Policy Paper

ACCELERATING THE MINING, VALUE ADDITION AND USE OF KEY MINERALS IN BUILDING AN INTEGRATED ECONOMY

By
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INTRODUCTION

1.1 PREAMBLE

1. The Presidential Economic Council (PEC) was established in 2012 with the aim of discussing the current issues affecting the economy and generating harmonized solutions to them. At its first meeting, National Planning Authority was tasked with the mandate of preparing discussion papers for the Council. During its meeting of 6th May 2013, the Council resolved to have the next paper feature the subject of minerals and value addition. Subsequently the National Planning Authority has prepared this paper on accelerating mining, value addition and use of key minerals in building an integrated economy to be presented on 1st July 2013.

2. This paper provides a synopsis of the mineral's subsector in Uganda and discusses its potential contribution to building an integrated economy. It presents proposals for accelerating the current projects in the National Development Plan (NDP) 2010/11-2014/15 and also stimulating other economic sectors in line with the Uganda Vision 2040.

3. The proposals will build on the current work being done by various sectors in line with the general policy framework of government. The process of preparing this paper has been consultative and based on the various government reports. Research has been done to benchmark with some developed countries.

1.2 BACKGROUND

1.2.1 CONTEXT

4. Uganda Vision 2040 envisions a minerals sector that is a major driver of employment creation and GDP growth. It has therefore categorically placed the Minerals Sector under the group of opportunities that urgently need to be harnessed for the Country to achieve faster socio-economic transformation.

5. It recognizes the role mineral development will play in supporting the energy and manufacturing sectors and also promoting the Science, Technology and Innovations Sector. Equally significant is the fact that the NDP already outlines the strategies to improve this sector and identifies Iron ore and phosphates as key core projects. This paper accordingly details proposals to accelerate the implementation of these strategies among others with a view to triggering the necessary momentum for the achievement of Vision 2040.

1.2.2 POLICY, LEGAL, PLANNING AND INSTITUTIONAL FRAMEWORKS

Policy Framework

6. The Constitution of the Republic of Uganda places important natural resources including minerals under the protection of Government, on behalf of the people of Uganda. In order to develop Uganda's mineral sector and attract investment, the Government put in place the Mineral Policy in 2001.

7. The policy aims at establishing an internationally competitive investment environment for the sector, with conducive, stable, predictable, legal and fiscal environments to attract foreign and local investment for exploration and mine development. The policy objectives are:

- To stimulate mining sector development by promoting private-sector participation;
- To ensure that mineral wealth supports national economic and social development;
- To regularize and improve artisanal and small-scale mining;
- To minimize and mitigate the adverse social and environmental impacts of mineral exploitation;
- To remove restrictive practices on women's participation in the mineral sector and protect children against mining hazards;
- To develop and strengthen local capacity for mineral development; and
- To add value to mineral ores and increase mineral trade.

Legal Framework

8. The legal framework is enshrined in the mining Act, 2003 and the Mining Regulations, 2004, which vests the ownership and control of minerals in, on or under any land or water in Uganda in the Government. The key tenets of the law include: Ownership of minerals, the licensing regime, Royalties, Adequate compensation, Mineral agreements, and Environment, Taxation, and Mining regulations. The legal framework provides for mineral rights which include:

prospecting license, exploration license, retention license, mining lease and locational license as explained in table 1 below.

Table 1: TYPES OF MINERAL RIGHTS

Licensing Type	Prospecting License (PL)	Exploration License (EL)	Retention License (RL)	Location License (LL)	Mining License (ML)
Purpose	Search for minerals and evaluation.	Mineral exploration and quantification of mineral reserves.	Granted to the holder of EL in cases when the identified mineral deposit cannot be exploited due to economic reasons.	Granted to citizens of Uganda or in case of corporations, the citizens hold 51% and license is for operations of a smaller investment not exceeding USh10 million.	Mining operations.
Area	All over the country but outside existing License.	Maximum area of 500km2.	Same as the existing EL	Varies in size depending on the type of the license.	Not exceeding the area of EL.
Maximum Duration	One year and not renewable.	Three years, renewable for two terms of two years each and half area relinquished on each renewal.	Three years and renewable once for two years.	Two years and renewable every after two years.	21 years and renewable for 15 years. Sometimes the life of the reserve is considered.

Institutional Framework

9. The Department of Geology, Survey and Mines (GSMD), under the Ministry of Energy and Mineral Development, is mandated to perform the following: Mineral exploration and geological mapping; Geo hazards surveys; Geo-thermal energy surveys; Document and disseminate Geo-scientific data; carry out licensing and regulation of the mining sector; Technical support to both public and private investors in mining; and Laboratory analysis of materials related to earth science.

10. The Commissioner of GSMD is responsible for the grant and revocation of all mineral rights. The Minister responsible for the mineral sector plays an arbitration role in case of disagreements between the Commissioner and the private party. The decision of the Minister is subject to judicial review in the High Court if the aggrieved party files an application.

Planning Framework

11. The mineral sub-sector is in the process of preparing a subsector investment plan to guide the investments in the sector. Currently the sub-sector plans are expressed in the Ministerial Policy statements but all aligned to the National Development Plan. Over the last decade, the Government of the Republic of Uganda, World Bank, African Development Bank (AfDB) and Nordic Development Fund (NDF) funded and implemented the Sustainable Management of Mineral Resources Project (SMMRP). The project had an estimated total cost of about US$ 42.7 million. The project components included : - Strengthening of Governance and Transparency in the Mineral Sector Management; - Community Development and Mineral Resources; - Establishment of Environmental and Social Management Capacity; - Geo-Information and Development; and - Project Coordination and Management. The objective of the Sustainable Management of Mineral Resources Project (SMMRP) for the Republic of Uganda was to strengthening the government's capacity to develop a sound minerals sector based on private investments and improvements in selected artisanal and small scale mining areas. One of the achievements of the project was the high Resolution Airborne Geophysical Survey Programme involving magnetic, radiometric and electromagnetic surveys that is aimed at assisting and promoting mineral exploration commenced in December 2006. In addition the DGSM is implementing a computerized Mining Cadastre and Registry System (MCRS)

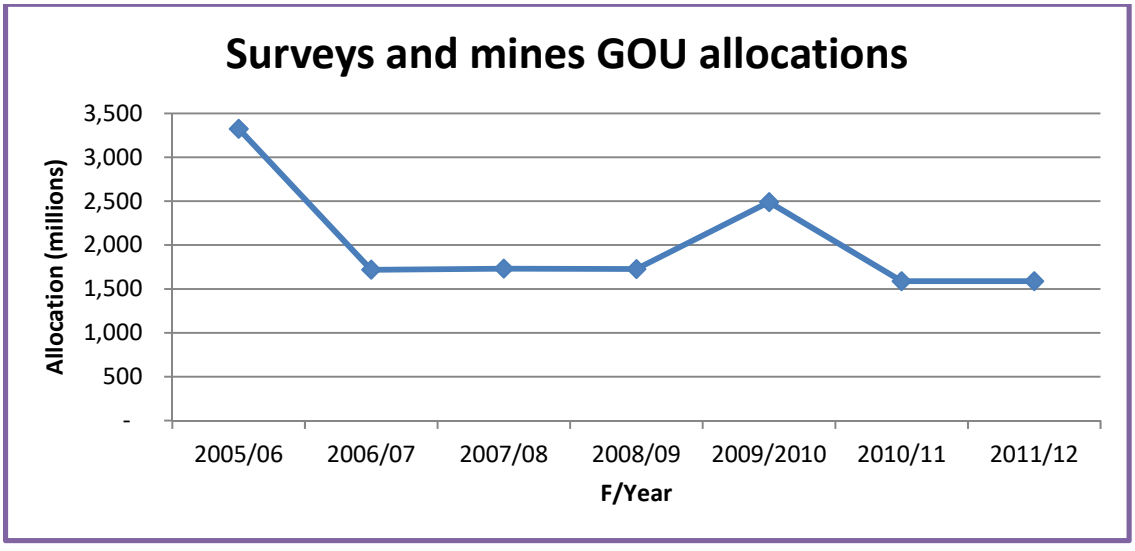
12. Over the last decades, the sub sector has funding challenges. The table below shows the sub-sector budget over the last 4 years. The major funding was for the

project which ended last year. The government appropriation has remained less that UGX 2billion over the years as shown in the graph below.

Table 2: sub-sector budget over the last 4 years

	Recurrent Budget estimates			Sustainable management of mineral resources	
F/Year	Wage (000,000)	None Wage (000,000)	Total (000,000)	Development (000,000)	Grand total (000,000)
2005/06	489	264	753	21,273	22,027
2006/07	577	260	837	24,169	25,007
2007/08	577	272	850	31,640	32,491,
2008/09	577	271	849	20,669	21,518
2009/2010	578	272	850	24,005	24,855

Figure 1: Allocations to Survey and Mines



1.2.3 MINERAL RESOURCES OF UGANDA

13. Uganda is endowed with a variety of minerals (Figure 2). The occurrences of these minerals is attributable to Uganda's favorable geology which comprises of very old rocks that have been subjected to several geological events in the past leading to

the mobilization of metals and their subsequent emplacement and concentration in economic deposits.

14. The Minerals that exist in Uganda are grouped into two functional categories, namely:

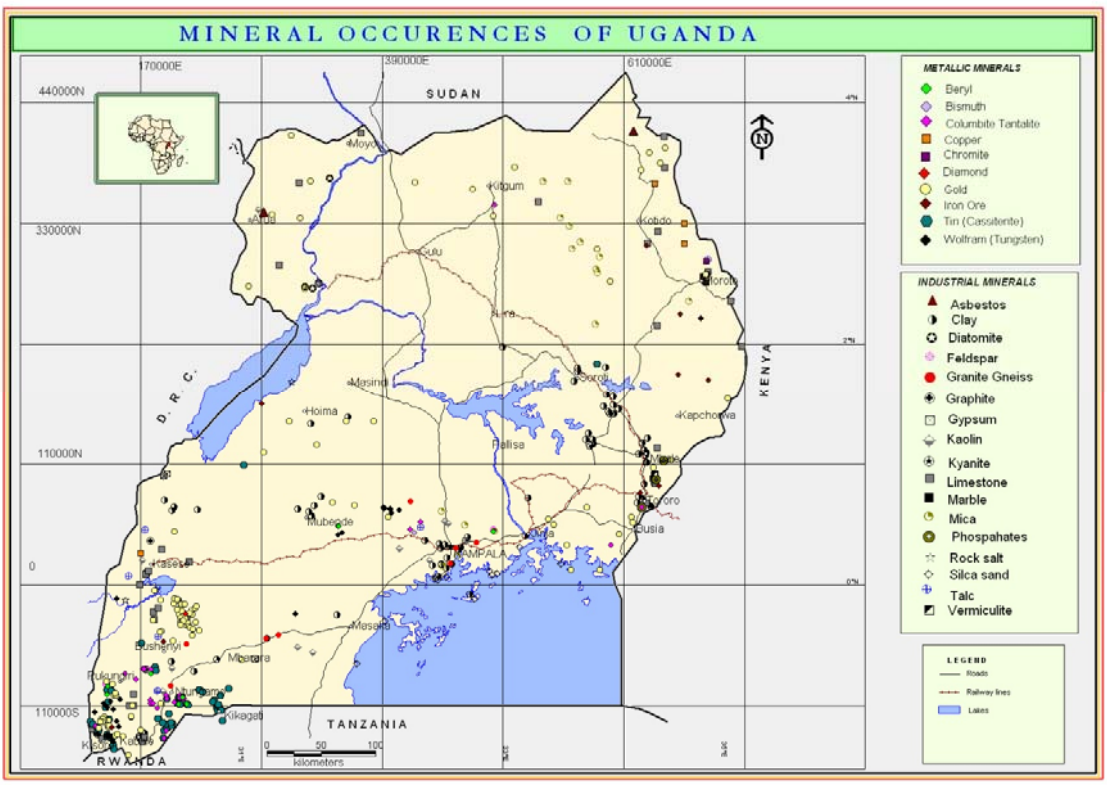
- *Metallic Minerals:* copper, cobalt, nickel, gold, chromium, platinum, lead, zinc, iron, tin, wolfram, beryl, niobium, bismuth, manganese, rare earth elements, uranium, silver, molybdenum, and diamond.

