



# MINISTRY OF ENERGY AND MINERAL DEVELOPMENT



## DIRECTORATE OF GEOLOGICAL SURVEYS AND MINES

**P.O. Box 9, ENTEBBE**



Value addition on Marble at Sunbelt Mining Group Limited Factory in  
Moroto, Karamoja.

**PERFORMANCE REPORT FOR FY 2020/21**

**JULY, 2021**

## TABLE OF CONTENTS

Table of Contents .....	i
List of Figures .....	ii
List of Tables.....	iv
Acronyms.....	vi
Executive Summary .....	1
1 Introduction .....	5
2 Insituitional framework.....	5
3 Performance of the directorate .....	6
3.1 Geological Survey Department .....	6
3.2 Mines Department.....	17
3.3 Geothermal Resources Department.....	25
4 Projects .....	46
5 Challenges and Recommendations .....	47
5.1 Challenges.....	47
5.2 Recommendations .....	47
6 Appendices .....	48
6.1 Stategic minerals in uganda .....	48
6.2 Seismicity of Uganda and the surrounding region during the period June 2020 – 30 June 2021. ....	54

## LIST OF FIGURES

Figure 1 : Geophysical Maps showing alignment of structural trends with uranium anomalies .....	10
Figure 2: Anomalies of Bukusu carbonatite complex from geochemical.....	11
Figure 3: Airborne Analytical Signal map showing a number of structures trending NW-SE .....	12
Figure 4: DGSM - Client online engagements, at least 10,452 clients were engaged virtually from July 2020 - June 2021 .....	13
Figure 5: Some of the strategic minerals in Uganda. Note some of the Agriculture and alternative energy mineral. See also appendix 1 for the rest. ....	14
Figure 6: Location of earthquake events that occurred within and close to Uganda region.....	16
Figure 7: works progress at Ntugamo Beneficiation Centre is 90 % complete. ....	17
Figure 8: Progress on Fort Portal Beneficiation Centre construction. Structures and Perimeter wall already done, Leveling of compound was ongoing as of 30/06/2021. ....	18
Figure 9: A local community leader explaining to the participants on how to detect gas emissions using a portable gas monitor .....	26
Figure 10: Photograph showing meeting between GRD staff and Kibiro LC 1 Executive Committee.....	26
Figure 11: Civil works on-going at Kitagata (Ekyomugabe hot spring) as part of the geothermal spa development plan.....	31
Figure 12: MFPED, MTWA and MEMD staff at Buranga geothermal site. ...	32
Figure 13: Staff conducting Temperature data logging at Kibiro.....	33
Figure 14: A submerged TGH that could not be measured.....	34
Figure 15: Temperature data logging on 21th July 2020.....	35

Figure 16: The source of the mud flow/ejection and geothermal grass (thermophilic grass) at Rwanga, Panyimur Town Council.....38

Figure 17: Analysis of volatile components of geothermal water at Karungu hot springs, Rubanda District. ....39

Figure 18: A local community leader explaining to the participants on how to detect gas emissions using a portable gas monitor. ....40

Figure 19: Meeting between GRD staff and Kibiro LC 1 Executive Committee. ....41

Figure 20: One of the two submerged TGH site at Panyimur.....42

Figure 21: The Chairman Panyimur LC III at the point where the lake water crossed the road. ....43

Figure 22: Local community representatives from Panyimur Sub-County at Kibiro TGH sites.....45

## **List of Tables**

Table 1: Licensing status as at 30/06/2021 compared to Licencing status as at 30/06/2020.....	19
Table 2: Mineral production of FY2020/2021 Verses 2019/2020.....	20
Table 3: Non-Tax-Revenue (NTR) for FY2020/21 compared with FY 2019/20.....	22
Table 4: Temperature and depth measurement at Kibiro, July 2020. ....	34
Table 5: Temperature gradient for the Bore Hole.....	36

DGSM TOP MANAGEMENT



**AG. DIRECTOR/ DGSM**



**AG. COMMISSIONER/GSD**



**COMMISSIONER/MD**



**COMMISSIONER/GRD**

## ACRONYMS

AAS	Atomic Absorptions Spectrophotometer
ACP	African Caribbean Pacific
ASM	Artisanal and Small-scale Miners
BGR	Bundesanstalt für Geowissenschaften und Rohstoffe (BGR)
DCIUNIN	Design, Construction and Installation of Uganda National Infrasond Network
DGSM	Directorate of Geological Survey and Mines
DoP	Directorate of Petroleum
EU	European Union
GRD	Geothermal Resources Department
GSD	Geological Survey Department
ICGLR	International Conference of the Great Lakes Region
ICT	Information Communication Technology
IT	Information Technology
Ltd	Limited
MD	Mines Department
MDA	Ministry Department Agency
MFPEd,	Ministry of Finance Planning and Economic Development
MOU	Memorandum of Understanding
MW	Mega Watts
MWAMID	Mineral Wealth and Mineral Infrastructure Development
NEMA	National Environment Management Authority
NFA	National Forestry Authority
REE	Rare Earth Elements
RINR	Regional Initiative on Fight against the illegal exploitation of Natural Resources
SMMRP	Sustainable Management of Mineral Resources Project
TGH	Temperature Gradient Hole

ToR	Terms of Reference
UK	United Kingdom
UNDP	United Nations Development Program
UWA	Uganda Wildlife Authority
XRF	X-ray Fluorescence



## EXECUTIVE SUMMARY

The mandate of the Directorate of Geological Survey and Mines is to *Establish, Promote the Development, and Strategically Manage and Safeguard the Rational and Sustainable Exploitation and Utilization of Mineral Resources for Social and Economic Development.*

The Medium term Key priorities that the Directorate implemented include:

- (i) *Providing a conducive Legal and Regulatory framework to boost investment in the Mineral Sector, spur industrial development, job creation and poverty reduction;*
- (ii) *Institutional and human resource capacity building to harness optimal benefits from the mineral resources;*
- (iii) *Promoting and monitoring mineral resources exploration and development in order to contribute significantly to socioeconomic development of Uganda; and*
- (iv) *Promoting Health and Safety in the mining industry, and the people of Uganda through geohazards mapping, monitoring and advisory services.*
- (v) *Promoting Regional and International cooperation for research and development of the mining industry*

### PROGRESS ON LEGAL AND REGULATORY FRAMEWORK

**The Mining and Minerals Bill 2020:** The Mining and Minerals Bill 2020 was passed in April, 2021, and currently awaiting gazetting into law.

