The Next Major Gold Mining Destination In Africa
Geological Research Authority of Sudan (GRAS)
The Republic of the Sudan Ministry of Minerals

Sudan Minerals Potential and Investment Opportunities

By Dr. Mohamed Abu Fatima – GRAS Director General

UK-Sudan Trade & Investment Forum
12TH December 2017, Central London
1. Introduction
2. Mineral Potential of the Sudan
3. The Mineral Sector Developments
4. Investment Opportunities in Mineral Development
5. Way forward
Infrastructure in Sudan is challenging due to fast growth.
“Sudan is one of the 20 countries producing 38% of world gold production.”
MINISTRY OF MINERALS

- Established in 2010
- Authority for metals and minerals within the lands, rivers and the continental shelf of Sudan
- Responsible for managing the mining investment system
- Promotes local and foreign investment in the mining sector

Key Activities:
1. Supervision of geological exploration and prospecting
2. Entering contracts with investors and granting licenses
3. Developing local human resources in mining
4. Managing relations with institutions and relevant regional and international organizations
5. Administration of GRAS, SMRC, SUDAMIN
MINISTRY OF MINERALS

Sub Bodies

GRAS—Geological Research Association of Sudan
- national geoscience technical organization
- fosters sustainable growth and socio-economic development of mineral resources
- develops and administers equitable policies for both industry stakeholders and the State of Sudan

SMRC
- Monitors companies licensed for exploration and mining

SUDAMIN
- develops national technical standards
• Highly prospective geology and under explored
• Currently hosting the largest gold rush in the last century
• Gold endowment – 93t produced in 2016 (80% artisanal and small scale mining)
• 2nd largest gold producing country in Africa
• One of the most stable governments in Africa
• Safe and easy to work –
• U.S. Announces Revocation Of Sudanese Sanctions Regulations("SSR"): New Opportunities
POSITIONED TO BE A MAJOR MINING DESTINATION

- Potential to re-emerge as a significant oil producer and become a mineral-based economy
- Mineral resources and oil reserves remain under-explored
- One of the last Precambrian terrains to be prospected
- Geological environments similar to large mineral deposits elsewhere globally – world-class deposits remain undiscovered
Major Pan-African Gold Deposits in NE-Sudan

Gold-Bearing Deposits in NE Sudan

ARIAB VMS – Oxide Au District

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- Source Tucker Barrie Presentation 2016
Sudan within the 20 countries producing 38% of world gold mine production

Globally total Artisanal workers are 30 million, 10 million are in Africa and more than 1 million in Sudan (10% relative to Africa)

ASM GLOBAL PERSPECTIVE
- 30 million ASMs in 50 countries Worldwide
- 12% of global Gold production (+/-350 tonnes)
GEOLOGICAL ENVIRONMENT OF SUDAN
Sudan has great mineral potential.

1m @16.6% Cu and 1.58g/t Au included in 12.9m@4.87%Cu and 1.07g/t Au

1m @18.5% Cu and 0.79g/t Au included in 7m@9.56%Cu and 0.86g/tAu

Pb

Cu

fluorite

graphite

Phosphate

MINERAL POTENTIAL
MINERAL POTENTIAL IN SUDAN

The main mineral potential includes:

- Precious Minerals: Gold, Silver, Platinum
- Base Metals: Copper, Zinc, Lead
- Other Metallic Minerals: Iron, Chrome, Manganese, Uranium, REE
- Agro minerals: Phosphates, Potash
- Industrial Minerals: Limestone, Marble, Gypsum, Granite, Kaolin, Graphite
- Gemstones

