Minerals of Somalia:
– From exploration to artisanal production to export

Abdulkadir Abiikar Hussein; London, UK; 25th January 2013
qaadir.abiikar@hotmail.co.uk

1. INTRODUCTION

Somalia's mineral potential was not adequately explored nor surveyed properly. Since colonial and post-independence time, the country remains to be one of final frontiers that will offer opportunities and surprises to companies that venture into. At present, an almost insatiable hunger exists for commodities and especially mineral resources. As the demand and price rise and the producing deposits dwindle, the global commodity sector is seeking new frontiers from which to satisfy the demand. Somalia is a new frontier area, not adequately explored that is ready to reveal its secrets of oil, gas, uranium, platinum, rare earth metals, gold, copper, iron, manganese, tin and gemstones.

2. GEOLOGICAL SUMMARY OF SOMALIA

1	Young volcanic intrusions in Awdal, Bakool, West Hiiraan, Gedo and west Bay near the Juba River	The young basalts – liparitic volcanics are exposed in small narrow areas.
2	Mesozoic to Recent sediments make up most of the exposed rocks of Somalia	Clastic and marine Jurassic sediments overlie the Precambrian and early Paleozoic. Cretaceous to Tertiary sediments with clastic sequences, evaporites and marine successions cover large parts of Somalia.
3	Two islolated uplift Neoprotrozoic – Early Cambrian complexes	One occurs west of Mogadishu in Bur Region – Bur Massif
		The second one occurs in northern Somalia from Borame, across Hargeisa, Sheikh, Erigabo to Ras Aseyr through Puntland. It's parallel to the Gulf of Aden.

- Bur Massif consists of gneisses, amphibolites, quartzites and marbles, intruded by granites. It is part of the Neo-proterozoic Mozambique Belt.
- The northern area with outcropping crystalline rocks, including the Darkainle alkaline complex, is part of an early Paleozoic fold belt.
- Bur Massif and the Northern crystalline basement used to be part of the Neoprotrozoic of the Gondwana, the super-continent that rifted, broke apart and drifted to carry Madagascar, India, Antarctica and Australia away from Somalia (Africa). The Neoprotrozoic of Tanzania, Mozambique, Madagascar and Somalia seems to have some similar characteristics.

3. EXPLORATION

From the colonial times to the period of 1960 – 1991, Somalia's mineral exploration was sporadic and it focused, to some extent, on the crystalline basements: Buur Massif, west of Mogadishu and the Northern Crystalline Basement, parallel to the Gulf of Aden. Some geological surveys were carried out mainly by the Geological survey of the Ministry of Minerals and Petroleum, funded by UNDP or some donor countries. Other surveys were either done by the Department of Geology of the Somali National University or the Russians (previously the Soviet Union). Those mineral surveys identified some valuable deposits of minerals though the minerals were not developed for production and export. By 1988, the mineral sector constituted only a tiny percentage of the GDP, equal to 0.3% despite the fact that minerals can help Somalia to generate hard currency needed for meeting the demands of its public services, if surveyed and developed.

4. ARTISANAL PRODUCTION

Currently, mining in Somalia is primarily for production of non-metallic minerals which consist of gemstones, salt, sepiolite, gypsum and kaolin.

