastern Nigeria and on the Jos Plateau and in the Benue Trough.
  - ✓ The basalt ranges from 22 million years to 7 million years in age.

GEOLOGY AND MINERAL RESOURCES

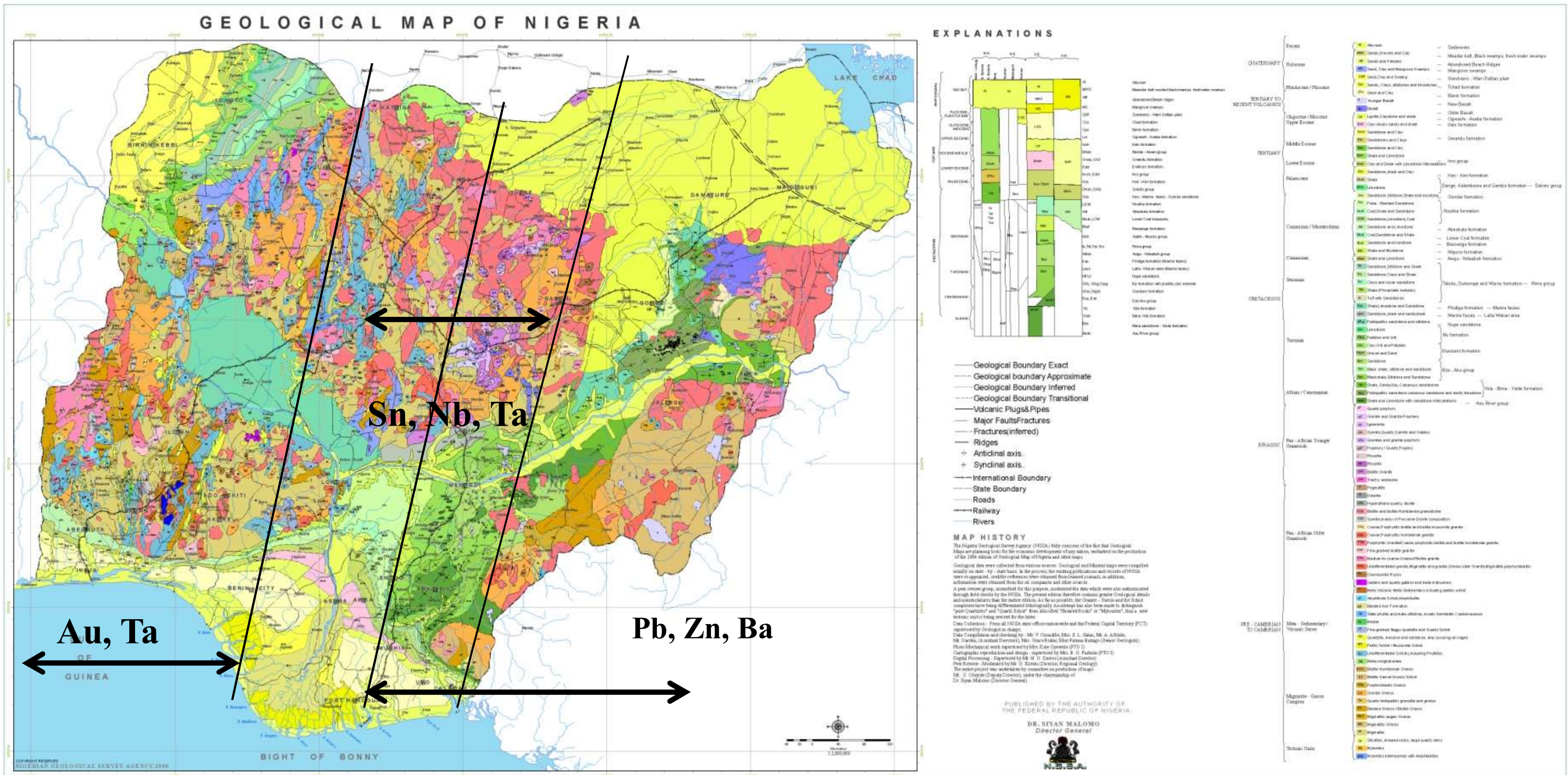


- Nigeria has about *44 solid mineral commodities* occurring in about *450 locations* nationwide
- These include, coal, bauxite, tantalite, gold, tin, iron ore, limestone, niobium, lead and zinc
- Seven of these minerals are considered strategic minerals by the Ministry of Mines and Steel for accelerated development.