- *Industrial Minerals:* limestone, marble, dolomite, phosphates, feldspars, kaolin, bentonite, gemstones, talc, diatomite, graphite, mica, bauxite, barites, asbestos, lithium, ball clay, pozzolanic materials, potash, zircon, salts, gypsum, silica sand, kyanite, vermiculite and construction materials such as sands, gravel, hard rocks for aggregates and dimension stone resources.

15. There are also high potentials for radioactive elements (uranium, thorium) and rare earth elements (REE) as well as hydrocarbons. In addition, there are several potential geothermal sites which exist.

16. It is important to note that these occurrences are mapped based on preliminary, geological and reconnaissance data. This type of mapping simply establishes the occurrence of the different minerals. It does not tell the extent to which the minerals deposits occur or the technical and or commercial feasibility of the mineral. There is therefore need to undertake detailed exploration to ascertain the technical and commercial viability of the minerals known to exist in the Country.

Figure 2: MINERAL OCCURENCES OF UGANDA



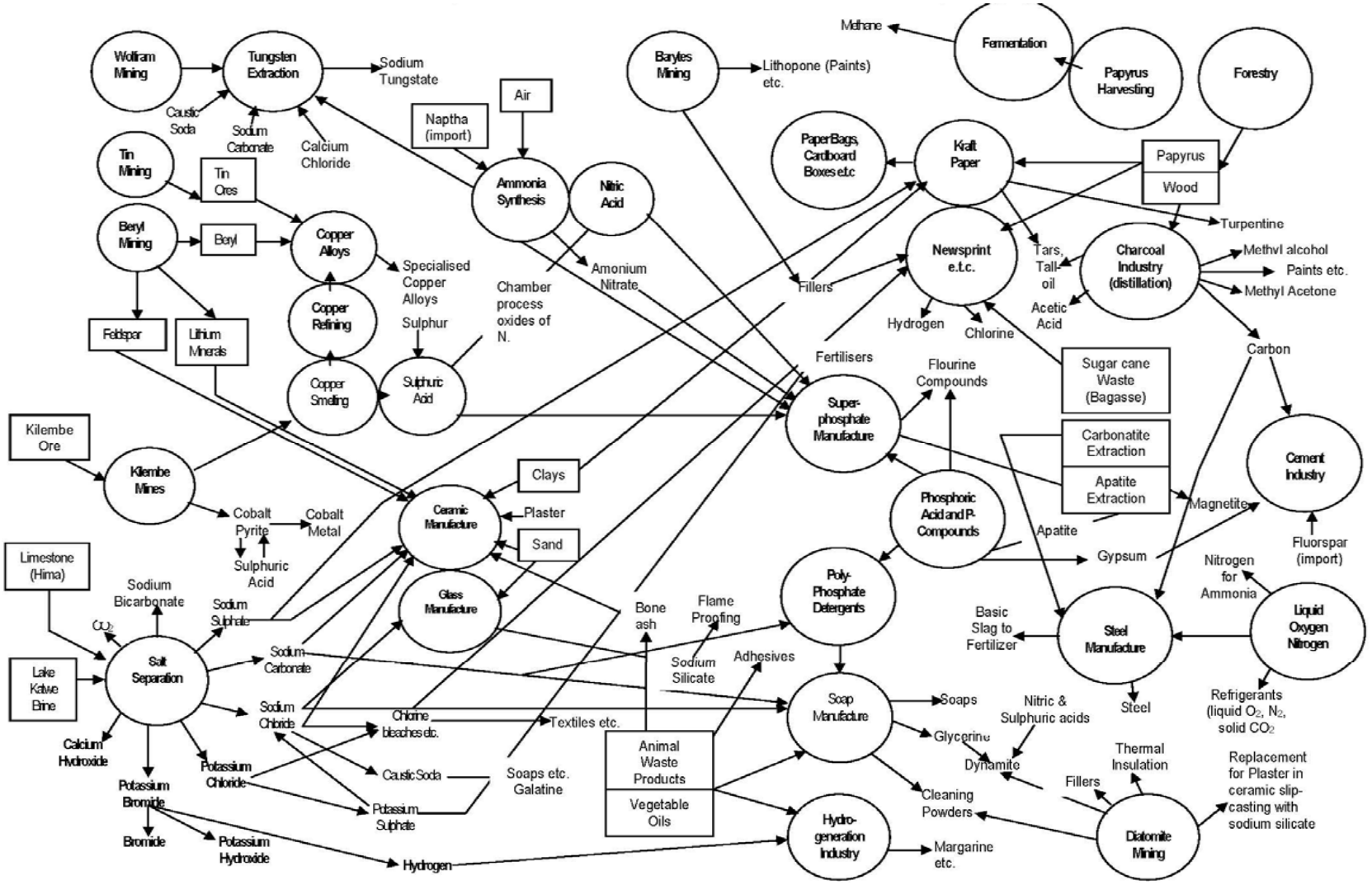
Source: Ministry of Energy and Mineral Development Annual Report, 2008

2.0 MINERAL EXPLORATION AND DEVELOPMENT

2.1 INTER-LINKAGES IN MINERAL DEVELOPMENT

17. Development (processing and refining) of a particular mineral is usually supported by other mineral products or alloys. Processing one mineral can involve several other minerals or their alloys e.g., processing of limestone to make cement requires iron ore, pozzolana, gypsum, kaolin and sand. Also one mineral can be processed to produce several value products like limestone can make cement, lime, agricultural lime, whitener and water purifiers. The key issue is to aim for higher value products. It is therefore important to ensure that mineral development is planned in a systematic manner to harness the synergies and complementarities that exist between various minerals. Figure 3 shows the interconnectivity of the various minerals and their supporting industries.

Figure 3: MINERAL DEVELOPMENT POTENTIAL OF UGANDA



Source: Uganda Mineral Journal

2.2 MINERAL DEVELOPMENT STAGES

18. Exploration is a high risk business where the odds of a major discovery are low. Exploration ranges from early-stage prospecting aimed at finding new mineral targets to aggressive drill programs designed for resource estimates. Three stages of exploration properties are defined: grass-roots, advanced and pre-feasibility. An exploration property is areas of land in which the legal rights or title have been acquired by a person or company.

Grass roots property

19. A grass root property is an early-stage exploration property where a small to moderate amount of previous exploration work has been completed and where no significant mineral deposit is known. Grass root properties may be highly speculative. It is possible that previous, usually historic, exploration may have identified a small mineral showing or deposit, but significant new exploration is required to property characterize any potential deposit. Deposits are poorly known here and its mineral showings only.

Advanced property

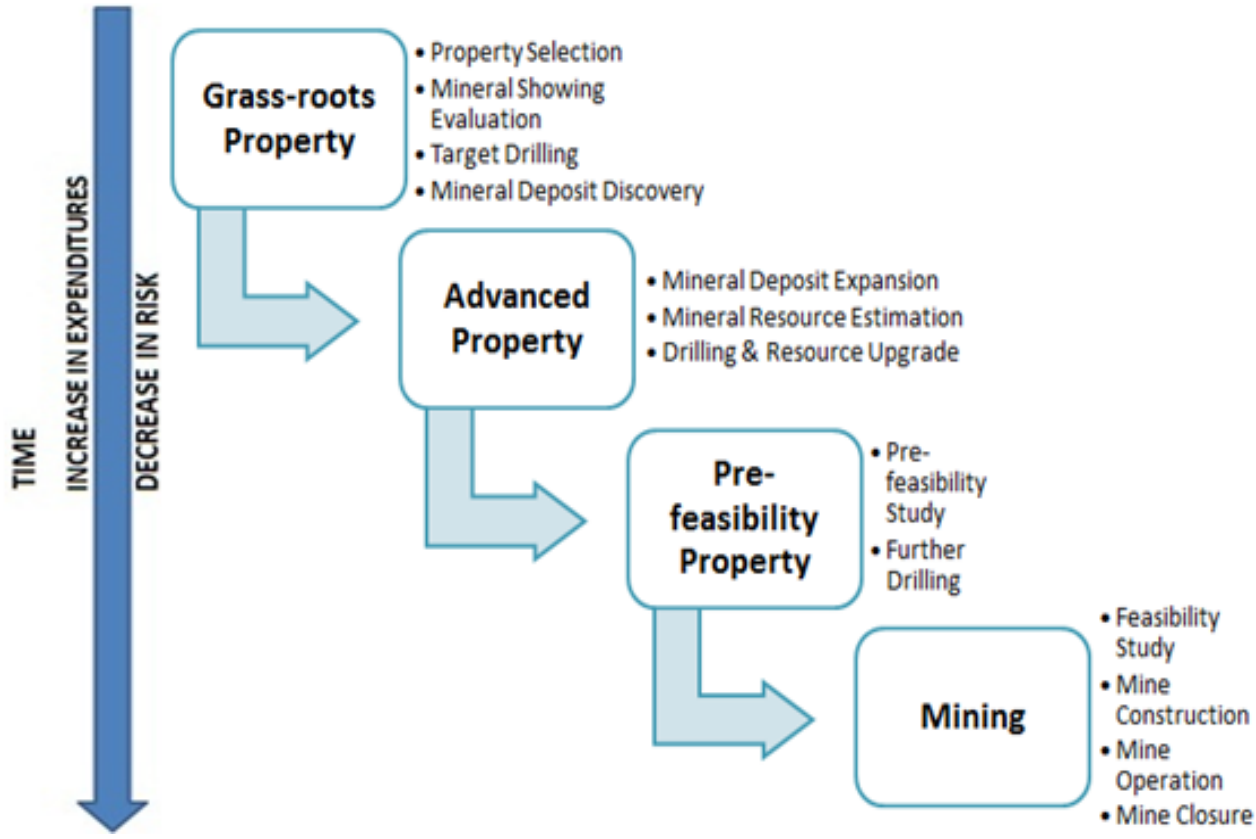
20. An advanced property is one that contains a known mineral deposit that requires further definition to assess its size and character. The mineral deposit shows potential to be economic, but more work is required to assess this potential. Here a potentially significant mineral deposit is known and exploration is focused on deposit expansion and inferred resources estimates. Here there is anticipation of moving toward a pre-feasibility study, metallurgical test work, and “order of magnitude” mine evaluation or scoping studies may be undertaken.