A. **Kaolin:** Kaolin is used for making pots and water containers in the south. Beyond that using kaolin for ceramic industry is an elienOther resources such as rock salt destined for domestic purposes are produced by the folks traditionally.
B. **Rock-salt and sea-salt:** Salt trade goes back to the ancient times the Ajuraan were the rulers of the regions between Central Somalia to Mogadishu, Baydhaba and to Qallafe in Ethiopia on the Shabelle River. Salt was carried on camel backs. Nowadays, rock salt from Hiinlabi, Warshuba and Ba'adweyn in Galgaduud, Central Somalia, is mined and transported to Mogadishu and to some towns in the Somali State of Ethiopia. Elsewhere, salt is also mined: Hafun, Hurdiya and Zaila districts. Cxv
C. **Sea-salt**: In Lower Juba, on Kudha shores, on south-east coast of Somalia, south of Kismayo, sea water was desalinated using solar energy technologies to evaporate and condense into pure water. Likewise, in Jasiira, south of Mogadishu by few kilometres, seawater is trapped and left to evaporate under the sun, leaving salt rich in minerals such as Na, K, Mg, Mn, phosphates and chlorides.
D. **Sepiolite:** In El Buur, mining of meerschaum (sepiolite) was traditionally done over the years producing "Burjiko, Idin and Dabqaad and art-facts. The first description of a Meerschaum (sepiolite) occurrence in the E1 Bur area of Central Somalia was by Stahr et al. (1990). They described a material extracted and worked by local inhabitants, that produced ceramic and popular art objects from the raw (unburned) clay. However, sepiolite has an immense industrial uses which Somalis do not benefit from it currently, though in the future this world-class deposit will attract investments. Somalia produced small quantities of sepiolite, which was its only mineral export. The country has large deposits of sepiolite in the El Bur area. The Indho Qabyo prospect was estimated to have resources of 19 Mt of sepiolite, which included 3.5 Mt of meerschaum-quality and 15.5 Mt of sepiolitic material. Estimated resources in the El Bur area totaled about 100 Mt.
E. **Tin production**: During the colonial period, tin was commercially mined by the British in Somalia before World War II in Erigabo area. There are tin-tantalum deposits located at Dhalan and Majiyahan, which were exploited in the seventies by Technoexport of Bulgaria.
F. **Gemstones**: There is a growing market for gemstones and a sustainable potential in which people can thrive and make a living out of it. People are collecting gems from valleys and sometimes dig pits. Mining gemstones is artisanal and production is not developed for export. Gems for sale are not readily obtained. There are no authorised and licensed gem dealers who buy from collectors and cut the mineral and sell them. The markets of gemstones in Hargeisa, Bosaso and Mogadishu seem to be lacking orientation. In addition, there is no Gemmological Association that advises collectors, producers, cutters and exporters.

5. UNTAPPED POTENTIAL AND UNDISCOVERED RESOURCES

The mining sector of Somalia is new and virgin. Over the years, it was neglected and ignored. It has an immense potential, and there are countless options and opportunities to those who intend to invest in Somalia. The geological evolution of Somalia, together with abundance of mineral deposits and its diversity are pointers towards rich and massive potential destined for discoveries.

Untapped and unexploited deposits include gold, anhydrite, bauxite, columbite, copper, feldspar, iron ore, kaolin, quartz, silica sand, tantalum, thorium, tin and uranium.

On the beaches of East Berbera, the presence of simpsonite (a high-grade calcic aluminium tantalite) in heavy mineral sand deposits is reported. The mineral is found in the alluvial fans that drain from the crystalline basement. This implies the presence of undiscovered tantalum resources in the adjacent basement.

6. POTENTIAL TARGETS FOR EVALUATION AND PRODUCTION

A. **Cement Production:** There is a high-grade limestone (Calcium limestone) which is suitable for cement production near Berbera at Suria Malable near Berbera; north of Baardheere Bur Anole and Markabley) and at Jiiqleey (south of Beledweyne on the Shabelle River). The cement factory in Berbera used to exploit the limestone for production of cement, in addition to having one of the world's largest deposits of gypsum-anhydrite near Berbera. Around 80 – 90% of the raw material for cement production is limestone; clayey raw material (clay, mudstone or shale) accounts for between 10 – 15% and the remaining 5% is gypsum or anhydrite.

B. **Aggregate production:** Somalia is stabilising and bouncing back to normalcy. Many towns and cities are under construction: Hargeisa, Bosaso, Mogadishu, Baydhaba and Kismayo. Except Mogadishu, the other towns have ample rocks suitable for aggregates. Mogadishu does not have hard rock; instead it has soft rock (soft coral reef), that will fail in Los Angles Abrasion Test on hardness of the aggregates. Crushed rocks (aggregates) and concrete and asphalt batching plants will be a booming business that has a high priority for investment.

C. **Piezo-quartz mining**: Piezo-quartz is important for electronics and good deposits of the mineral are reported in Lafaruug and Da'arburuq in Somaliland. The Russians mined from those sites in the early 1980s. Piezoquartz are also found in the pegmatites of the NE Somalia.