**The Geothermal Policy draft** that was under review was incorporated in the National Energy Policy 2020.

**The communication Strategy** Internal and external stakeholders' consultations for the DGSM was also undertaken.

### PROGRESS ON INSTITUTIONAL AND HUMAN RESOURCE CAPACITY BUILDING

**Infrastructure Capacity development:** Included Rewiring of the entire DGSM buildings in Entebbe, Equipping of the Mineral Laboratories, construction of Mineral Beneficiation Centres in Ntungamo (90%) and Fort Portal (93%). Others included purchase and installation of specialized geothermal and office equipments for the Directorate.

**Human Resources Capacity:** Five (5) Officers completed their MSc degrees in various science disciplines from the UK, Malaysia, South Korea and Japan.

Five other (5) Officers continue with their MSc degrees locally in Uganda as they work. Various online courses, workshops and conference were virtually attended. Also in-house coaching, mentoring, workshops, presentations, training of internship graduates and students, and induction of new staff were undertaken

## **PROGRESS ON PROMOTING AND MONITORING MINERAL RESOURCE EXPLORATION AND DEVELOPMENT**

### ***Mineral exploration:***

Geological, Geochemical and geophysical investigations of Boma Uranium Anomaly in Sembabule and for gold prospectivity in Mubende identified potential gold hosting structures and that uranium is associated with ferruginized sandstones.

Geothermal resources investigations in Panyimur geothermal field revealed that the thermal activity at Panyimur extends to Panyigoro, suggesting a possibly larger geothermal area at Panyimur than originally thought. Also temperature data logging, processing and analysis of 7 out of 8 Kibiro TGH identified two (2) anomalous areas for consideration in Phase-2 deep well exploration drilling.

***Mineral Sector Promotion:*** In addition to daily sector promotion through geodata dissemination at DGSM, website and geodata portals, the sector was promoted at a series of radio and TV talk shows and adverts, local print media and Billboards in Kampala Metropolitan which culminated into a DGSM Centenary conference at the Imperial Resort Hotel, Entebbe on December 3<sup>rd</sup>, 2020. Strategic minerals in Uganda were in a special promoted during the process. A compilation on the sector was further promoted on various media platforms as part of the Presidential inaugural speech for the 2021-26 term of office.

***Licensing status:*** As at 30/06/2021, the number of running/active licences was 716 representing about 0.5% improvement in FY2020/21 compared to FY 2019/20 despite the Covid-19 restrictions. This was attributed to e-licensing system which simplifies licence application and management remotely from the comfort of the licensee's premises globally.

***Production:*** Production dropped by only 1% in 2020/21 compared to that of 2019/20. This is attributed to more production of pozzolana, iron ore and vermiculite than usual that almost cancelled out the decrease in production of key minerals like limestone, leading to only 1% drop.

**Exports:** There were no mineral exports reported due to ban on raw mineral exports in quest for value addition for the country to benefit more from its mineral resources. Covid-19 pandemic restrictions also played a big role.

**Imports:** There were no Mineral imports during the year. This was mainly attributed to the limited market for minerals in Uganda besides the global Covid-19 pandemic restrictions which disrupted most businesses.

### **Non-Tax Revenue (NTR):**

NTR dropped by 5.79% in FY2020/21 compared to that of FY2019/20. This is attributed mainly both the global Covid-19 Pandemic and ban on export of unprocessed minerals which adversely affected the prospecting, exploration, mining and mineral dealing activities globally. Accordingly, mineral prospecting and dealers licences respectively decreased by 10.6% and 46.6% in FY2020/21 compared with FY2019/20.

ROYALTIES from Mining and Mineral Dealers Licences are the main contributor to NTR. The contribution of ROYALTIES to NTR in FY2020/21 was 62.4%. Ban on export of minerals discourages prospecting, exploration, mining and mineral export activities and hence decrease in royalties and NTR. It is therefore recommended that the ban on export of unprocessed minerals be lifted to boost exploration and mining activities for better royalties and NTR contribution to government.

### **PROGRESS ON PROMOTING HEALTH AND SAFETY IN THE MINING INDUSTRY**

To ensure health and safety in the mining industry and Ugandan society at large, environmental concerns at Kibiro and Panyimur, promotion of Equal opportunities and gender issues in mining as well as Earthquake monitoring and advisory services were undertaken.

**Rwanga mud flow:** mud flow as result of compressed gas in the subsurface at Rwanga village in Panyimur Town Council was closely monitored. No significant effects on the environment were observed.

**Kibiro Environmental issues:** Environmental monitoring activities around Temperature Gradient Holes (TGH) in Kibiro were conducted. Only hydrogen sulphide which has been discharging for thousands of years at the hot springs with no danger to animal life was detected. The Geothermal Resources Department has carried out Environmental and Social Impact Assessment

(ESIA) at Kibiro and Panyimur as a requirement before deep exploration drilling done.