These are

- Gold
- Coal
- Barytes
- Tantalite
- Iron ore
- Bitumen
- Lead/Zinc

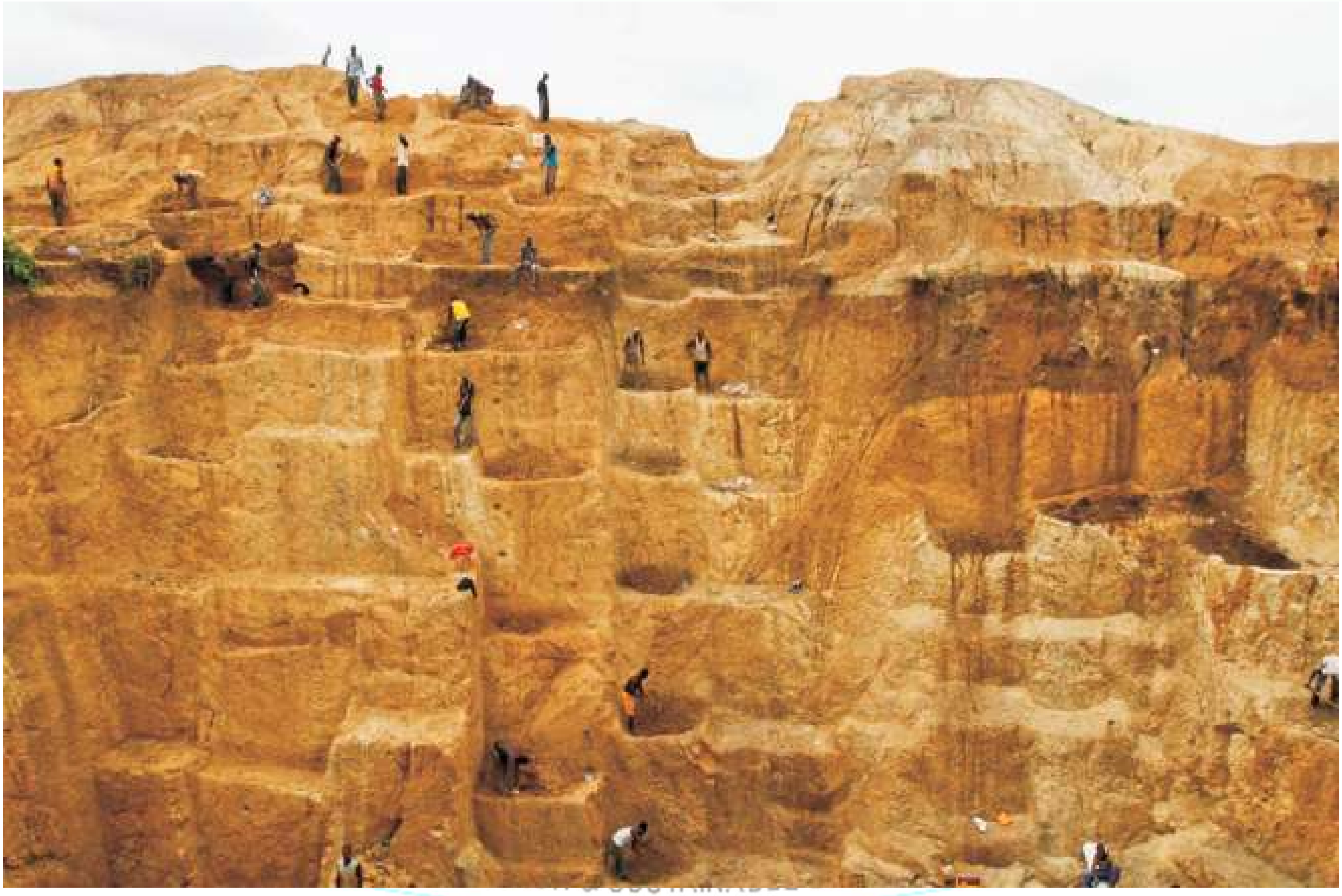
Metallogenic (Mineral Bearing) Provinces