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Number of Licenses</th>
<th>Number Of Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Gold</td>
<td>49</td>
<td>36</td>
</tr>
<tr>
<td>2 Chromite</td>
<td>117</td>
<td>46</td>
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<tr>
<td>3 Gypsum</td>
<td>30</td>
<td>21</td>
</tr>
<tr>
<td>4 Salt</td>
<td>37</td>
<td>34</td>
</tr>
<tr>
<td>5 Iron</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>6 Marble</td>
<td>26</td>
<td>7</td>
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<tr>
<td>7 Manganese</td>
<td>14</td>
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</tr>
<tr>
<td>8 Mica</td>
<td>11</td>
<td>6</td>
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<tr>
<td>9 Copper</td>
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<td>2</td>
</tr>
<tr>
<td>10 Talc</td>
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<td>2</td>
</tr>
<tr>
<td>11 Feldspar</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>12 Quartz</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>13 White Sand</td>
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</tr>
<tr>
<td>14 Kaolin</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>15 Bentonite</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>16 Fluorite</td>
<td>2</td>
<td>1</td>
</tr>
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</table>

London Dec 12 2017

The Republic of the Sudan Ministry of Minerals
Sudan has a long history and a big heritage of Mining culture which go back to three thousand years when Nubians extracted gold and base metals and smelted iron to make water wells.
The mineral sector’s influence on Sudan’s economy was significant because of petroleum production and refining. In recent years, cement and gold production became more significant to the Sudanese economy. In 2016, Sudan played a significant role in the global production of gold, accounting for nearly 4% of the world’s gold mine output.

- Since the beginning of this decade, the mineral sector has played an important role in the economy of the country.
- Until 2009, the contribution of the mineral sector to GDP was about 1%.
- Since 2010, the contribution of the mineral sector to GDP increased to 2% and subsequently to 4% in 2016.
2\textsuperscript{ND} LARGEST GOLD PRODUCER IN AFRICA
Without any Commercial Gold Mines

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<thead>
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<td>1</td>
<td>South Africa</td>
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<tr>
<td>2</td>
<td>Ghana</td>
<td>Ghana</td>
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<tr>
<td>3</td>
<td>Mali</td>
<td>Mali</td>
<td>Mali</td>
<td>Mali</td>
<td>Mali</td>
<td>Sudan</td>
<td>Sudan</td>
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<tr>
<td>4</td>
<td>Tanzania</td>
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<td>Tanzania</td>
<td>Sudan</td>
<td>Mali</td>
<td>Mali</td>
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<td>Mali</td>
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<tr>
<td>5</td>
<td>Guinea</td>
<td>Guinea</td>
<td>Guinea</td>
<td>Sudan</td>
<td>Tanzania</td>
<td>Tanzania</td>
<td>Tanzania</td>
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<td>6</td>
<td>Togo</td>
<td>Togo</td>
<td>Sudan</td>
<td>Guinea</td>
<td>Burkina Faso</td>
<td>Burkina Faso</td>
<td>Burkina Faso</td>
<td>Burkina Faso</td>
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<tr>
<td>7</td>
<td>Zimbabwe</td>
<td>Congo, DR</td>
<td>Togo</td>
<td>Burkina Faso</td>
<td>Togo</td>
<td>Togo</td>
<td>Togo</td>
<td>Congo, DR</td>
<td>Guinea</td>
</tr>
<tr>
<td>8</td>
<td>Congo, DR</td>
<td>Sudan</td>
<td>Burkina Faso</td>
<td>Zimbabwe</td>
<td>Guinea</td>
<td>Congo, DR</td>
<td>Congo, DR</td>
<td>Togo</td>
<td>Zimbabwe</td>
</tr>
</tbody>
</table>

\begin{itemize}
  \item **Sudan Gold Production (in kg)**
  \item Gold Production 2010-2016
  \item >400 Tons
  \item Produced 93.4 Tonnes Of Gold In 2016
\end{itemize}
Project Overview: Block 14

- 7% royalty
- 15% corporate tax

**Ownership Interest**

<table>
<thead>
<tr>
<th>Ownership Interest</th>
<th>Current</th>
<th>After Development Decision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orca</td>
<td>70%</td>
<td>70%</td>
</tr>
<tr>
<td>Local Partner</td>
<td>30%</td>
<td>10%</td>
</tr>
<tr>
<td>Government</td>
<td>0%</td>
<td>20%</td>
</tr>
</tbody>
</table>
SUDAN GOLD REFINERY CO.LTD