**Earthquake monitoring:** The National Seismic Network was maintained and operated. The seismic network recorded twenty one (21) Earthquake events of which five (5) moderate - Light events originated in Hoima, Bundibugyo, Kasese, and two in the Lake Victoria Region, Uganda. The caution as earthquake events become more common in the country is that building plans and or feasibility studies to inform construction designs should be carried out before the project commences.

**Equal opportunities and gender issues:** Equal opportunities and gender issues affecting mining communities were mainstreamed in Mubende and Kigezi-Ankole mining sites.

### **PROGRESS ON PROMOTING REGIONAL AND INTERNATIONAL COOPERATION**

DGSM continued to subscribe to international journals including: African Mining Journal magazine, International Journal of Mining, Reclamation and Environment, International Journal of African Earth Sciences and Minerals Engineering periodicals.

## **1 INTRODUCTION**

The Directorate of Geological Survey and Mines is mandated to establish, promote the development, and strategically manage and safeguard the rational and sustainable exploitation and utilization of mineral resources for socio-economic development of the people of Uganda in line with the NDP III and VISION 2040. The Directorate vision is: A model of excellence in sustainable management and utilization of mineral resources. The Directorate's Mission is to ensure reliable, adequate and sustainable exploitation, management and utilization of mineral resources.

## **2 INSITUITIONAL FRAMEWORK**

The Directorate of Geological Surveys and Mines is composed of three Departments. These include: The Department of Geological Surveys; Mines Department; and Geothermal Resources Department. The Directorate is headed by a Director and each Department is headed by a Commissioner.

Geological Survey Department (GSD) is responsible for establishing the mineral potential of Uganda as well as promoting the development of the established mineral targets. This is done through geological, geochemical and geophysical surveys, Laboratory services and geoscientific data dissemination. The Department is also in charge of geohazards mapping and advisory services.

Mines Department is mandated to license and regulate exploration and exploitation of mineral resources, ensuring compliance to the mining legislation and promotion of sustainable mining and development of the mineral resources.

The Geothermal Resource Department on the other hand focuses on exploration, promotion and development of the country's geothermal resources.

DGSM works closely with other MDAs such as MFPED, NFA, UWA, DoP, PAU and the Uganda Police Force to realize its mandate

## **3 PERFORMANCE OF THE DIRECTORATE**

### **3.1 GEOLOGICAL SURVEY DEPARTMENT**

#### **3.1.1 Policy Formulation Regulation**

##### **3.1.1.1 Communication Strategy**

As efforts to enhance publicity and sector promotion of the mineral, Live-works was contracted to design a comprehensive communication strategy to guide on what, how, to whom, where and when to communicate using various platforms. Due to COVID-19 pandemic lockdowns, delivery of the project on time was not possible. An extension was therefore secured to finalize with the stakeholders consultations and usability testing of the design.

The Internal and external stakeholders' online workshops were held on 22nd and 29th June 2021 respectively. Pending is now the usability testing.

#### **3.1.2 Institutional Capacity**

##### **3.1.2.1 Accredited mineral laboratory at DGSM:**

Provisions for the DGSM to establish and maintain an accredited mineral laboratory for analysing mineral samples were incorporated in the Mining and Minerals Bill, 2020.

##### **3.1.2.2 Infrastructure**

**Drilling Rig:** Drilling Rig is already shipped to Uganda awaiting part of its accessories before delivery to DGSM. Effects of covid-19 restrictions delayed the process.

##### **Mine water, carbon and Sulfur and precious metal analysis equipment installation**

All four equipment under contract for the supply, installation and commissioning of mine water, carbon and sulfur and precious metal analysis equipment were successfully installed and commissioned. The equipment installed include: S1 TITAN Portable X-Ray Fluorescence, Elementrac Carbon Sulfur Analyzer, Dionex Aquion Ion Chromatography, and four Axion MSR Emergency Shower and Eye/Face Wash Stations. Pending is conclusion of training under the contract both within and outside of the country.

##### **Supply and installation of charging system**

Contract for supply and installation of charging system for backup battery system for selected analytical instruments and un-interrupted power supply

for LMIS infrastructure of DGSM Laboratories in Entebbe was successfully concluded.

### **Supply of laboratory consumables**

Procurement was concluded for the supply of laboratory consumables for the fire assay analytical technique with an approval of contract award.

### **Supply of laboratory gases**

Framework contract with M/s. Genome Scientific LLC Limited for supply of laboratory gases (argon, acetylene, helium, oxygen and nitrous oxide) at the DGSM Laboratories in Entebbe for three years was signed is in place.

**Access control system installation:** Installation of an access control system for the DGSM Laboratories in Entebbe was implemented successfully by M/s. A&S Electronics Limited.

**Mechanical and electrical work supply and installation:** Contract to supply, install and commission a dust extraction system for the sample crushing unit and a secure venting system for the chemical store at DGSM Laboratories in Entebbe was concluded with the approval of contract award to M/s. Ficah Enterprises Limited.

**Twenty (20) cathode lamps** for analysis of rest of elements using the GBC Savant Atomic Absorption Spectrometer (AAS) were delivered.

**Other Procurements:** Much other procurement especially under the MLESD have been concluded but delivery of contracts obligation are yet to be met.

### **3.1.3 Human Capacity Development**

**Training Needs Assessment was undertaken and internal** trainings on geochemical and geophysical surveys, GIS, equipment uses, database management systems and health safety and environment management in mining areas continued. Also long term studies leading to Master's degrees within and outside Uganda are ongoing and some yet to commence this FY2021/22.