History of Gold mining in Nigeria

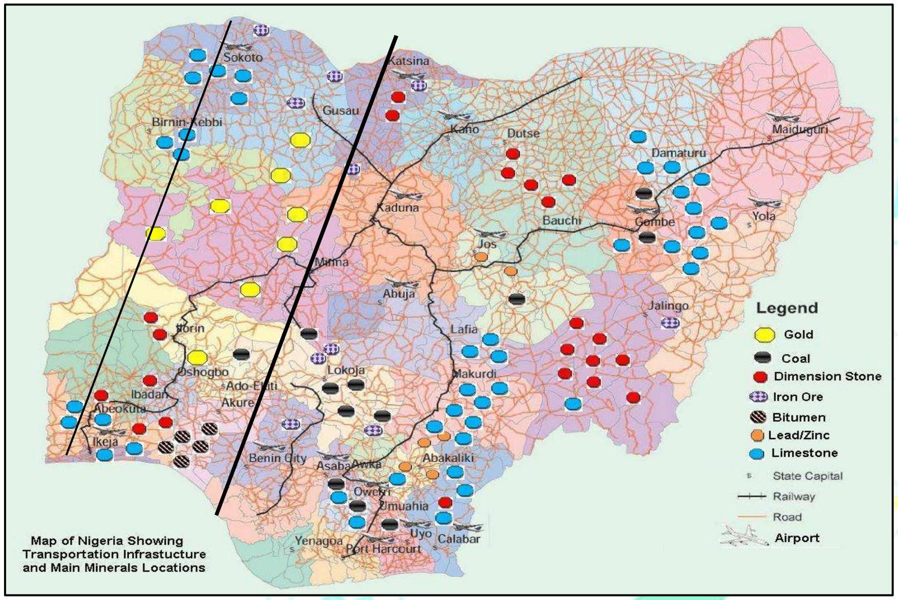
- Gold production in Nigeria started as far back as 1913
- Reached it peak in the period **1933-1943** when ***1.4t of gold were produced.***
- Subsequently gold production declined during the Second World War and never recovered as mines were abandoned by mostly colonial companies.
- The Nigerian Mining corporation's efforts to continue exploration in the 1980’s did not last due to paucity of funds.
- In the absence of any systematic exploration and development, the Nigerian goldfields have experienced ***intense artisanal workings*** which target both the primary gold-quartz reefs and their associated alluvial occurrences.