Pre-feasibility property

21. A pre-feasibility property is one that contains a mineral deposit in which a mineral resource estimate has been determined. The primary aim of exploration at this stage is to up-grade the mineral resource estimate in anticipation of proceeding with a pre-feasibility or feasibility study. Common features of a pre-feasibility property include: infill drilling to up-grade mineral resources estimates, Engineering, economic and environmental studies. Properties at the pre-feasibility stage have the highest value and least risk and hopefully one or more will progress to mining.

22. It is important to note that most of the data at the Department of Geological Survey and Mines is limited to at the grass-roots property level. The relationship between the level of development and private investment is such that the higher the development level, the lower the level of risk that will be borne by the private sector. A clear analysis is required to determine the lead level that Government should take in the various stages of mineral development.

Figure 3: MINERAL DEVELOPMENT PHASES



2.3 MINERAL EXPLORATION (DEPOSIT TO MINE)

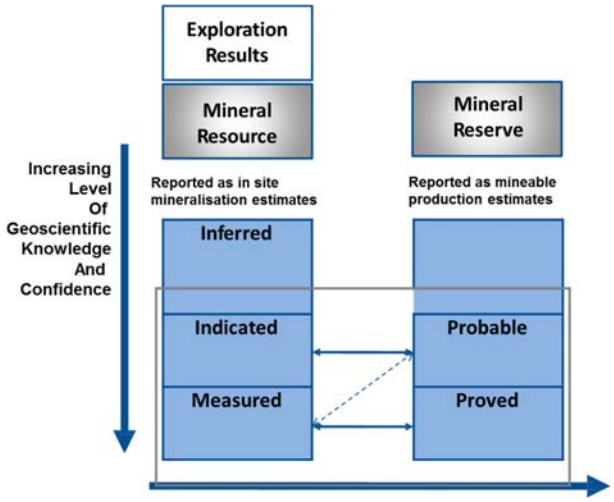
23. Mineral exploration is a process of finding commercially viable concentrations of minerals (deposits) to mine. It is a much more intense, organized and professional exercise and requires high level of expertise and equipment. The mineral exploration methods vary depending on the area being explored as well as the density and type of information being sought. The various methods commonly

used include: Geo-physical methods, remote sensing (aerial photography), Geo-chemical methods, Resource evaluation and Reserve definition.

24. The Uganda Sustainable Management of Mineral Resources Project, a programme for acquisition, processing and interpretation of geo-data was carried out from 2004-2009. An extensive airborne survey for geophysical data (magnetic, radioactive, electromagnetic,) was followed by ground geological and geochemical surveys. This geo-data helped in estimation of mineral deposits and their occurrence. Among the major outputs of this survey were: increments of reserves of vermiculite, indication of some iron ore deposits, discovery of uranium and 15 other types of minerals.

25. Figure 5 shows the various stages of exploration before a deposit is translated into a mineral resource with proven estimates.

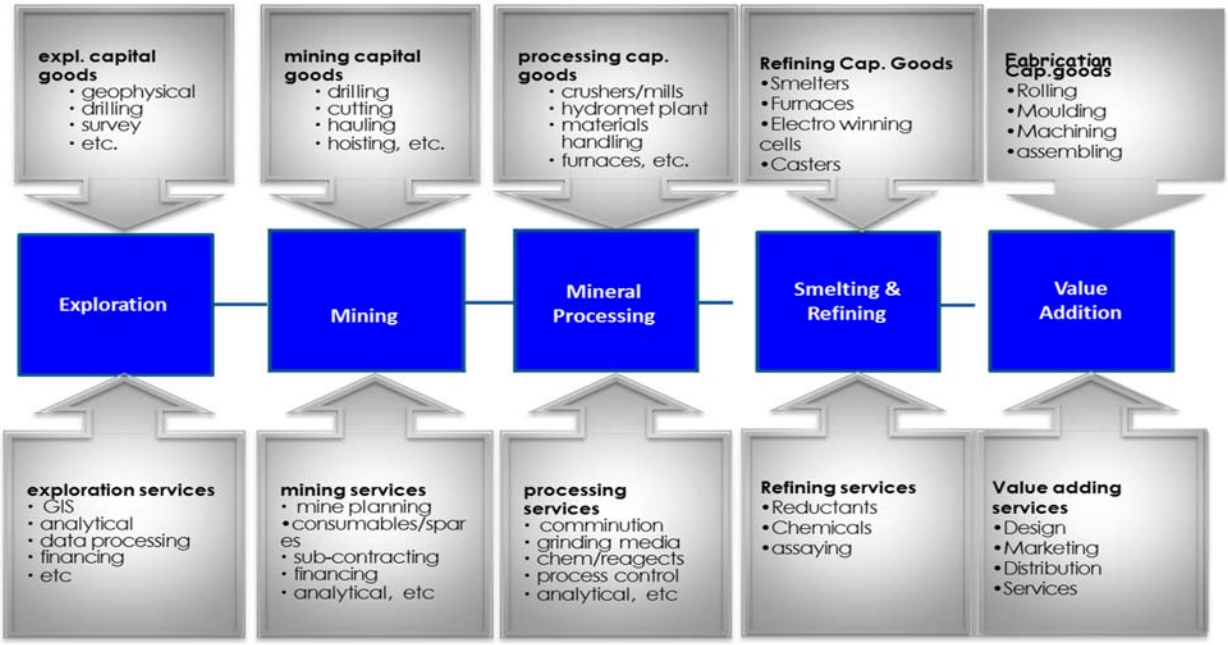
Figure 4: STAGES OF EXPLORATION



Source: Witts University, Mineral Economics Value Chain Analysis, 2001

2.4 MINERAL DEVELOPMENT (MINE TO VALUE CHAIN)

FIGURE 5: MINERAL VALUE CHAIN



Source: Witts University, Mineral Economics Value Chain Analysis, 2001

26. These mineral value chains must be analyzed in line with the industry they intend to support in the Country. Scrutiny of various value chains shows that employment opportunities are highest at the beginning and the end whereas capital is intensive in the processing and refining therefore a mineral economic strategy must look at the location of capital and risk versus the demand on the international and local markets. This should inform a beneficiation strategy for our Country.

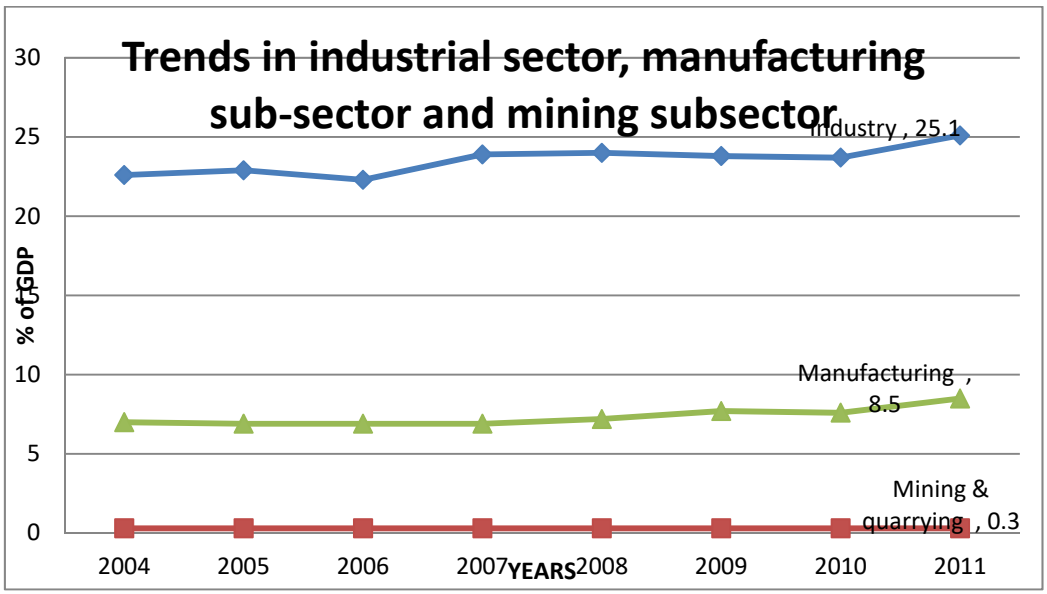
3.0 THE ROLE OF MINERALS IN BUILDING AN INTERGRATED ECONOMY

27. Globally, minerals have been used to stimulate industrialization and other sectors of the economy. Various minerals have varying multiplier effects and benefits to the economy. On some minerals, longer value chains with many secondary and tertiary industries can be harnessed, while others have limited effect. Therefore planning and investing in mineral development has to be undertaken based on their potential returns to the economy in terms of direct revenues, job creation and multiplier effects based on secondary and tertiary industries but also support to the other sectors of the economy.