**Subscription to international journals:** To promote research and Development by staff, DGSM subscribed to international journals including: African Mining, Mining Journal magazine, International Journal of Mining, Reclamation and Environment, International Journal of African Earth Sciences and Minerals Engineering periodicals.

**Geoscientific data/information sharing:** GSD continued to collaborate with other organizations in order to exchange geoscientific data/information relevant for staff empowerment in the mineral sector. Publications and reports were received in the Documentation Centre (DGSM) and shared.

**Chemists trained:** Four (4) Chemistry and Environment Laboratory (CEL) staff were trained on how to use the newly installed Elementrac Carbon Sulfur Analyser.

**Mr. Gabriel Data, Assistant Commissioner – Geology and Mr. James Francis Natukunda, Principal Geologist – Mapping** successfully completed an eight weeks online course in JORC Code Reporting which started in September 2020, and were awarded the Online Professional Certificate in JORC Code.

**Ms. Naomi Nangoku Mumoita, Senior Mineral Dresser, Mr. Miiro Eddy, Mineral Dresser, and Mr. Kalajja Adrian, Mineral Dresser** attended a Webinar training on Particle Size Analysis organised by Microtrac Retsch GmbH, Avant-Garde FZCO and Vision Scientific on 2nd March 2021.

**Ms. Naomi Nangoku Mumoita**, Senior Mineral Dresser attended orientation HACT training/UNDP policies and procedures organised by UNDP, from 29th to 31st March, 2021 at Serena Hotel.

**The newly recruited staffs (1 chemist and 2 technicians) were** trained on how to use the Laboratory Management Information System (LMIS).

**Chemistry and Environment Laboratory (CEL) staff** were trained on how to use the following equipment: i) Oxford X-Supreme 8000 benchtop X-Ray Fluorescence (XRF) Spectrometer, ii) S1 TITAN Portable XRF, and iii) Dionex Aquion Ion Chromatography (IC).

**Sensitization and training** of laboratory staff on health and safety in laboratory operations carried out.

### **Long Term Training**

- (i) , Ms. Erios Naiga, Documentation Officer completed her three (3) years MSc. Degree in Informatics at Gyeongsang National University in South Korea.
- (ii) Keith Tunde (Geologist) completed his Master's degree in Environmental Management studies at Kingstone University, London, UK
- (iii) Sudan unity Birungi, (Geologist) completed a Master of Science degree in Geotechnical Engineering in Malaysia.



- (iv) Mr. Eddy Miiro (Mineral Dresser) continues to pursue a two (2) year's Master of Science in Chemical Engineering at the University of Cape Town, South Africa.
- (v) Jacqueline Nakirrija (Geologist) continues with a MSc in GIS at Makerere University
- (vi) Martin Ekiryagana (Senior Staff Cartographer) and Stella Nankinga (Geologist) continue with their MSc. Degrees in Environment and Natural Resources management at Makerere University.
- (vii) Stellah Pule (Staff Cartographer) and Henry Mulindwa (Geologist) continue with an M.Sc. In Natural Resources Management at Nkumba University.

**Promotions:** Six (6) Officers were promoted (Appendix 6.2) to various levels: Chemist (1), Senior Chemist (1), Senior Geophysicist (1) and Assistant commissioner (3).

**Retirement:** On other hand, **Mr. Baguma Zachary**, Commissioner /Geological Survey Department and Ag. Director/DGSM retired from public service on 19/6/2020 after making the retirement age of sixty (60) years. The office of Director was handed over to Ms. Agnes Alaba, Commissioner/Mines Department. The handover of Office was witnessed by the MEMD/HRM Office led by Ag.AC/HR, Ms. Samali Ibanda. The Call for filling the position of Commissioner/GSD was made (internally) and applications to fill position were submitted to HRM/MEMD in June, 2020 for further management.

### **3.1.4 Mineral exploration, promotion, production and value addition**

#### **3.1.4.1 Mineral Exploration**

**Airbourne geophysical Survey:** Airbourne geophysical Survey in Karamoja Region by XCalibur Airborne Geophysics to facilitate geological mapping and mineral resources exploration commenced in March, 2021 and progressed well and according to schedule of the contractor. In summary:

- (i) Magnetic survey: still ongoing – Line kilometers flown so far +142,000 line-km (around 63% of the total area – 227,993 line km)
- (ii) Gravity Survey : still ongoing – Line kilometers flown: 22,500 line-km (over 96% of the total area – 23,189 line km)
- (iii) DGSM staff GIS and RS training for extraction of geological features from remotely sensed data (images) was undertaken.
- (iv) Geological basemap for ground truthing was also completed.

**Feasibility Study on Iron and Steel Development:** Review and verification of Feasibility Study Report on Iron and Steel Development in Uganda together with NPA was undertaken.

**Boma Uranium Anomaly follow up investigations**

Geological, Geochemical and geophysical investigations of Boma Uranium Anomaly in Sembabule were carried out to delineate possible structures that could be controlling mineralization in the prospect. Preliminary interpretation confirmed that the uranium anomaly is structurally controlled. Geophysical anomalies (Figure 1) coincide with the geochemical and geological anomalies. It was also observed that uranium highs are associated with ferruginized sandstones.