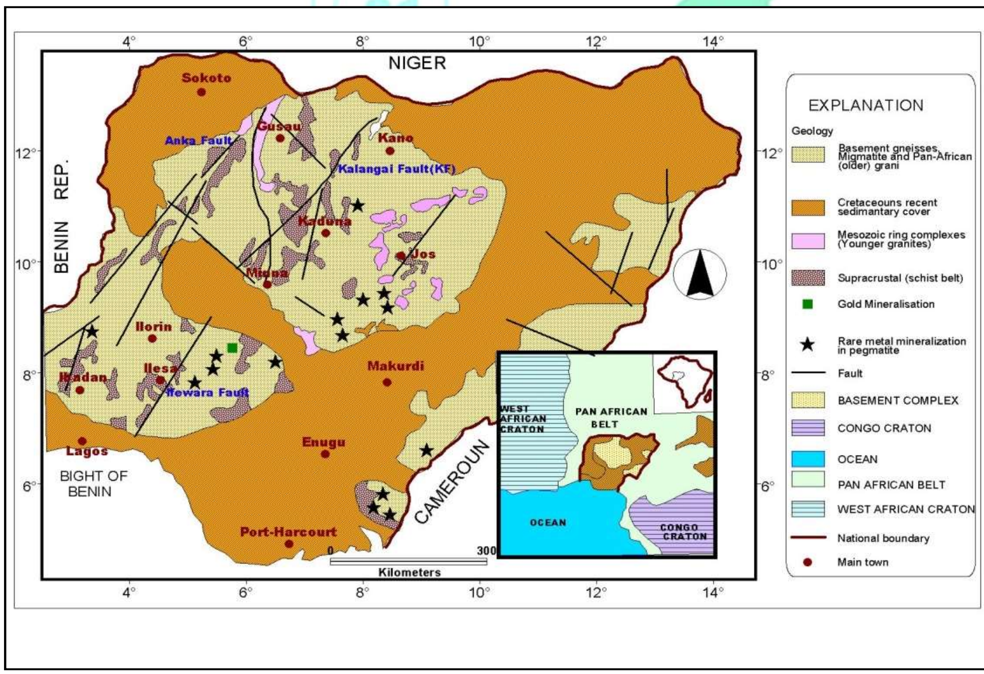
History of Gold mining in Nigeria



A typical artisanal mining

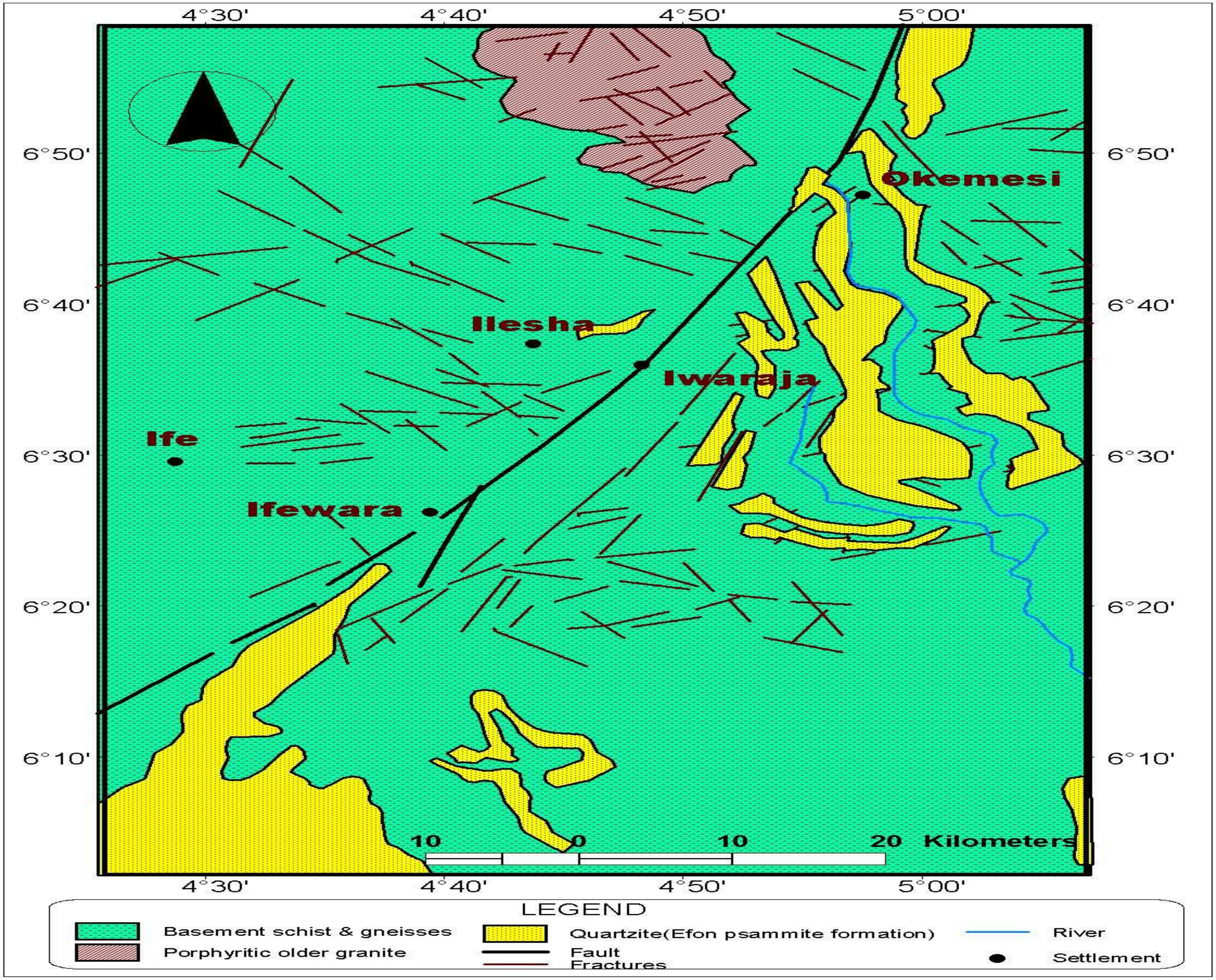
GOLD MINERALIZATION IN NIGERIA



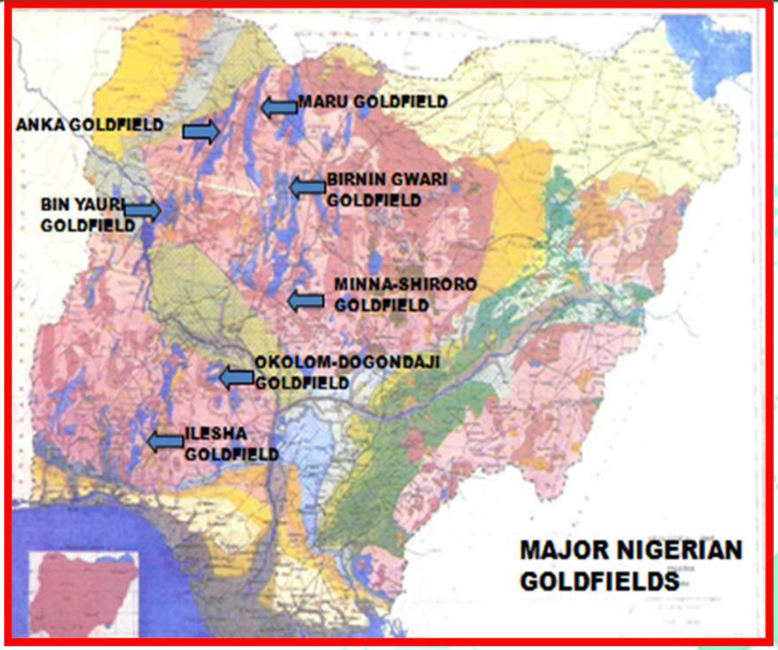


- Probably 90% of Nigeria's total gold production has been from alluvial deposits derived from primary gold mineralization in the basement rocks.
- Most primary gold mineralization in the schist belt commonly occurs in quartz veins within several lithologies.
- All the producing areas have been in the western part of the basement where schist belts are best developed.
- Four gold fields can be outlined; ***Ilesha-Egbe, Minna-Birnin Gwari, Sokoto and Yelwa*** (Woakes & Bafor, 1983)