3.1 MINERAL SECTOR CONTRIBUTION TO GDP

28. Mining is classified under the industry Sector of the economy. The industry sector in Uganda includes mining and quarrying, formal and informal manufacturing, electricity and water supply and construction. The industry share of GDP, at current prices was 26.3% in 2011/12. Although the contribution of industry sector to GDP has increased over the period, the contribution of the mining and quarrying sub-sector to GDP has stagnated at about 0.3% as shown by the graph 1. This implies that most of our industrial sector is not directly liked to use of local materials for aiding production

Graph 1: TRENDS IN THE INDUSTRIAL SECTOR



Source: UBOS statistical abstract (Various years)

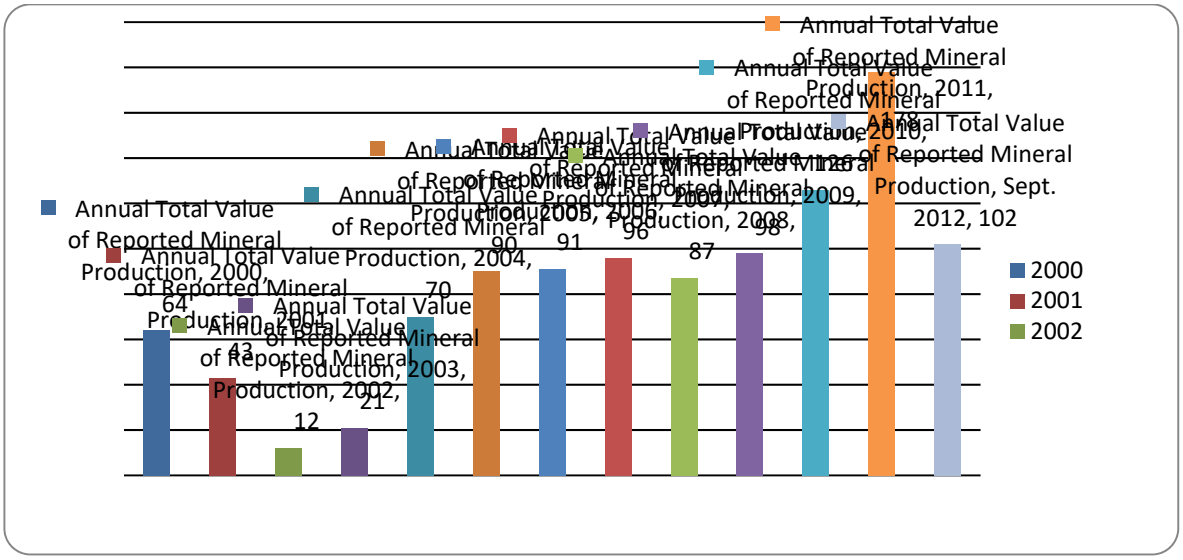
3.2 MINERAL PRODUCTION AND EXPORTS

3.2.1 MINERAL PRODUCTION IN UGANDA: 2002 TO 2011

29. Mineral production in Uganda increased by nearly ten-fold (967%) between 2002 and 2011. Mineral production rose from a total of 153,111 to 1,634,036 in this period. Of the nine key minerals produced in this period, Pozoliana has achieved the fastest growth rate over the 10-year period (2002-2011) increasing by more than 50-fold (5,477%).

30. The increasing trend of the value of reported production is shown in Graph 2. Over the FY 2011/12 the value of Uganda's mineral industry has grown strongly achieving average annual growth of 5 per cent.

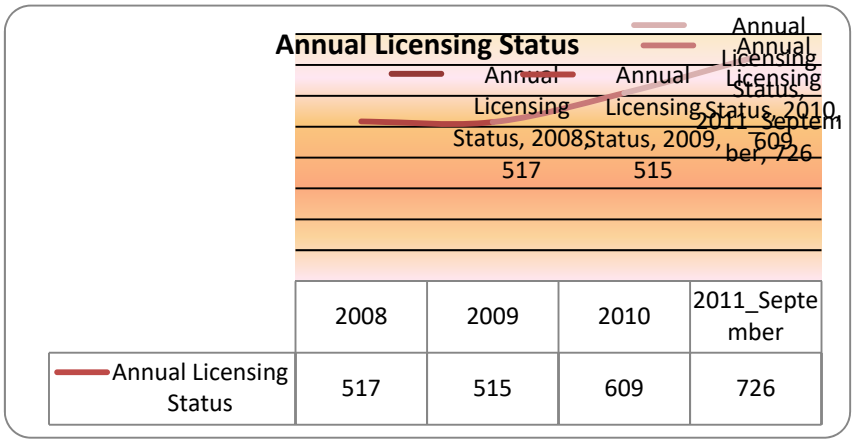
Graph 2: MINERAL PRODUCTION 2002 – 2011 (million tons)



Source: Annual reports of the Ministry of Energy and Mineral Development

31. Production of Iron-ore only got started in 2004 following the commencement of license issuance while that of Cobalt was suspended between 2002 and 2003 due to the temporary closure of the KCCL plant. Production of Gypsum ceased in 2008 having increased by nearly 16-fold between 2002 and 2008.

Graph 3: MINERAL RIGHTS LICENCING



Source: Annual reports of the Ministry of Energy and Mineral Development

32. By the end of September 2012 the licensing status stood at 634 licences compared to 726 licences by September 2011. These include 556 Exploration License (EL),

40 Location Licenses Two Retention Licences, 20 Mining Leases, and 4 Special Mining Leases.

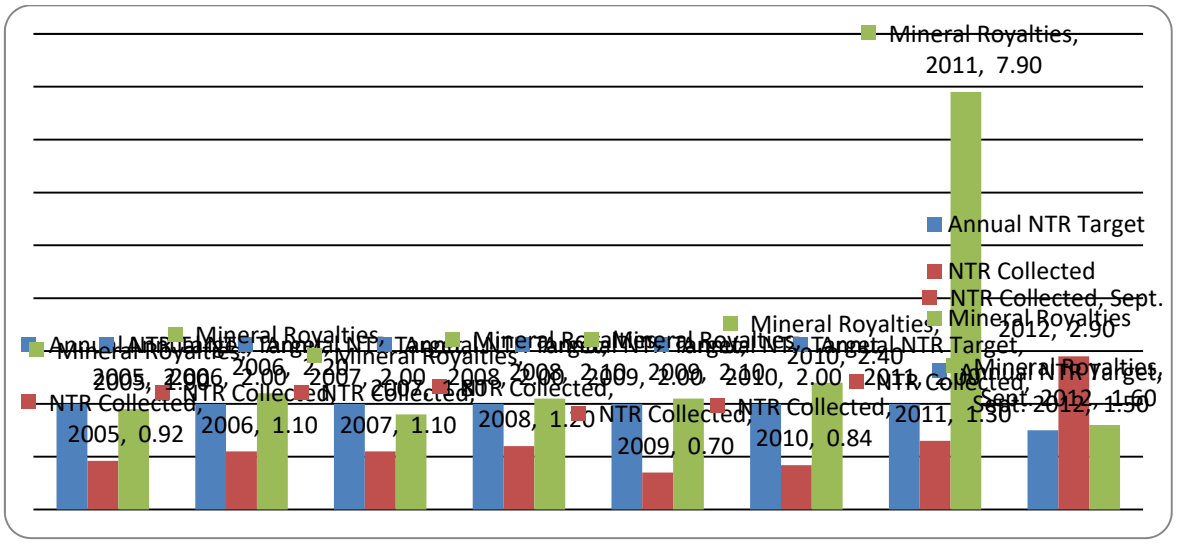
3.2.2 NON -TAX REVENUE

33. DGSM increased efforts to collect larger portion of revenues from the minerals sector in form of Non-Tax Revenue by levying application/issuing, registration and mineral rental fees, and collecting unit and value based royalties on mineral projects within the Country's borders. As more formal mines become established, the sector increases its bargaining power to review/change tax laws or royalties to better suit the objectives of the the National Development Plan

34. In the last three years Government has been realizing about UGX 3 billion annually from mineral fees, rent and royalty. This revenue is as a result of the investment Government put in geo-data acquisition, the rush for mineral right acquisition and weak performance of the Uganda Shilling against major foreign currencies.

35. Since implementation of the new NTR rates was effected on 1st October 2011, the Department expects to increase average NTR per financial year from the current NTR by 50% i.e. from UGX 3 billion in 2009/10 and UGX 4 billion in 2010/11 to UGX 3 billion in 2011/12.

GRAPH 4: NTR FROM MINERALS



Source: Annual reports of the Ministry of Energy and Mineral Development

3.3 ECONOMIC CONTRIBUTION OF THE MINERAL SECTOR

36. Investments in the Mineral sector have followed a similar trend to that of their production. The number of mineral and exploration licenses granted by Government increased from 91 and 19 to 311 and 138 over the period 2003 and 2011 respectively. This increase in licenses in the mineral sector was accompanied by a corresponding increase in incomes and revenues from the sector.

Table 3: INVESTMENTS IN THE MINERAL SECTOR 2003-2011

Project Output Indicator	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cumulative Exploration and Development (US $ million)	5.0	5.0	45.7	96.2	151.1	201.8	252.6	298.1	333.9
Cumulative fiscal revenues (NTR) from mining (US $million)	0.5	1.1	2.7	4.5	6.2	7.99.3	9.3	10.9	14.6
Total Mineral Licenses granted	91	111	164	207	250	293	232	284	331
Number of Exploration Licenses granted	19	78	55	57	105	119	66	138	138

Source: Department of Geological Survey and Mines

37. Total investment in mineral exploration increased by 67-fold (from US$5 million in 2004 million to US$340 million in 2011). License fees and royalties from mining have increased from US $0.5 million in 2003 to US$14.6 million in 2011. This rate of income increase is way beyond that of total GDP over the same period indicating that growth in mineral production has been a major driver of Uganda's GDP growth over the last decade. The current actual added value of the mining sector to Uganda's GDP is currently not well known but will soon be established upon the completion of the ongoing construction of new supply-use tables by the Uganda Bureau of Statistics in July 2013.

38. There are, however, several Private Sector Investment Studies that have been conducted in the past by the Uganda Investment Authority (UIA) in collaboration with Uganda Bureau of Statistics (UBOS) and Bank of Uganda (BOU) to ascertain the actual investments realised by licensed projects in general. The Investor Survey 2011 is one of such studies that were intended to generate adequate statistical information to update the investor register. This survey targeted all domestic and foreign licensed projects from 1991 to 2010 whose status was not established by the previous surveys. The Survey targeted all domestic and foreign projects licensed by UIA between 1991 and 2010, but whose operational status had not been established during the previous Private Sector Investment Surveys. A total of 3,153 were covered in this latest survey and 16 of them were mining projects with a planned investment value of US$ 51,033,500 of which US$

102,757,348 was actually invested. This represented 1.8% of the projects surveyed.

39. To date UIA has licensed 153 mining and quarrying projects, with a planned investment value of US$ 783,345,559 projected to create 17,669 jobs. It is not however clear what is actually on the ground apart from the 16 projects that the above mentioned survey covered.

3.4 MINERAL ANALYSIS

40. In Uganda's case, over 27 potentially viable minerals have been mapped and explored. However, detailed exploration and feasibility has not been carried out therefore most of them are still at preliminary stages of development. The analysis was based on the potential direct revenues, job creation, length of value chain (multiplier effect) and support to other sectors. These attributes distinguishes the six key minerals below from the others. They include: Iron ore, Phosphates, Limestone, Uranium, Geothermal and rare earth minerals. However, Geothermal should not be classified as a mineral due to its indefinite nature if properly utilized. Its sometimes classified as renewable source of energy. The following sections discuss each of these minerals in turn.