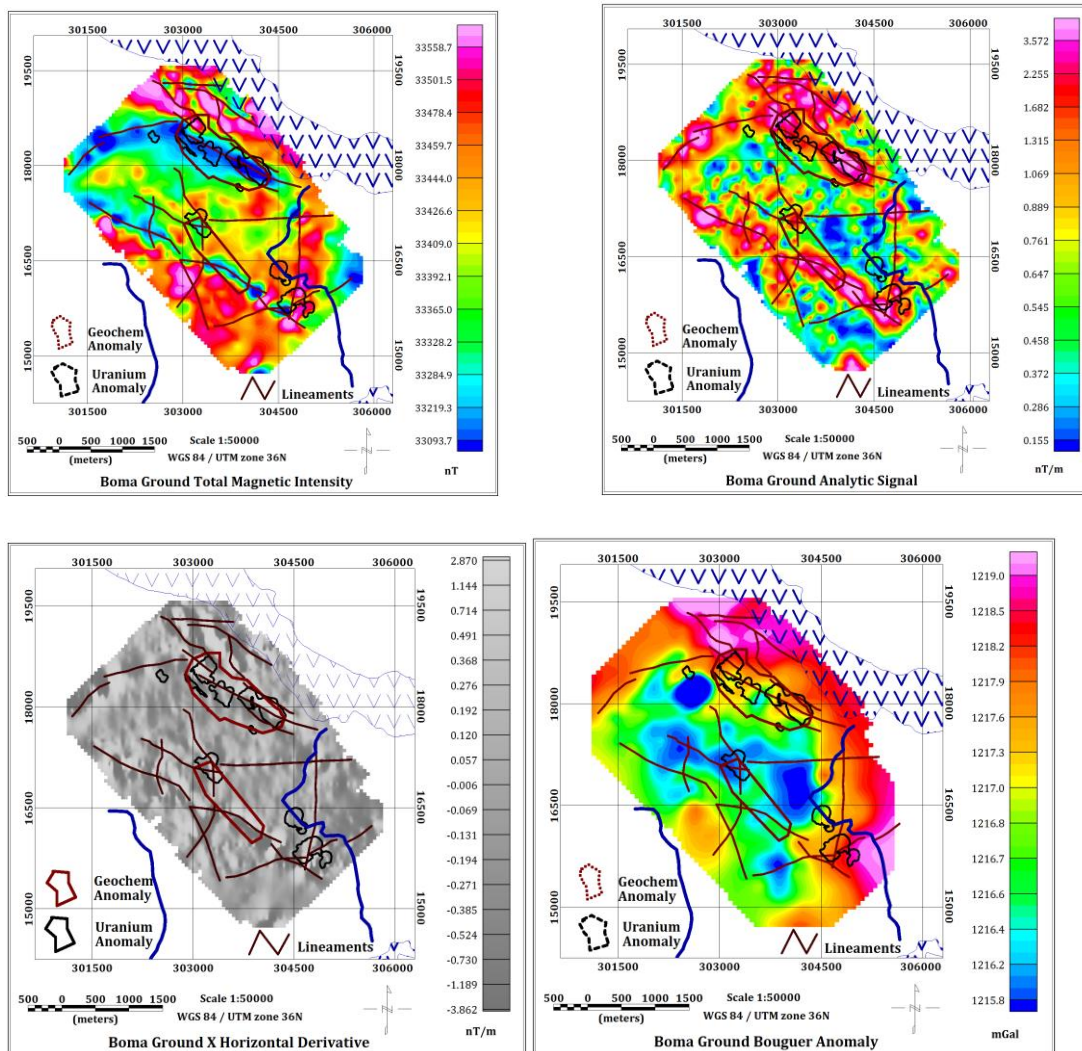


Figure 1 : Geophysical Maps showing alignment of structural trends with uranium anomalies

## Bukusu REE follow up investigation

Bukusu REE follow up investigations were undertaken (Figure 2) to determine the lateral extent of the anomalies that will be used to locate targets for pitting, trenching and drilling. One hundred and twenty nine (129) soil samples and one (1) rock sample were collected. The samples await analysis to inform further investigations.

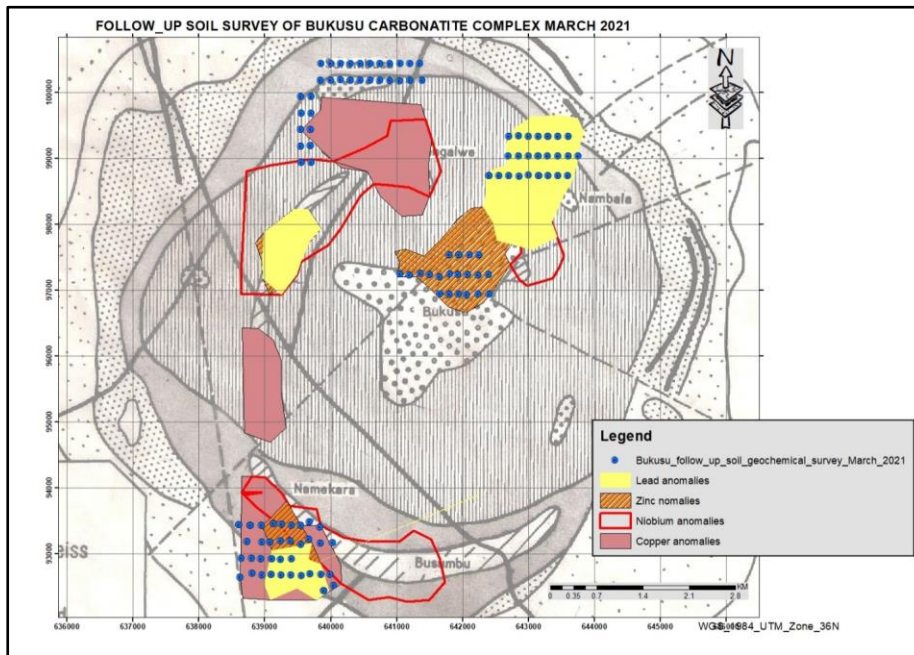


Figure 2: Anomalies of Bukusu carbonatite complex from geochemical

## Geochemical and geophysical Survey of Sheet 59/3 in Mubende and Kssanda Districts

Geochemical and geophysical surveys were carried out to map any shear zones and other structures that could be hosting gold mineralization in the area and hence, generate gold anomalies for ASM registered associations in Mubende and Kassanda Districts.