- Located In Khartoum – Capital of Sudan
- Sudan gold refinery maintains a high quality wet chemical refinery (aqua regia process) as well as a complete precious metals melting system for accurate and reliable results
- The refinery is producing gold of different purities including: 995.0; 999.0; 999.9 in one kilo or large standard bars
- Refinery is producing silver of 999.0 fineness (400 kg/day)
- The refinery has an annual production capacity of 270 to 360 tons
MINING OBJECTIVES & POLICY

1. Diversify the sources of national income in order to revive the economy
2. Expand the national industrial base – add value for mining products
3. Provide employment opportunities and combat poverty
4. Increase the Gross Domestic Product
5. Conservation of the environment and encourage safe techniques for gold processing
6. Attract foreign mining investments and encourage national investors
7. Training and capacity building of workers in the mining sector
8. Develop and upgrade local laboratories as well as build up minerals database and develop geological researches
9. Enhance sustainable development projects in mining – corporate social responsibility (CSR)
10. Continuous upgrade of the geological & mineral maps of the Sudan
SUDAN PRO-MINING INVESTMENT FRAMEWORK

The Government is entitled to:

- 5 to 7% royalty
- 15-35% free carried interest
- 15% business profit tax
- Varied property taxes

- Attractive Mining Code and Investment Framework
- Exploration License 2+1 years term and renewable
- Mining Licenses – 25-year term and renewable
- Investors recover all capitalized exploration and development expenses
- Agreements cover both the exploration and exploitation periods
- Custom free importation of all mining equipment + VAT retention
- Majority equity ownership
- Right to transfer ownership
- Favorable foreign exchange rates
- No withholding taxes
- Access to the available data
- Commercial terms negotiable
MINERAL SECTOR DEVELOPMENT

>376 Companies Active in Sudan

- Large Scale Concessions 300km²+ 152
- Small Scale Concessions 1-5km² 154
- Tailing Processing 70

1M+ Artisanal Miners
more than 150 concession agreements for exploration and exploitation of various mineral commodities have been signed between the government of the Sudan and national and international mining companies.
PROPOSED NEW CONCESSION BLOCKS

160+ Concession Blocks Available for Investment

119 Blocks With Identified Mineral Occurrences

54 NEW Blocks Being Prepared
# Proposed New Concession Blocks

<table>
<thead>
<tr>
<th>Mineral Type</th>
<th>No of Blocks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gold + Silver</td>
<td>1</td>
</tr>
<tr>
<td>Potassium</td>
<td>1</td>
</tr>
<tr>
<td>Gold</td>
<td>64</td>
</tr>
<tr>
<td>VMS</td>
<td>2</td>
</tr>
<tr>
<td>Chrome</td>
<td>2</td>
</tr>
<tr>
<td>Gossan</td>
<td>15</td>
</tr>
<tr>
<td>Graphite</td>
<td>3</td>
</tr>
<tr>
<td>Uranium</td>
<td>17</td>
</tr>
<tr>
<td>Iron</td>
<td>6</td>
</tr>
<tr>
<td>Salt</td>
<td>4</td>
</tr>
<tr>
<td>Gypsum</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>119</strong></td>
</tr>
</tbody>
</table>

![Proposed Concession Blocks Pie Chart]

- Gold: 54%
- Gossan: 13%
- Uranium: 14%
- Graphite: 5%
- Iron: 3%
- VMS: 3%
- Gypsum: 3%
- Salt: 1%
- Potassium: 1%
- Gold + Silver: 1%

*Proposed Concession Blocks*
Specific area of cooperation may include, but are not limited to, such areas of mutual Interest as:

1. Mineral resources assessment
2. Geological mapping
3. Geochemistry
4. Geophysics
5. Geological hazards
6. Environmental studies, risk management and mitigation
8. Information systems; Publications, libraries and databases
9. Analytical methods in geosciences
10. Cartography and Digital cartography
Specific area of cooperation may include, but are not limited to, such areas of mutual interest as:

• Various and modern methods in minerals exploration
• Establishment of mineral polices in geodatabase management and mineral based economic strategy
• Value added mechanism in mineral commodity to avoid export as raw materials.
• Off–shore exploration (+ deep sea exploitation eco-friendly methods)
• Agro minerals/metals identification towards fertilizer industry
• Seismic Hazards studies with upgrading the seismological center in GRAS,
• Artisanal mining regulation and legalization to control the various hazards
• Remote sensing and land sat interpretation along with GIS soft wards.
5- Investment Opportunities in Mineral Development

- Investment is open for all mineral commodities, mineral industries and others.

- Mining Services cover:
  - 1- Equity Financing
  - 2- Concession Taking
  - 3- Mineral exploration and mineral resources evaluation,
  - 4- Mining development.
  - 5- techniques
  - 6- Feasibility studies,
  - 7- Equipment providing.

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Investment in mining services cont...

Innovation Technology

- Investment in the Field of Laboratory-Related Industries
- Investment in capacity Building and Training.
- The Establishment of Smelters, refineries..etc.. (copper smelter, steel, aluminum, chrome and ferrochrome industry).
- Fields of investment are open for product added values.

The Central Integrated Laboratories project is intended to provide multiple services:
- Sample preparation for chemical analysis;
- A wide range of wet & dry chemical analysis to provide accredited analytical results;
- Mineral treatment and mineral processing;
- Mineral separation: flotation, magnetic separation, cyanidization etc.;
- Close control of the results throughout.

1. Geotechnical Laboratory
2. Geophysical Laboratory
3. Petrography Laboratory for polish and thin section analysis
4. Sample preparation Laboratory
5. Chemical analysis Laboratory
6. Mine design Laboratory
7. Metallurgical Laboratory (Bench Scale)
8. Metallurgical Laboratory (pilot Scale)
9. Water and Environment Laboratory
10. Medical Laboratory
11. Meteors & Meteorites Analysis Laboratory
12. Isotope Laboratory
Industrial Minerals & rocks

• In Production (UTILIZED)
  Marble, Chromite, Gypsum, Talc, Kaolinite, Silica, sand, Wollastonite, Aggregates and Scoria.

• Not in Production (UNUTILIZED)
  Graphite, Magnesite, Bauxite, Barite, Bentonite, Kayanite, and Natural Pozollana.
Industrial Minerals
Graphite, Fluorite and Mica...

Data sources: Shape files (Minerals in the Sudan, Sudan States, River Nile)
Geographic Coordinate System: GCS_WGS_1984, Datum: D_WGS_1984, Adindan
Regional Geology Administration, Geological Research Authority of the Sudan, Ministry of Minerals, September, 2011

Prepared by: Hind Siddig Adam Hamed

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London Dec 12-2017
M A R B L E

• **MARBLE** is used in the production of Cement, quick lime, dimension stones and carbonate powder.
• The later is used in pharmaceutics, sugar, paints and poultry and in natural pozollan production.
• **OCCURRENCE**
• **The Red Sea state** - Dordaib, Tahilla, Abosamer and in Tahamiam.
• **The River Nile state** - Elkormot Valley, West of Berber, Abo Hamad, Al Shirek.
Examples of Range of Decorative Marble

N.M. 7  N.M. 20
N.M. 6A  N.M. 1
N.M. 8  N.M. 40B

Nile Rose

N.M. 6A  N.M. 40A
N.M. 11  N.M. 2
N.M. 10  N.M. 5

Nile White

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ACHIEVEMENTS OF THE CEMENT INDUSTRY IN SUDAN

• Self-sufficiency of (3) million tons per year domestic cement consumption.

• Relief the burden of 250 million dollars annually allocated foreign currency to import cement.