3.4.1 IRON ORE

41. Iron ore occurs mainly in two areas in Uganda, as hematite ore in the Muko area (at Butare and Kashenyi) in the Kabale and Kisoro districts and as (titano-) magnetite in Sukulu and Bukusu carbonatites in the Tororo district. At Butare an ore estimate of 1.2–2 Mt is given. At Sukulu the magnetite estimate is 45 Mt with 62% iron content. At Bukusu the estimate of iron ore is 23 Mt with 10–15% TiO_2. The Ti-content of magnetite in both deposits is a limitation for its use, they need to be separated. In many deposits ilmenite occurs in titanomagnetite as fine exsolution lamellas, making separation almost impossible. If both minerals are possible to liberate by grinding and separate by weak magnetic methods, then Bukusu may have potential as an iron ore. Essential questions will be the grade and the recovery.

Figure 5: Iron Ore Sample

42. Muko-type iron ore is of high quality and is composed mainly of very fine-grained (10–30 μm), oriented and massive hematite. The amount of silicates is small in the massive ore but sometimes there are spots of carbonate. Chemically the iron ore is pure, and the chemical impurities like phosphorus, sulphur, chromium, titanium or vanadium are very low. According to chemical analyses, a typical Muko-type iron ore contains 97.9% Fe_2O_3, 0.05% P_2O_5 and 0.65% SiO_2 and 0.004% S (Data & Ongee 2005). Results were similar and only minor variation was found in localities visited by the project team. Iron content in samples from Butare was 69.3% Fe (99.2% Fe_2O_3,), in Rutoma 57.7–68.7 Fe (82.5–98.3% Fe_2O_3,) and in Makanga 67.0% Fe (95.9% Fe_2O_3). Titanium, vanadium and chromium were low: 0.02% TiO_2, 0.017% V and 0.08% Cr (5 samples).

43. Uganda presently has seven steel mills that mostly use scrap as the basic raw material. The national demand for steel products is estimated at a little over 140,000 MTpa while the current production level is estimated at only 57,200 MTpa (MISSB, 2006). The lack of enough steel and steel alloys has not only crippled the industrialization process but has increased the cost of production. Currently the manufacture of steel machinery is quite impossible due to the low availability of steel.

44. When processed, Iron Ore provides steel whose products are mainly used in the construction of high ways, dams, buildings, industrial complexes among others. However, it can also be used for fabrication of steel machinery and equipment that is required for the value addition process of other products. Figure 6 below summaries the potential end products and uses of steel in an economy.

Figure 6: End Uses and Processes of Iron Ore

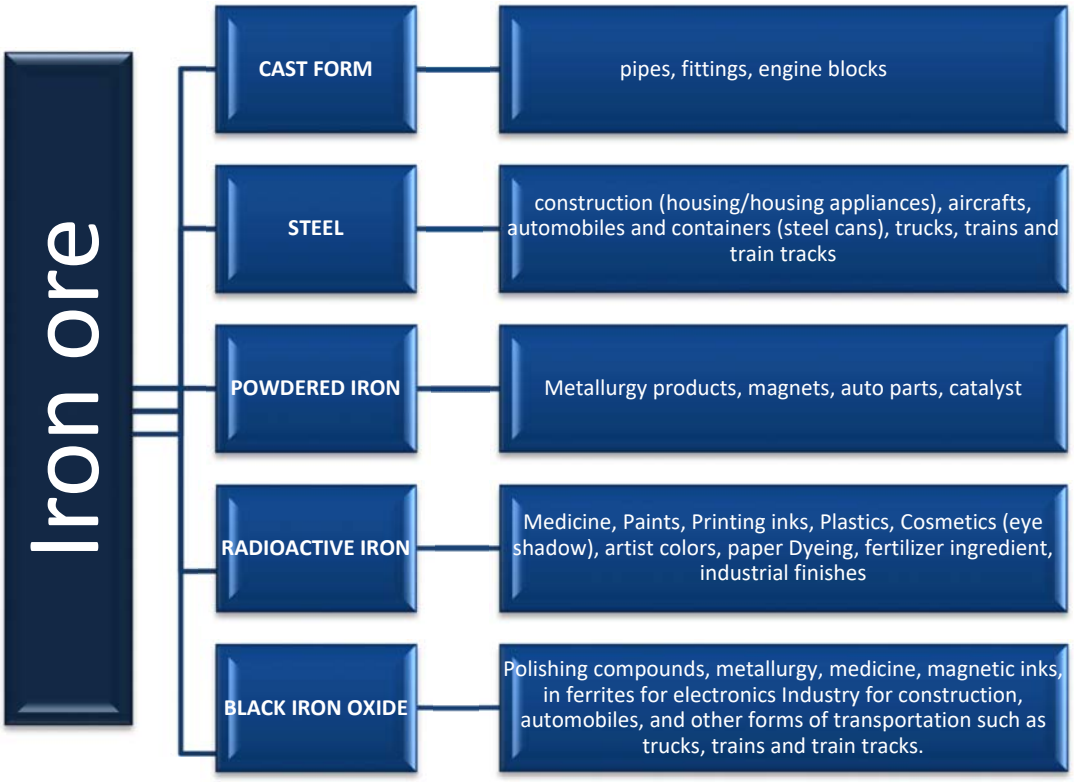


Table 4: IRON AND STEEL MILLS IN UGANDA

Steel mill	Production facilities	Installed Capacity (MTpa)	Rolling Capacity (MTpa)	Actual Production (MTpa)	Product Range
Steel Rolling Mills Ltd, Jinja	2 x 8MT IF 1 x 15 MT EAF	70,000	50,000	40,000	Rebars
Tembo Steel Ltd, Lugazi	1 x 1.5MT IF 1 x 2.0 MT IF	9,000	9,000	7,200	Rebars Angles
Tembo Steel Ltd., Iganga	1 x 5 MT EAF	12,500	10,000	6,000	Rebars Angles Hollows
BM Steel, Mbarara	1 x 3 MT IF	Not working	Not working	Not working	Not working
BM Steel Kilembe	1 x 2 MT IF	4,000	5,000	4,000	Rebars
E. A. Steel Corp.	1 x 10 MT EAF	24,000	Not working	Not working	Not working
UGMA Eng. Corp.	2 x 1MT IF	4,000	2,000	-	Rebars
Total	-	**123,500**	**76,000**	**57,200**	-

Source: MISI, 2006

Table 5: IRON ORE DEPOSITS IN UGANDA (UIA, 2008)

Deposit location	Iron ore grade	Deposits
Butare, Kabale	90-98% Heametite	500 MT
Kashenyi, Kyanyamuzinda, Kamema	90% - 98% Hematite	NA
Mugabuzi, Nyaituma	Hematite	20 MT
Bakusu, Nakhupa, Nangawale, Surumbusa	Magnetite	41 MT
Sakulu, Tororo	62 %Magnetite	45 MT
Napak, Tororo Hills	Magnetite	Not known

3.4.2 LIMESTONE

45. Limestone is a key input in production of cement and hydrated lime dust both of which are key inputs in the construction of highways, bridges, dams and most of the infrastructure that is key for Uganda's achievement of the Uganda Vision 2040 targets. Figure 7 below details many of the other potential end uses and products of limestone.

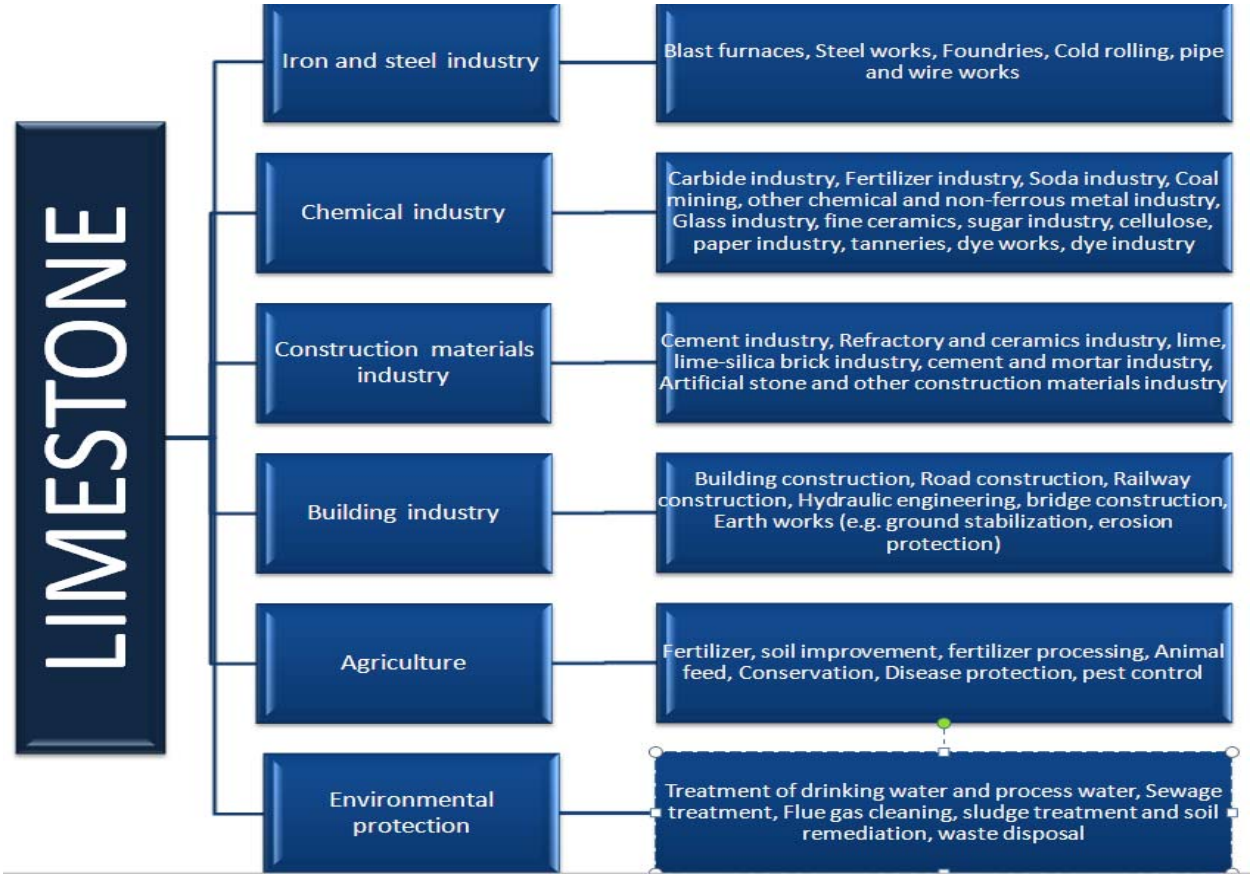
Figure 7: Other potential end uses and products of limestone

46. Currently the production capacity of cement in Uganda is about 2 million tones whereas the demand is at 3 million tones. A bag of cement in Uganda is about USD 11 compared to USD 3 in Malaysia and USD 4 in china. The limited access

and high cost of this critical input increases the cost of doing business and reduces the pace of development.