- Typically, gold bearing quartz vein carry some sulphides, galena and pyrite being the most common
- The veins are conformable with the general **N-S to NNE-SSW** structural trend of the basement

Structural Trend



MODES OF GOLD MINERALIZATION IN NIGERIA



Gold mineralization in Nigeria are mainly two types - (Primary and Secondary Mineralization).

- **Primary**

-Primary gold mineralization associated with quartz veins , reefs and stringers, with different morphologic types which includes

- Concordant veins or discordant vein system,
- Mineralized wall rocks are common adjacent to known veins and may be impregnated with fine grained sulphide minerals (Pb, Cu etc) or as free gold.

-Primary mineralization also occur as limonitic quartz veins; stained reddish brown to yellow in colour, is sometimes associated with sulphides (Galena or Pyrite). This often extends into the (gneissic) wall rock providing localized haloes of enrichment.

- **Alluvial**

Secondary gold mineralization is also found in alluvial placers within the sediments of flowing streams around the host rocks.

- **Elluvial**

Mineralization associated with insitu weathering of gold bearing veins and rocks around shear zones or breccia zones

GOLD MINERALIZATION IN NIGERIA






Gold Occurrences in Nigeria

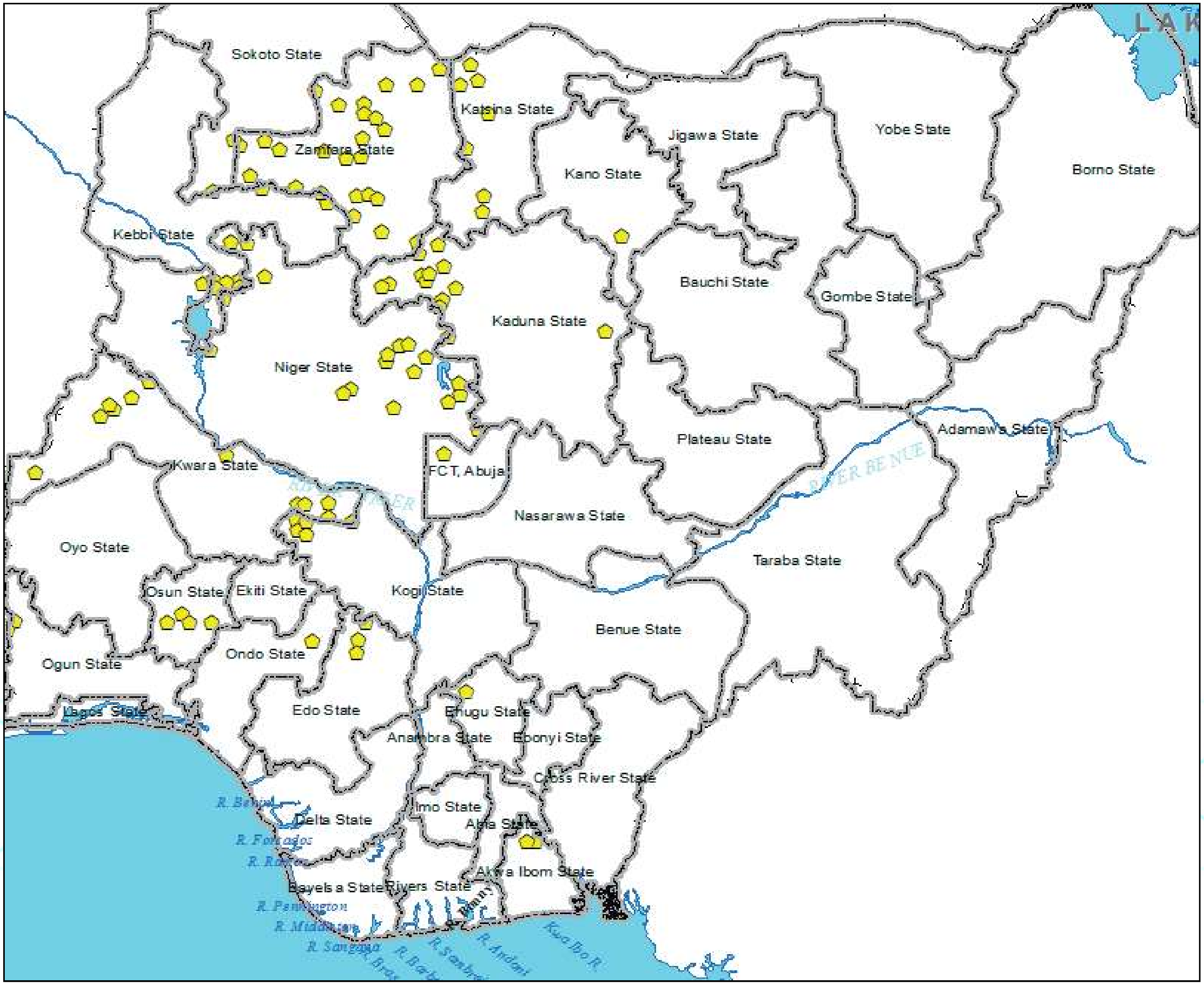
The most important occurrences are found in the