D. **Uranium**: Documented uranium deposits are found in three areas of Galgaduud-Mudug and in Alio Ghelle in Bur Massif. These deposits need further exploration and evaluation, though in 1984 work began to develop them. The Alio Ghelle deposit is small carnotite deposit, with a reported indicated resource varying between 10-25 Mt at 0.07-0.08% U_3O_8.

E. **Iron ore deposits:** At Bur Galan and Dahimir, a low-grade iron resource was evaluated as having a depth of 200m each one and having a reserve of 394 Mt (@38.7%) grade and 30 Mt (@38.7%) grade respectively.

F. **Gold and platinum:** Traces for the existence of gold was reported in Arabsiyo and in El Bur (placer type) in Galmudug. To date the results of the testing for gold are not available. The northern basement complex consists of a series of high-grade metamorphic rocks which enclose at least two greenstone belts that are known to contain evidence of volcanogenic gold-rich base metal deposits. A number of layered and zoned mafic/ultramafic intrusive complexes are known, and stream sampling has delineated platinum group metal anomalies associated with these igneous complexes.

G. **Tin:** Deposits of tin-tantalum in Elayo, Majiyahan, and simpsonite in Berbera provide a good justification for exploration of those areas.

H. Lithium and salt mining: The geology of the rock salts of Galmudug resembles to have formed in playa-like environment. Further evaluation could be carried out on the rock-salt deposits to confirm the existence of Lithium carbonate below the salts.

I. Sepiolite production: This deposit is one of the largest in the world. The product can be exported from Hobyo port (Central Somalia), which is about 150 km away from El Bur.

7. CHALLENGES

A	Security	B	Infrastructure of the country
C	Previous data is not adequate	D	Expenses to re-do investigations

Agro-minerals			
#	**Mineral**	**Description of the deposit**	**Location**
1	Posphorites	Metamorphosed phosphorites containing 24% P_2O_5. The deposit size is not known.	Buur Massif at Moode Moode, some 25 km from Buur Hakaba, on the road to Baidoa.
2	Bird guana deposit	Migratory birds vising the island year after year	Hiis and Mait, on the north-east coast of Gulf of Aden
3	Apatites	Dharkainle alkaline complex with nepheline syenites and small carbonatite intrusives	Dharkainle complex, 33 x 3 km (length and width) is in northeast Borame.
4	Sepiolite	Playa-flat deposits	South of El Buur
5	Salt	Rock salt deposits in Galmudug, Zeila, Hafun and Hurdia	Warshuba, Hiinlabi, Ba'adweyn and Dhinooda, Zeila, Hafun and Hurdia
Industrial minerals			
5	Gypsum or (anhydrite)	The deposit is estimated to have a resource of 5 Mt of 80% pure gypsum and more than 2.5 Mt of 90% pure anhydrite	Suria Malableh, South of Berbera and at Jiiqleey, 45 km north of Buulo Burte.
6	Limestone	Limestone rich in calcium (Calcium limestone) for cement	Deposits are found at south Berber, Jiiqley in Beled Weyne and near Markabley north of Baardheere, east of River Juba
7	Piezo-electric Quartz	Pegmatite dykes and associated quartz veins emplaced into low grade metamorphic schists	Lafaruug, Da'arburuq, on Berbera-Hargeisa road and in Elayo.
8	Copper	Copper-bearing quartzites were surveyed at Bohl	At Bohl near Abasa Wadi, south of Boon in Somaliland
9	Iron	Low-grade iron-ore resources at Bur Galan at a depth of 200 m depth of 394 Mt at 38.7% Fe) and at Dahimir similar grade iron deposit exists	1. Buur Galan in Buur Basement. This resource is 394 Mt at 38.2% 2. Dahmir body has a workable resource of 31 Mt of Fe at 35 – 40%.
10	Uranium – carnotite (U_3O_8)	1. Small uranium (carnotite) deposit related to Buur Massif. 2. Surficial calcrete deposits with uranium oxide (U_3O_8) mineralisation in Gagaduud and South Mudug regions.	1. Aliyow Gelle near Bur Hakaba. The resource varies between 10-25 Mt at 0.07-0. 2. Ghelinsoor – El Buur area has an estimated resource of 8000 ton of uranium oxide (U_3O_8) from ore that grades 0.116%. 08% (U_3O_8). 3. Wabo-Mirig deposit was estimated to have a resource of 5,500 tons of from ore that graded 0.08%.(U_3O_8) 4. Dusamareb has an estimated resource of 3000 tons of from ore that graded 0.08%
11	Muscovite, tantalite, albite, microcline and quartz	Pegmatite dykes and associated quartz veins emplaced into low grade metamorphic schists	Majiyahan and Elayo, Puntland or Somaliland
12	Kaolin	• Kaolin produced from Lower Cretaceous weathering deposits in northwest Somaliland	1. NW Somaliland , between Las Gal and Merodile 2. Dunes between Marka and