Preliminary interpretation confirmed gold mineralization in the area. Potential gold hosting structures (Figure 3) were identified in the southwestern part of the prospect. This also was confirmed by some small scale mining operations in the area.

Fifty nine (59) stream sediment samples, fifteen (15) heavy mineral concentrates (HMC) and seven (7) rock samples were collected for analysis for further informed decision making.

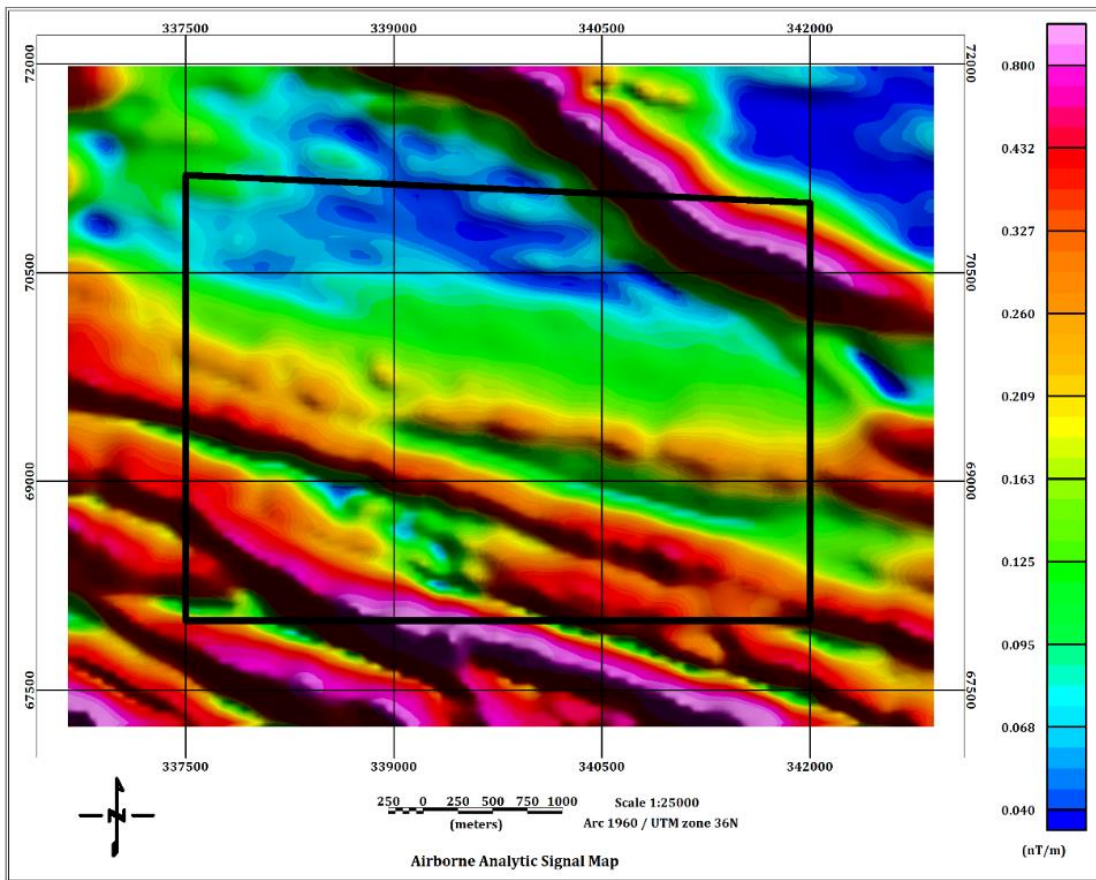


Figure 3: Airborne Analytical Signal map showing a number of structures trending NW-SE

### Review of Uranium Anomalies in Block 3

Additionally review of available airborne data for Block 3 in order to increase on Uranium stock was undertaken. The review generated 14 uranium anomalies for ground follow up

**Monitoring of Exploration licences:** Review of returns and field monitoring of Exploration licences for compliance was undertaken

### Sensitization for Airborne Geophysical Survey:

**Laboratory Services:** The Mineral Laboratories continued with mineral dressing and analytical services so as to support mineral exploration tasks and police investigations on mineral crime related cases. The analytical techniques used included gravimetric, X-Ray Fluorescence (XRF) spectrophotometry, and UV-Vis spectrometry.

### 3.1.4.2 Mineral Sector Promotion

**Communication Strategy:** As efforts to enhance publicity and sector promotion of the mineral, Live-works was contracted to design a comprehensive communication strategy to guide on what, how, to whom, where and when to communicate using various platforms. Due to COVID-19 pandemic lockdowns, delivery of the project on time was not possible. An extension was therefore secured to finalize with the stakeholders consultations and usability testing of the design.

The Internal and external stakeholders' online workshops were held on 22nd and 29th June 2021 respectively. Pending is now the usability testing.

**Directorate Virtual platform:** GSD continued to manage DGSM website [www.dgsm.go.ug](http://www.dgsm.go.ug) and Facebook page (Directorate of Geological Survey and Mines) where inquiries were attended to. The sector has received enormous public engagement. A total of 10452 viewers of DGSM face book page (Figure 4) were attracted during the year.