- Maru
- Anka
- Malele
- Tsohon
- Birnin Gwari-Kwaga
- Gurmana,
- Bin Yauri,
- Okolom- Dogondaji and
- Iperindo

✓These areas are associated with the schist belts of northwest and southwest Nigeria.

✓ There are also a number of smaller occurrences beyond these major areas.

Gold Occurrences in Nigeria



Gold Production in Nigeria

Gold Production Figures

600 ounces-1.4t in 1933-1943,

Current Gold Production Figures

- 1.5-8.6ppm in **Anka**,
- 30ppm in **Malele,**
- 5-100g/t in **Tsohon-Birnin Gwari**,
- 5-15ppm in **Bin Yauri**,
- 0.0006-0.056g/tonne in **She**, Niger state
- 34.48g/tonne at **Garin Hawal,** in Kebbi state.
- 0.5-1g/t from bedrock and 2g in sampled veins at **Gada-Biyu**,
- 20-30 ounces in **Uke,**
- 15-25ppm in sediments, 1-8ppm in soil sampled with values for the Limonitic quartz of 45g/ton-60g/ton gold at **Gwagwalada.**

NEW FIND AREAS

Gada Biu Toro area Bauchi State

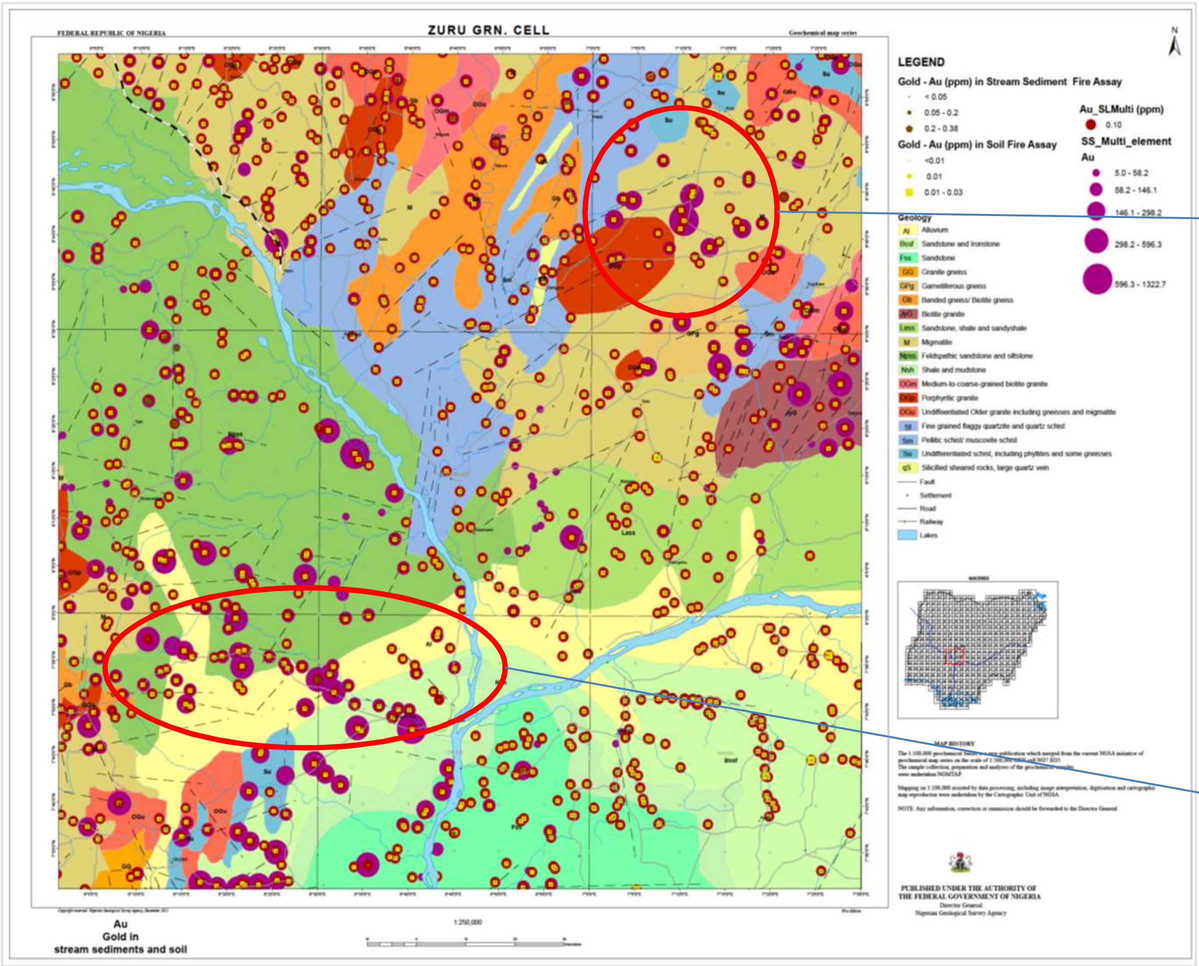
- Gold mineralization in Gada-Biu area is found in quartz veins hosted in gneisses as primary mineralization and secondary mineralization in alluvial placers within the sediments of the NW-SE flowing river Bangel. The primary mineralization often extends in to the gneissic wall rock providing localized haloes of enrichment.
- The alluvial gold in the area is associated with buried alluvial flats of the drainage channels of river Bangel. Due to extensive weathering of bedrock materials including the veins, there is thick pile of overburden reaching >10m. This also forms a veritable source of elluvial materials which contains significant amount of gold.
- The mineralization in Gada Biyu occasionally yields about 2g gold from 5kg vein and wall rock material while weathered piles of bedrock materials around the mineralized area yields between 0.5-1g/t

Uke, Keffi Nasarawa state,

- The geology of the Uke gold mineralization is typical the Nigerian Basement terrain consisting gneisses which may have proximal intrusions of granitoids of relatively younger age. Gold rich quartz veins or reefs hosted in biotite gneiss proximal to intrusions of granitoids of relatively younger age. These are also associated qurtzofelsphatic veins. And the structural disposition of the gold bearing veins are consistent with the regional lineament trends of NNE/SSW direction deduced from airborne data (TMI, Ansig and 1VD).
- Field report from the area indicated that 20 - 30 ounces of gold are recovered on daily basis from the combined operations of artisanal miners and semi mechanized operators.

GOLD PRODUCTION IN NIGERIA (cont'd)