• The positive social impact of Employing a large number of workers as well as on the shipping sector,

• Contribution to the social RESPONSIBILITY such as Building villages, schools and other services like medical centers, mosques ..etc.
Cement Factories
Gypsum is a common mineral; in evaporates sedimentary rocks, often associated with halite, silvite, and sulfates.
Tin - Tungsten

Jebel Eyob which is. Strongly altered granite into greisen.
Chromite, Manganese & Iron

Iron Ore of Abu Tulo

Chromite

Mn
In Ingassana hills Chromite occurs frequently as veins lenses and pods. Most of the chrome ore from Ingassana hills and there is 44 companies have licenses of chrome.

Sudan Chrome (Cr₂O₃) varies from 26% up to 54%.
Black sands:
Titanium – iron – Thorium Minerals

- **Location:** Huge black sands accumulations occur at Red Sea Shore.
- **Dimension:** 6 km X 100 m X 2m.
- **Reserves:** 11 million tons of heavy minerals concentrates estimated to contain 600,000 ton of ilmenite, 110,000 tons of zircon and 45,000 tons of rutile and 3000 ton of monazite (Cerium Phosphate)

Sea ports and handling facilities

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SHOW CASES:-

COMPANIES OPERATING IN THE SUDAN

Alliance for Mining Co. Ltd

- On April 30, 2013, the Government of the Republic of the Sudan granted an exploration license for Block 30 in Red Sea State to Kush for Exploration and Production Co. Ltd. (Kush E&P)
  
- In the end of 2014, Kush E&P and Sudanese partners established a special project company – Alliance for Mining Co. Ltd. – to operate the GPP and hold production license

Managem Mining Company

Advanced Exploration and Pilot Development

- Proved 66t of Au at 1 out of 5 sites in 1 of their 3 concessions
- Heading for 250t of Au & associated metals
COMPANIES OPERATING IN THE SUDAN

Orca Gold Inc.
- Advance-Stage Gold Project in Northern Sudan
- Current Resources: 1.792 Moz Indicated Au resource at 1.82 g/t and 536k Inferred resource at 1.7 g/t
- On track to be first large scale gold mine in The Sudan

Ariab Mining Company
Open pit operation and exploration for VMS
Delgo Mining Ltd. is the gold productive subsidiary of the Turkish TAHE International Metal Mining Corporation which active in Block 17 northern Sudan – River Nile state since April 2010.
Conclusions and Way forward

- Sudan is the last major Precambrian terrane in Africa yet to be explored for mineral resources.
- The diversified geology which merges with neighboring African countries hosts a huge mineral potentials.
- Infrastructure is developing, and the environment of investment is encouraging.
Conclusions and Way forward .... Cont.,

➢ The mining industry remains a key sector of the economy of Sudan as signified by economic indicators.

➢ Sudan remains committed to maintain its investor friendly climate in mining

➢ Collaboration with industry and neighboring governments to strengthen the mining industry in Sudan and in the region.

➢ Participants are encourage to visit Sudan Booth to get more geological information and opportunities relating to other sectors
WAY FORWARD FOR THE SUDAN

- OPEN FOR INVESTMENT AND POSITIONED TO BE AFRICA’S NEXT MAJOR MINING DESTINATION:
  - Economic Sanctions Imposed By The U.S. Eased in January 2017

- UNDER EXPLORED:
  - Sudan Is The Last Major Precambrian Terrane In Africa Yet To Be Explored For Mineral Resources
  - Diversified Geology Hosts Huge Mineral Potential

- MINING-FRIENDLY:
  - Infrastructure Is Developing
  - Easy Permitting Process
  - Skilled Labour Available
Great Gate has opened for Direct Investment opportunities and great hope for new discoveries and development in SUDAN

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Finally you are warmly Welcome To visit Sudan and share our wealth.

THANK YOU

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3rd Annual Sudan International Mining Business Forum & Exhibition
27-28-29 March 2018 Grand Holiday Villa Hotel & Suites
& Exhibition Center, Khartoum, Sudan