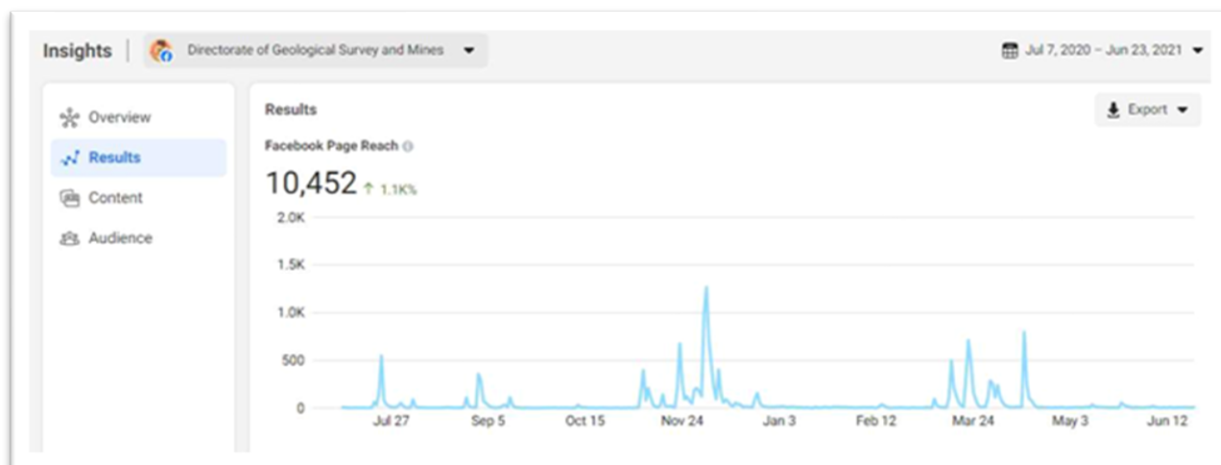


Figure 4: DGSM - Client online engagements, at least 10,452 clients were engaged virtually from July 2020 - June 2021

**Mineral sector promotion during the Presidential inaugural speech for 2021 – 2026:** Achievements of the Mineral sector/DGSM during the NRM government leadership were compiled and submitted for promotion of the sector on various media platforms as part of the Presidential inaugural speech for the 2021-26 term of office.

**Document preparation and archiving:** Continued to receive process and archive incoming new records (journals, books, mineral related newspaper articles etc.), among others.

**Data Dissemination:** Continued to disseminate Geodata/information to various users including road construction feasibility studies e.g. (Kyenjojo - Kamwenge road upgrade to tarmac, Karamoja airborne geophysical survey contractor, mining companies (e.g. Wagagai), underground water survey, NEMA, researchers (students etc.); and

**Strategic minerals promotion:** Prepared mineral promotional materials on strategic minerals on (cement, agriculture, alternative energy, building and construction, electronics, Battery) and promoted in a special way during the centenary celebration of Geological Survey at the imperial resort hotel Entebbe, December, 2020 (Figure 5 and Appendix 6.1)

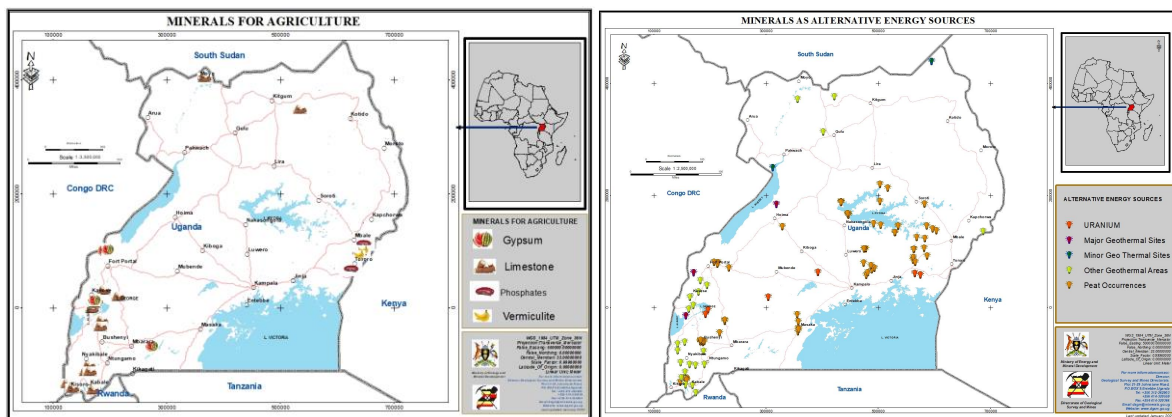


Figure 5: Some of the strategic minerals in Uganda. Note some of the Agriculture and alternative energy mineral. See also appendix 1 for the rest.

**Centenary celebration of DGSM:** the Mineral sector was promoted on various platforms (print, TV, radios, Billboards) during the celebrations of DGSM Centenary which ended with TV talk shows and a conference in December 2020.

**Gender mainstreaming in the mineral sector:** Sensitization on gender mainstreaming in mining sector and collection of gender segregated data in Mubende District was undertaken.

### 3.1.4.3 Production and Value addition promotion

- (i) The laboratory technical staffs continued performing method validation and verification of the use of the UV-Vis spectrophotometer for analysis of Iron ore and gravimetric technique for gold.
- (ii) Field trip was undertaken to the Boma, Sembabule District for bulk sampling for method development and validation for analysis techniques to be using in the recently installed ICP-OES.