Geochemical Analysis Of Gwagwalada Gold Area

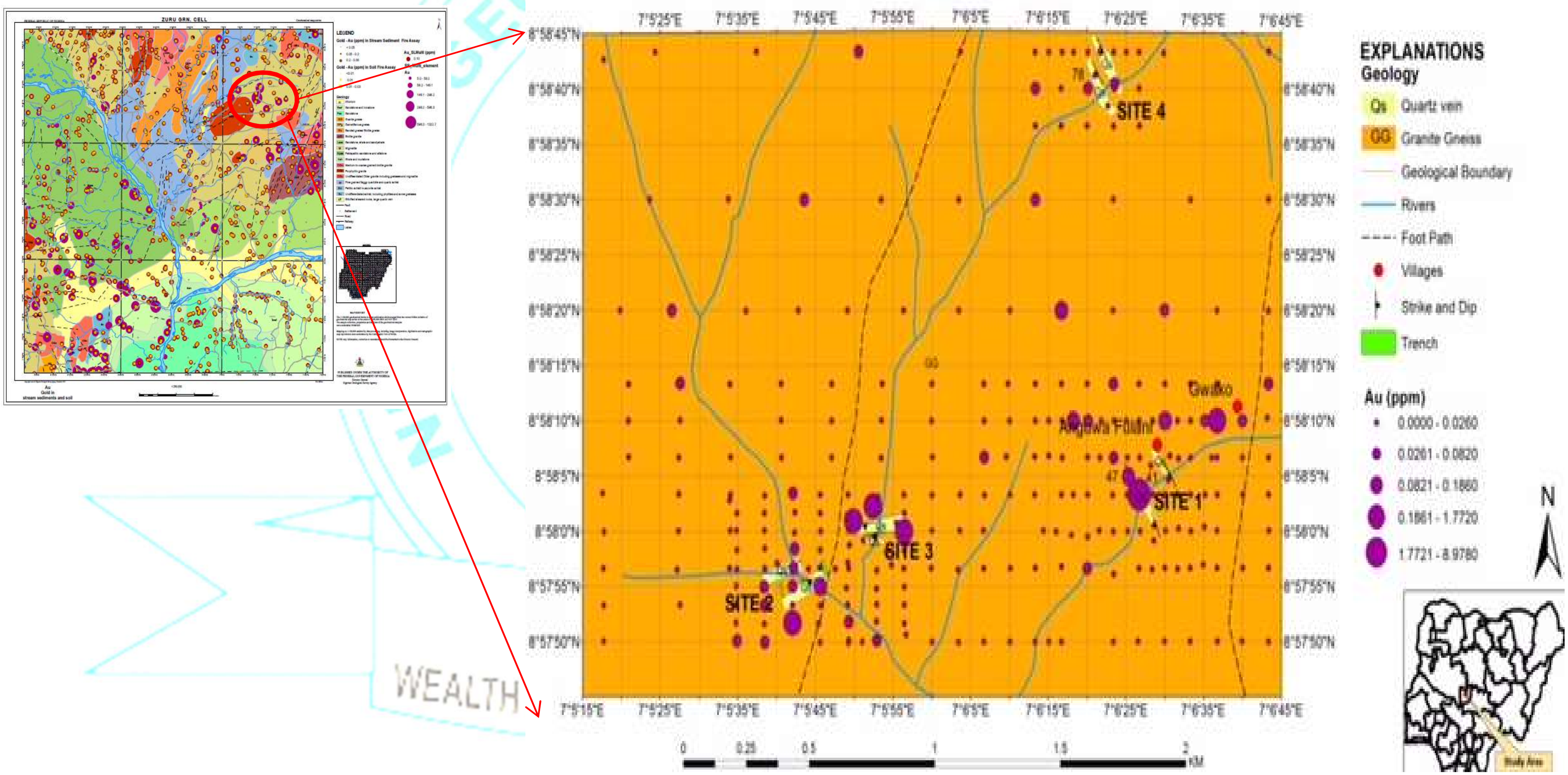


Anomaly shown on Abuja Sheet and prepared for further analysis.

Anomaly shown on Kabba/Lokoja Sheet needs further analysis.

GOLD PRODUCTION IN NIGERIA (cont'd)

Further Analysis on Gold location in Gwagwalada, Abuja Sheet map from Zuru cell



Investment Opportunities

Investment opportunities abound in the following areas

- Applying for mineral titles with a view of owning the Mining rights for the gold deposit(direct gold deposit ownership).
- Partnering with existing title holders for detailed exploration Consultants and specialists
- Partnering with existing title holders in joint venture Agreement to explore mine and market the gold resources of areas of interest

NGSA SERVICES

Regional Geological Mapping

✓Production of geological maps in various scales (2m, 1m, 250k, 100k, 50k)

Regional Geochemical Mapping

✓8 cell out of 44

Airborne Geophysical Survey

✓Magnetic
✓Radiometric
✓Gravity
✓EM

Ground Follow-up

✓Geophysical investigation for Gold, Base Metal Sulphides, Iron ore, Uranium, Kaolin, graphite, etc.

✓Regional gravity survey (Old Kaduna State, Osun, Ebonyi, Enugu, Anambra, Kogi, Benue, Ekiti and part of Ondo)

NGSA SERVICES

Core Sampling
Archiving and management of core logs
A new core shade has been built and is being equipped
10,000 core boxes
Drill hole core logs database developed

Engineering Geotechnical Mapping
(Owerri, Aba, Enugu, Oshogbo, Benin, Maiduguri, Gombe, Yola, Makurdi, Kaduna, etc.)

Hydrogeological Mapping
(Ibadan, Abeokuta, Ilesha, Onitsha, Benin, Kano, Jos, Sokoto, Calabar, Katsina, Daura, etc)

NGSA SERVICES

- Marine and coastal geological surveys
- Geohazard monitoring
- Mineral exploration
- Remote sensing interpretation
- Map production (geology, geophysics, geochem, geotech, hydrogeo, geostat, geohazard, geomarine, etc)
- Laboratory services

THANK YOU!!!

GEOSCIENCE INFORMATION
FOR
WEALTH CREATION & SUSTAINABLE DEVELOPMENT