		• Red sand dunes leaching and chemical weathering • Chemical weathering of the granites of Bur Haybe, near Wanle Weyn	Mogadishu. 3. Kaolin has been found in the Bur Area (Bur Bur, Bur Dubud, Bur Galin, Bur Narible, and Bur Siabo) and
13	Ilmenite and monazite	Alluvial deposits at the mouth of the Juba River and far upstream in Luuq area	Coastal dunes near the mouth of Juba River
14	bauxite	Surficial or shallow deposit, easy to mine with 45% available alumina - a high grade deposit.	A place north of Baydhaba by about 40 km north (Lat= 3.22N and Long= 43.42E)
15	coal	Coal deposit of the Dhaban Basin and in Hed Hed area.	Somaliland, near Berbera
16	Tin: cassiterite	Pegmatite dykes and associated quartz veins emplaced into low grade metamorphic schists	Majiyahan and Elayo, Puntland or Somaliland
17	Silica sand	The sand dunes between Marka and Mogadishu – Quaternary sand and older Red dunes	The coastal sand dunes between Mogadishu and Marka.
18	Co, Ni, Sc, Fe, V, Cr, Ti); and heavy mineral s like zircon, kyanite, ilmenite, and rutile	Transition' elements in laterites	The coastal sand dunes between Mogadishu and Marka.
19	Gold	Sulphide deposits in Arapsiyo and gold-quartz veins linked to pan-African granites	Arapsiyo (13.5 ppm) and Abdulkadir, West Somaliland
20	Molybdenum and bismuth	Vein enrichments associated with intrusive syenites and minor carbonates	Arabsiyo – Borame area in west Somaliland
21	Platinum	Placer (stream) sediments adjacent to Hamar gabbro in Barkassan – Mandhera complex	Mandhera complex near Mandhera not far from Hargeisa
22	Simpsonite (a high-grade calcic aluminium tantalate)	heavy mineral sands deposits and undiscovered tantalum resources in the adjacent basement.	The beaches east of Berbera implies the presence of
Gemstones			
23	Emerald, sapphire, ruby, acquamarine, opal, tourmaline, garnet, red spinel, beryl, quartz	1. Northern crystalline basement 2. Buur Massif from Dooy to West Hiiraan	From Borame, Hargeisa, Sheikh to Erigabo. The north seems to be richer in gemstones than Bur Massif. From as south as Yaaq Baraawe to El Ali and Mukiile in west Hiiraan.
Dimension rocks and aggregates			
24	Granite, marbles, sandstones	Bur and Bur Haybe deposit	Bur Hakaba and Wanla Weyn
25	Crushed rocks	Bur and Bur Haybe deposits	Bur Hakaba and Bur Weyn in Hiiraan, nearest aggregate source to Mogadishu.
26	Limestone aggregates	Bur Weyn in Hiiraan	Bur Hakaba and Bur Weyn in Hiiraan, nearest aggregate source to Mogadishu.
27	Feldspar		The country's feldspar deposits are found in Laferug, Berdale, Bur Degis, Bur Mado, Laferug, and Waaf Dhai.

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Abdulkadir Abiikar Hussein; London, UK
qaadir.abiikar@hotmail.co.uk

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