47. In Kasese, limestone reserves are estimated at about 18 – 20 million tonnes, tororo the limestone reserves are exhausted and in Karamoja there's very large deposits marble although the amounts have not been quantified. This sector is fairly developed compared to other minerals.

Figure 8: POTENTIAL END USES AND PRODUCTS OF LIMESTONE



3.4.3 PHOSPHATES

48. There are several alkaline/carbonatite complexes in eastern Uganda, best known are Sukulu and Bukusu, which host major resource of apatite, and also magnetite, Nb minerals and REE. Carbonatitic limestone (soevite) can also be used for cement production with certain restrictions, caused by high P-content. From the total resource, 130 Mt have been identified to contain pyrochlore on an average of 0.2% Nb2O5. In addition the soils contain 45 Mt of magnetite. The Bukusu

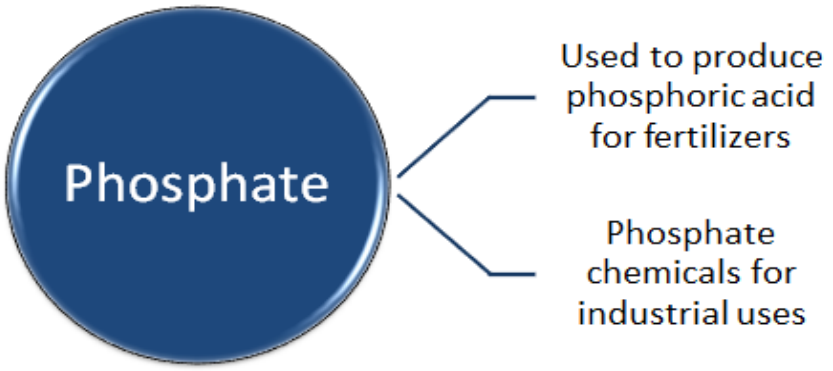
carbonatite also hosts a significant phosphate resource at Busumbu which was exploited from 1945 to 1963. Semi- processed material was sold to Kenya. An estimated 8.5 Mt of residual soils grading an average of 13% P2O5 have been identified at Busumbu. Also the (titano-) magnetite content is high.

49. Residual soils at Sukulu are estimated to be 230.8 Mt, averaging 12.8% P2O5 and 0.241% Nb2O5. Approximately 60–65% of 100% P2O5 report to the +325 mesh size fraction and 60–65% of the total Nb2O5 tonnes report to the -325 mesh size (Lamb, H.J., 1982). The 325 mesh size is 0.044 mm. The +325 mesh material indicates that the +325 mesh material equals 123 Mt @ 15.63% P2O5, 0.16% Nb2O5 and 34.05% Fe2O3 (Lamb, H.J., 1982). In addition the soils contain 45 Mt of magnetite. Figure 9 below shows a deposit at sikulu in Busia

Figure 9: Deposit at Sikulu in Busia

50. Phosphates are a key input in manufacturing of phosphates fertilizers. There's no known domestic producer of phosphate fertilizers in the country at the moment and those in use are mainly imported. The phosphate reserves in eastern Uganda are estimated at about 50 Million tonnes. This has hampered the usage of fertilizers in Uganda to stimulate agricultural production with estimates of current usage at 1kg/hectare where as in Kenya it stands at 31.3kg/hectare. The current cost of fertilizers in Uganda is at USD700 per tonne, compared to USD 250 in Kenya. Scientists estimate that fertilizers can boost yield by over 50%. Although the investor has had license over 8 years (since 2002), no tangible development has been done due to land issues and investor willingness to compensate the land owners.

Figure 10: POTENTIAL END USES AND PRODUCTS OF PHOSPHATES



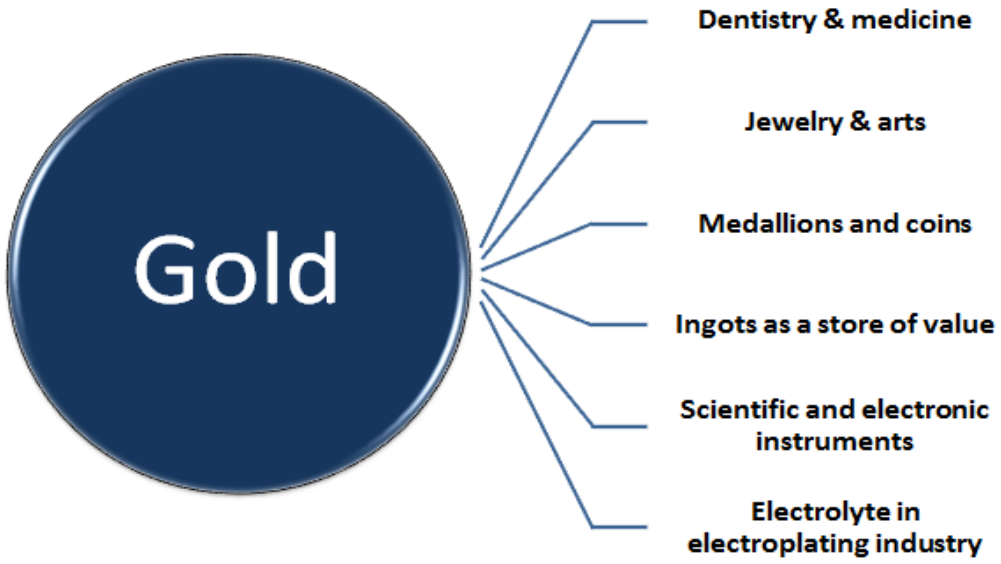
3.4.4 URANIUM

51. In the Uganda Vision 2040, it's estimated that over 24,000 MW will be produced from nuclear power which will complement other sources of energy including HEP, thermal, geothermal. This requires us to develop the uranium potential in the country to support the production of nuclear energy. According to the Uganda mineral profile 2011, Uranium is found in scattered deposits in Buganda, Ankole, Karamoja and covers an area of 2882 km2. Over 80 targets country wide discovered with 10 targets being first class order. The ten priority sites include Arua, Pakwach, Gulu-Kitgum, Masindi, Hoima-Kibaale, Fort-Portal and Mbarara-Ntugamo areas.

3.4.5 GOLD

52. Gold occurs in several prospects in Uganda. These include Karamoja, Busia-Tiira, Bugiri-Namayingo, Mubende, Kitaka-Buhwezhu area(Kitaka, Anderson's reef, Buckley's reef, Muti River, Mashonga, Chonyo River). Others include West Nile (Warr and Zeu), Hoima, River Kafu, Lira (Icheme and Barr) Aboke-Aloi and Kaliro-Ivuka. There are currently four small gold processing plants at Rupa (Karamoja), Busitema (Busia), Kamalenge and Kisita in Mubende. Most gold mining is done by artisan and small scale miners. There is a lot of illegal trading of gold going on.

Figure 11: POTENTIAL END USES AND PRODUCTS OF GOLD

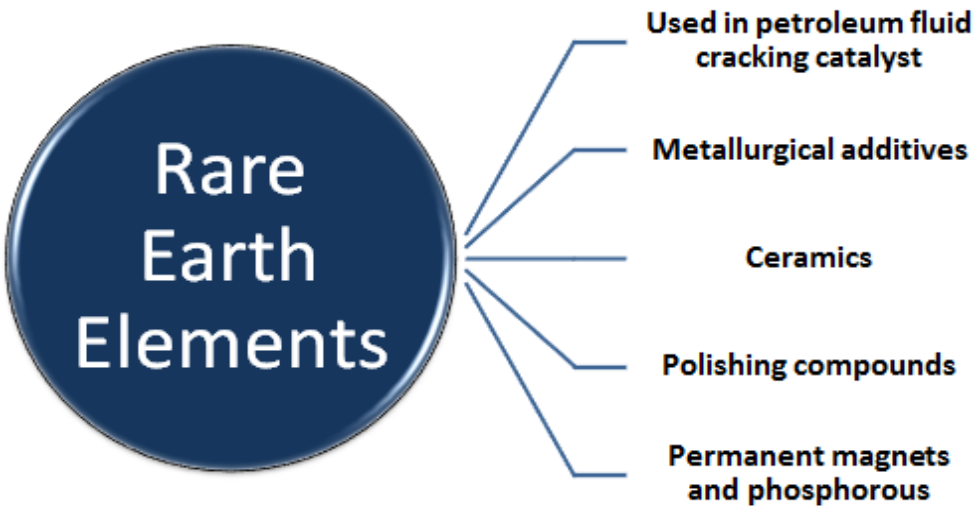


3.4.6 RARE EARTH MINERALS

53. Rare metals are metals that are scarce in terms of quantity or difficult to extract in high-purity status due to technical reasons or considerable financial requirements. There are a total of 31 chemical elements that are generally referred to as rare metals. Today, rare metals are essential materials to support industries of high-tech products that are needed in daily living and their production has been increasing as a result of improvement of refinery / smelting technologies. They are used as alloys, catalysts, materials of atomic reactors, permanent magnet headphones, compact discs, semiconductors, and batteries.

54. Rare earth minerals have been discovered in Bugiri and south east of Mashonga. Other prospects are reported in carbonatites in eastern Uganda like Sukulu, Lolekek ,Toror and Napak. Cerium and lanthanum are reported at Surumbusa and Bukusu in Manafa District. The Sukulu apatite also contains some amounts of rare earths and 0.32% La2O3 has been reported. Lanthanum is recorded in Sukulu west valley soils. High Lanthanum values which are reported at Butiriku may also point to the presence of discrete Rare earth bearing minerals. Strong rare earth anomalies were identified at Toror, Lolekek and Napak in Karamoja. This is one of the most interesting and economically significant finding that commands world market and should be explored and developed.

Figure 12: POTENTIAL END USES OF RARE EARTH MINERALS



Geothermal Energy

55. Geothermal energy is a renewable energy source in form of heat stores within the earth's crust. It is renewable because the earth's heat is being constantly replenished by the decay of radioactive elements. It is a clean energy source with less pollution, does not produce waste or toxic substances thus have minimum environmental impact. However, it requires careful drilling as it can trigger earthquakes and or lead to local depletions.

56. Uganda has the right and favorable geology for existence of geothermal resources. This good geological potential includes the tectonically active rift valley in western Uganda and its associated recent volcanism. The hot springs are genetically and spatially related to recent volcanism. Geothermal surface manifestations in the area include several hot and warm springs scattered from southern edge of the rift valley to its northern edge. Other manifestations include gaseous emissions and mineral precipitates. However, existence of geothermal resources is not enough for successful development. It is only a prerequisite.

57. Geothermal is a reliable energy source. Geothermal plant capacity factor range between 70-90% hence it is full operational all year around supplying a large volume of power. Geothermal energy can produce electricity in stable manner without any seasonal or daily fluctuation. It is a stable energy source. Geothermal power needs no fuel costs in the operation stage. It is an environmentally friendly energy source locally and globally that there is little emission of greenhouse gases. It has no combustion process. This energy source contribute to host community like supplying hot water for fish farming, horticulture (flower farming), irrigation,

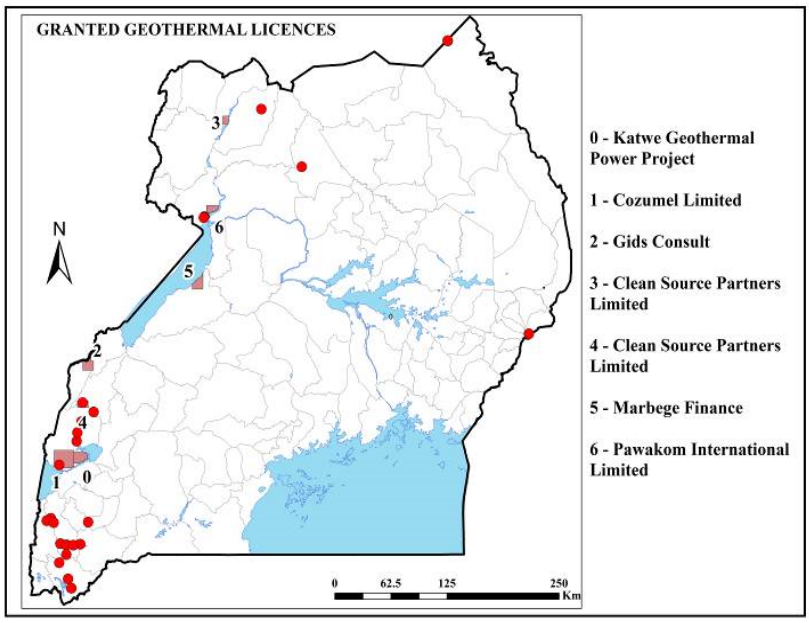
local industries, drying seeds, warming houses, swimming, recreation, employment. Example is Multi-purpose use of geothermal energy in Kenya where it used for electrical power, heat and carbon dioxide for flowers. Compared to Gas turbines, combined cycle, coal, diesel and hydro, geothermal energy has the “lowest annual operational costs” among the energy sources. Annual costs (US$/kw-yr.) is about 300 compared to 2000 hydropower.

58. Kenya has some 7,000MW geothermal potential with a current installed capacity of 204MW in 2010. Since it largely depends on imported fuel and its hydro power is easily affected by drought, Kenya has an aggressive development plan of geothermal energy. Kenya plans to expand geothermal capacity to 2,500MW by 2029. Kenya established Geothermal Development Corporation (GDC) as a vehicle to attain this development plan.

59. Uganda's vast natural geothermal resources should be drivers to set out a supportive framework to entice investment in exploration and development geothermal energy. With the acknowledgment that the structure of the unit must change to meet its expanding responsibilities a new organizational structure is needed to spearhead development of geothermal resources in Uganda. New organizational structure is needed because of specialization of geoscientist and engineers (geologist, geophysicist, geochemist, environmentalist, IT specialist, chemist, Reservoir Engineer, Drilling Engineers) in the geothermal industry. Success stories in Kenya involved creation of KENGEN and Geothermal Development Corporation for geothermal development. Rwanda has also formed a geothermal institution and as of now, there are yet to drill for geothermal.

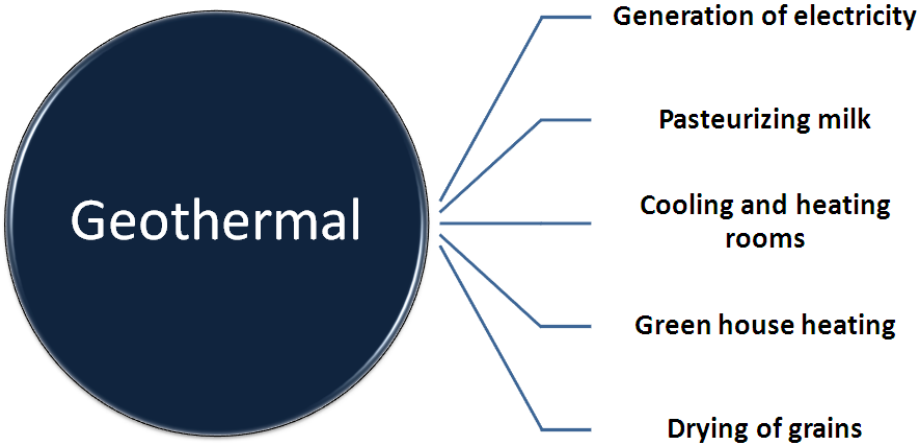
60. Currently, pre-feasibility studies for geothermal development are on-going at Panyimur (Nebbi), Kibiro (Hoima), Katwe-Kikorongo (Kasese) and Buranga in Bundubgyo. About seven licenses were granted to private investors. Red dots in figure 11 below show geothermal resource sites in Uganda.

Figure 13: GEOTHERMAL RESOURCE SITES IN UGANDA



Source: Annual reports of the Ministry of Energy and Mineral Development

Figure 14: POTENTIAL END USES OF Geothermal energy



4.0 CHALLENGES TO MINERAL DEVELOPMENT IN UGANDA

61. Whereas Uganda has commercially viable stocks of minerals, value addition and use of these minerals has hitherto been compromised by a host of issues. These issues are partly generic and partly specific to the respective minerals.

4.1 GENERAL CHALLENGES

4.1.1 POLICY FRAMEWORK:

62. Mineral Policy: The mineral policy is blind to the strategic nature of the various minerals that occur in Uganda. It doesn't classify or differentiate them according to their potential contribution to the economy. As a result, the licensing regimes for the different minerals are more or less the same. The geothermal energy is currently considered as a mineral. This will lead to the revision of the mining Act to suit the policy direction.

63. Licensing policy and regulatory regime: Uganda's current licensing policy and regulatory regime is not robust enough to ensure strong governance. The lack of a comprehensive appraisal of mineral rights poses challenges when it comes to dealing with elements of non-compliance. There is no separation of mandate for issuing the licenses and regulating the performance of licenses. There are challenges of inappropriate grant of mineral rights. Limited or no' due diligence is done to ensure that prospective licensees have the financial and technical capabilities to carry out real exploration and mining operations. In addition several technical submissions presented for evaluation are substandard professionally. The regulations do not impose specific limits of required financial and technical capabilities thus leaving it to the technical staff to determine what is appropriate.

64. The licensing policy is based on first come first served basis, which does not create good value in resource management and leads to lack of transparency. This policy has to be reviewed particularly in those parts of the country where there is sufficient data which can be used for licensing.

65. Inadequate Monitoring of Compliance and performance: There are inadequacies in monitoring compliance and performance of licensees due to many reasons including limited manpower in the Geological Survey and Mines Department, inadequate financial resources, and lack of a clear robust system. An internal appraisal carried out by the Ministry indicates compliance to be as low as 30%.

4.1.2 LAND ACQUISITION:

66. The Constitution of Uganda clearly delineates surface rights and mineral rights with regards to mineral exploitation. The surface rights belong to the people and the mineral rights belong to the state. Although there's a clear mechanism of acquiring mineral rights, the process of acquiring surface rights depends on the people occupying the land and the land tenure system which is a challenge. The law requires that before the certificate of Environmental impact assessment and or mining lease is granted, all the land owners are fully compensated. However mining may not start at all the sites at ago. Also the mind-set of people who are occupying the land thinking that investor will get very high returns lead to them demanding exorbitant prices. This delays project development and results into high investment costs discouraging reliable investors.

67. These issues have led to the stagnation of developing Sukulu Phosphate deposit, Tiira Gold Mine at Busitema and, to a certain extent, the expansion of Namekhela Vermiculite mine and iron ore development in parts of Muko in Kabaale and Kisoro districts.

4.1.3 ADEQUATE AND RELIABLE INFRASTRUCTURE, THE TRANSPORT AND POWER GRID:

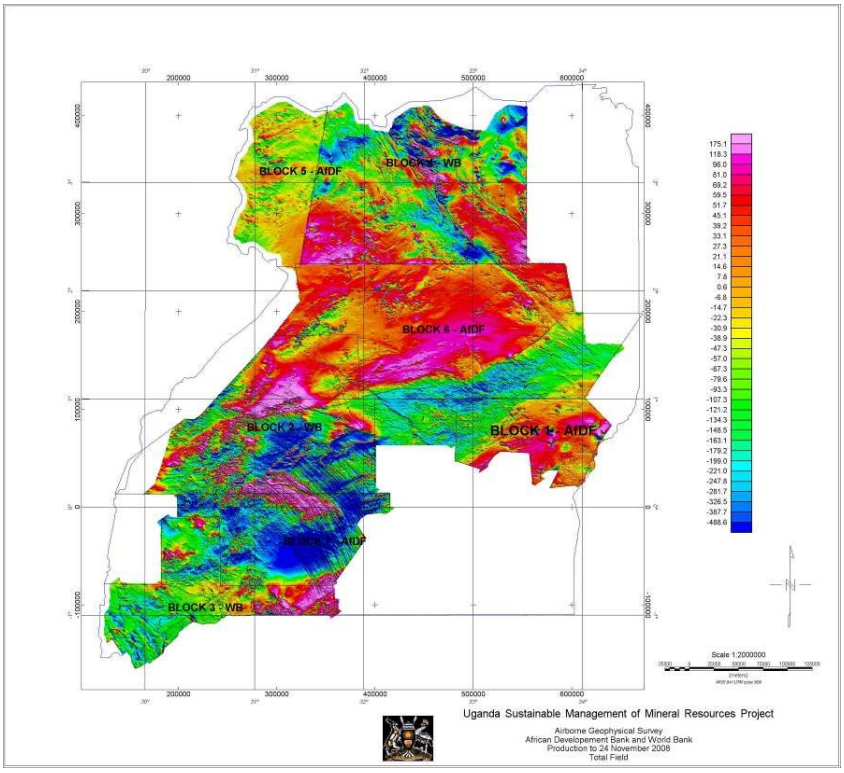
68. The scattered nature of minerals all over the country poses challenges to the provision of power supply and transport infrastructure. Lack of a functional railway system and all-weather roads to link mining and commercial centers poses barriers to would-be investors.

69. Value addition for some of the minerals requires a lot of energy in the refining process and subsequent manufacturing processes. This coupled with high cost of electricity compared with other countries deters investment in Uganda's mineral sectors.

4.1.4 DETAILED EXPLORATION, EVALUATION AND DEFINITION OF MINERAL RESERVOIRS:

70. Since 2004 Government has invested in acquiring, processing and interpreting geophysical, geochemical and other geological data to understand the location, availability and viability of Uganda's mineral potential. Figure 15 shows some of the airborne survey maps. However, as earlier explained this is a preliminary stage of exploration, and available geo-data may not provide sufficient information to enable an investor take a business decision.

Figure 15: Airborne magnetic map of Uganda (Reconnaissance data).



4.1.5 PROJECT READINESS:

71. Effective marketing of Uganda's mineral sector as an investment destination requires the preparation of the relevant studies as a precondition. Comprehensive exploration work and technical studies required to demonstrate project feasibility and economic viability for identified mineral occurrences are currently lacking. This inhibits marketing of concrete investment projects in the mineral sector because most of the minerals don't have feasibility studies that potential investors can utilize to make business decisions. In cases where investors have been willing to bear the additional costs of undertaking the necessary preparatory studies, there is evidence that they have encountered delays in processing the relevant licenses and Environmental Impact Assessments (EIAs) permits. EIA procedures by National Environmental Management Authority (NEMA) are particularly deemed to be cumbersome.

Institutional and Industry Capacity:

72. Accelerating the development of the mining industry demands a high degree of institutional competence and a minimum level of agility in industry players. Skilled personnel such as geoscientists, mining engineers, and other expertise in the area

of value addition are critically wanting in the country. The capacities of the various Government departments responsible for steering the development of the mining sector also needs to be enhanced in terms of mandates, equipment and personnel. There is need to argument the efforts made to train staff over the last and limit the staff turnover due to low levels of remuneration in the Public Service. The situation is compounded by the persistent lack of professional courses like mining engineering, metallurgy, mineral processing, and geophysics in Uganda's institutions of higher learning. There's inadequate institutional capacity and in appropriate set up to match with the changing demands.

Small scale miners

73. Over 30% of the sector's earnings are attributed to small scale and artisanal miners whose activities are not only illegal under the current law, but considered destructive to the environment due to the crude methods of exploration and extraction used. Some training to increase skills has been undertaken but a solution to formalize the activity has to be found because of its importance in being a source of income for many. There is need to improve their mining technology, environmental awareness, market information and handle social issues.

74. Smuggling of un-refined minerals to neighboring countries is a big problem and it makes value addition unviable.

Access to affordable finances

75. There is a lack of access to affordable finances to fund high risk investment in mining sector. The mineral sector has had a limited recurrent budget to carry out operations. If the sector is well catered for financially, it is able to generate significant revenue in form of non-tax revenue and income tax for the country. Reports from the MEMD indicate that if an additional budget of UGX 1 billion is granted to the mineral sector to enhance compliance so that all mineral right holders are able to pay royalties, fees and other rent on time, and also carry out the agreed work programme, that would generate UGX 8 billion per year as Non-Tax Revenue.

4.2 SPECIFIC CHALLENGES

4.2.1 IRON ORE

76. Fragmentation of licenses makes mining and value addition unviable for big investors. For Iron Ore alone, Government has so far issued 32 exploration licenses, 4 mining licenses and 4 Location licenses for iron ore. Given the resource estimates in the country, it would be better to exploit this resource under one major license.

77. Analyzing the current mining license shows that some obtained the license just to mine but not to add value (refining or smelting). E.g. Gold is exported as raw concentrate.

78. Suboptimal Utilization of minerals: Some of the ways in which both Government and investors put minerals is not prudential. There are cases whereby public facilities have been erected on ground where mineral deposits are confirmed (a school has been built on Nangalwe iron ore deposit while houses have been built on iron-ore deposits in Kabale) In other cases, private investors have failed the broader objectives of integrated development of the Iron Ore in their pursuit of their narrow objectives . In Manafwa District, Iron Ore is being used as road gravel simply because the investors extracting Vermiculite do not have storage ground for the Iron Ore that is a byproduct of their activity)

4.2.2 GEOTHERMAL

79. License holders are not adhering to their work and expenditure commitments.

80. Lack of equipment like Magnetotellluric (MT) and Transient Electro Magnetism (TEM) which probe deeper into the geo thermal reservoir.

81. Lack of geothermal feasibility studies.

82. Lack of legal and regulatory framework and institution for geo-thermal development. In Kenya, the Geothermal Development Company (GDC) was set up to fast track the development of geothermal resources. It is 100% state owned and it's functions include:

    i. To promote rapid development of geothermal resources in Kenya through surface exploration and drilling for steam.

    ii. To avail steam to power plant developers for electricity generation.

iii. To manage the geothermal reservoirs- to ensure constant supply of steam for power generation.

iv. To promote alternative uses of geothermal resources other than electricity generation.

4.2.3 LIMESTONE

83. Limestone has over 48 Exploration licenses. The biggest limestone deposits also co-exist as marble. There is therefore need to make a strategic decision on whether to extract it as marble or limestone

84. License holders are not adhering to their work commitments.

85. Fragmentation of licenses makes mining and value addition unviable for big investors.

86. Categorization of grade of limestone or marble to determine what should be used for cement, agricultural lime or tiles.

4.2.4 PHOSPHATES

87. Currently over 17 Exploration Licenses and one Retention License have been granted to explore for phosphates however one of the major licenses is expiring in June/2013. Local communities who settled on the phosphate deposits need to be relocated before mining can start. This has caused a long delay in permitting mining of this important resource.

4.2.5 GOLD

1. Over 300 Gold exploration licences have been issued by the GSMD. However, the following challenges still exist:

    i. Inefficient mining methods by artisan and small scale miners.

    ii. Mercury pollution by small scale miners at Bugiri – Namayingo border.

    iii. Illegal trade, mining and unregulated artisan mining

    iv. Lack of value addition (refining / smelting).

    v. Smuggling of the Gold to neighboring countries

5.0 RECOMMENDATIONS / ACTION PROGRAMME

5.1 POLICY REFORM

88. A mineral development master plan should be developed to guide systematic investment in the sector which will enable the economy to harness synergies and complementarities.

89. The mineral policy and Mineral Act should be reviewed to classify minerals along the benefits and the strategic nature they play in building the economy. A beneficiation strategy by value chain needs to be set up as follows: (i) Energy commodities –Uranium and Geothermal (ii) Iron and steel; (iii) Phosphates (iv) Limestone; (v) Rare earth metals

90. An institutional and human development programme for exploration and mining of uranium needs to be strengthened. A unit specifically to manage the exploration and development of uranium should be established and strong links with strengthened atomic energy unit in MEMD be established. Uranium exploration and development needs to be undertaken by Government as per the existing Government direction due to strategic and security reasons. The strategic areas in the value chain of uranium resource management are in processing of the uranium ore to obtain the metal (yellow cake) and enrichment of the metal to produce nuclear fuel for power generation and or other uses.

91. Establish a legal, policy and institutional framework for geothermal exploration and development to support its use in generating energy. A unit should be urgently set-up and strengthened. The licensing of geothermal sites should be reviewed and managed differently by another policy instrument not the mining Act.

92. Iron ore and phosphates need to be prioritized and declared strategic minerals. They should have a specific licensing regime taking into considerations the peculiar but strategic role they play to stimulate the economy. Due to the limited quantities available in the country, there is need for government to partner with Private sector in the development of these two industries. The fragmentation of licenses has to be stopped.

93. Rare earth should be declared as strategic minerals and have a specific licensing regime that takes into consideration the peculiar and strategic role they play in the economy. Due to the importance attached to these elements in driving the electronics sector, Government needs to develop a whole value chain from mining to use in industries. Therefore licensing should be regulated to conform to the strategic approach.

94. Review the current exploration and mining licenses with a view of eliminating non-performing and non-compliant licenses. An appraisal last year showed that many of the licenses were issued wrongly and in other cases, the licensees are non-compliant or not performing. This speculation has severely held up land exploration and the licenses should be reverted back to Government as soon as possible. Introduce clear assessment criteria with technical and financial requirements that are stringent to eliminate unserious entities.

95. Introduce performance guarantees (bank guarantees) when awarding Exploration license and Mining license to deter speculation. An exploration License guarantee should vary from mineral to mineral but the minimum guarantee should at least projected royalties for 3yrs and the Mining Lease guarantees the amount should be projected royalties for 3yrs. This money should be forfeited if the stated conditions in the licenses are not met and or the work is not done.

96. The ministry should operationalize the computerized mining cadastre and registry for transparency as well as eliminate delays and associated expenses. This will also help to streamline the licensing procedures. Further continue the Geological and Mineral Information System (GMIS) to host geological and mineral data has been established. This will provide a one Stop Centre for all geological and mineral information country wide, which is now accessible to potential investors.

97. Government should invest in improvement of the mineral dressing laboratory (value addition laboratory) in DGSM to enable testing of various characteristics and properties of minerals to enable faster mineral beneficiation.

98. Government should continue to invest in infrastructure as planned in the NDP to support the mining sector. It Government should commit to extend the roads to major mining areas for specific investors especially for strategic minerals. Furthermore for electricity, the rural extension programme under REA should be supported to extend power to specific sites where the mining is ready to take place. To enable bulk transportation of heavy minerals and their products, the railway should be extended to areas where enormous deposits have been found.

5.2 INSTITUTIONAL MANAGEMENT

99. To improve the institutional and human resource constraint, the structure of the current Department has to be reviewed and expanded into a Directorate to allow for recruitment of new professionals in the Ministry. The proposed separation of the department of geology and the department of mines should be expedited.

100. There is urgent need to recruit staff to fill the vacant positions in the Department. A number of senior staff are in acting capacity and should be confirmed or positions filled. A retention allowance is recommended to retain key professionals like it is done in the petroleum, exploration and production department.

101. There is a need for the establishment of a unit within NEMA to exclusively undertake EIAs for Mining projects given the growing demand and significance. Building capacity in the mineral technology and Environmental assessments is critical.

102. There is need to establish appropriate educational and training facilities for human resources development to meet the manpower requirements of the mineral industry. A comprehensive institutional framework for Research & Development, and Training needs should be developed. Some specific courses related to mining should be introduced at various institutions like Kigumba College to improve the country's human resource.

103. A development unit in the DGSM should be set up which will be responsible for planning and coordinating value addition to minerals produced in the country. The facility will provide an accelerated transformation of the mining industry through enhanced value addition by offering an excellent platform to nurture, sharpen and develop the skills of our indigenous craftsmen to international standards. It will also organize and uplift the small scale miners who are currently using rudimentary ways and methods. A special program for transforming the small scale miners need to be established and operationalized. Accelerate formalization of the sector by providing incentives to associations formed by artisanal miners

5.3 FINANCING

104. It is proposed that the Non-revenue tax collected by the department should be retained to be used in facilitating the monitoring of compliance with the licenses.

5.4 PROJECT READINESS

105. Carry out feasibility studies for iron ore and feasibility all the strategic minerals up to the third phase of feasibility studies to demonstrate project feasibility, economic viability and also prepare bankable projects that will attract investors. This will require investment in drilling and other equipment necessary to undertake further mineral evaluation and definition.

106. Need for an aggressive marketing campaign locally and internationally after an enabling environment has been put in place.