- (iii) Mr. Miiro Eddy and Mr. Kalajja Adrian both Mineral Dressers carried-out reviews of feasibility studies, progress and maximum beneficiation of minerals for tin, cobalt-copper, rare earth elements, iron ore, nickel mined by African Panther Resources (U) Ltd, Consolidated African Resources (U) Limited, Eurasian Capital SMC Ltd, Rwenzori Rare Metals Limited, Tread Stone Limited, Samta Mines and Minerals Uganda Limited.
- (iv) Ms. Naomi Nangoku Mumoita, Senior Mineral Dresser and Mr. Miiro Eddy, Mineral Dresser undertook a sensitization field activity on 3rd October 2020, in Euro Minerals mine; the aim of the activity was to promote and sensitize miners of services available in the Directorate of Geological Survey and Mines laboratories.
- (v) Ms Lajwe Grace (Principal Chemist), Mr. Henry Onyege (Senior Chemist), Mr. Kalajja Adrian (Mineral Dresser) and Mr. Kiggwe Richard (Geologist), undertook field trip to Ssembanule district to collect samples for ICP-OES method validation/verification for Uranium.

### **3.1.5 Health and Safety**

#### **3.1.5.1 *Earthquake Monitoring and advisory services***

DGSM Continued to operate and maintain the Seismic Network comprising five (5) seismic stations located at Entebbe, Hoima, Nakauka, Kilembe and Mbarara-Kyahi (Figure 6 and appendix 6.2)

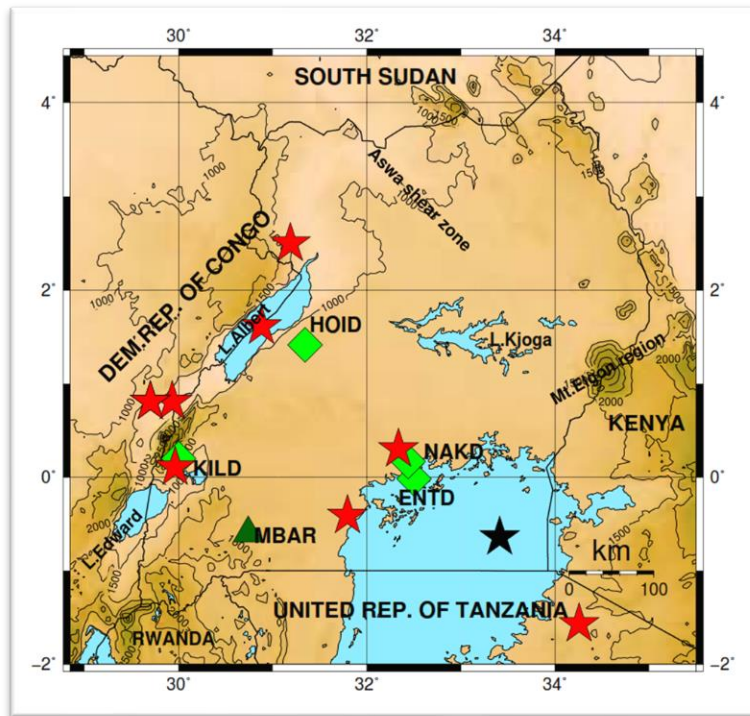


Figure 6: Location of earthquake events that occurred within and close to Uganda region.

The RED stars in (Figure 6 above) denote the epicentres of the events, GREEN diamonds represent the location of the broadband seismic station and the BLUE triangle is the location of IRIS Global. The BLACK denotes epicentre of the recently felt Lake Victoria tremor of 17th June 2021 that was felt strongly in areas surrounding Lake Victoria region including Kampala, Entebbe, Mukono, Jinja and Lake Victoria region.

The seismic network recorded 21 earthquake events (Appendix 6.3) of which five (5) originated (had epicentres) in Uganda i.e. Hoima, Bundibugyo, Kasese, and two in the Lake Victoria Region (Figure 3).

Like in FY 2019/20, Uganda experienced Light-Moderate Earthquake events during the FY 2020/21 (Appendix 6.3) which were felt by some people but no severe damages were reported.

It should however be noted that although the Uganda-DR Congo border is prone to earthquake events, occurrence of two earthquake events within Lake Victoria/Central Uganda should be good caution to all building and construction projects in the country and as such, feasibility studies to inform designs should be carried out the project commences.



### 3.2 MINES DEPARTMENT

#### 3.2.1 Policy Formulation Regulation

Review of the Mining and Minerals Bill 2020 was undertaken during the year. The bill was passed in April, 2021, and currently awaiting gazetting.

#### 3.2.2 Institutional Capacity

##### 3.2.2.1 Infrastructure Development

**Weigh bridge:** contract awarded to M/S AEA Limited. The equipment is being shipped to Uganda. Tracking indicates arrival at Mombasa was on 28th June, 2021. Delays mainly caused by travel restrictions due Covid-19 pandemic have affected the process.

**Beneficiation centres:** Construction of mineral beneficiation centres in Ntungamo and Fort Portal is progressing well. Ntungamo was at 90%

(Figure 7) whereas Fort Portal was at 93% (Figure 8) by close of FY2020/21



Figure 7: works progress at Ntungamo Beneficiation Centre is 90 % complete.



Figure 8: Progress on Fort Portal Beneficiation Centre construction. Structures and Perimeter wall already done, Leveling of compound was ongoing as of 30/06/2021.

### **3.2.2.2 Human Resource Development**

- (i) The staff of the Mines Department participated in a one day training on performance management at Amber house A406 boardroom, Kampala on 7th July 2020.
- (ii) The staff of the Mines Department participated in the review and preparation of the final draft Mining and Minerals Bill 2020 incorporating all stakeholders' comments.
- (iii)
- (iv) Nassuna Grace participated in the following: Technical representation of the Directorate during public service interviews for MEMD staff on 9th July 2020; preparation of the draft 2020 Mineral Sector Performance Report Thematic paper guide against the NSI as end of FY 2019/2020; attended a 1 day Women's Rights and Mining webinar: Sexual and Gender-Based Violence in the mining sector; participated in the development of Covid19 Standard Operating procedures (SOPs) for Energy and Mineral development Sector on 25th September 2020; supported staff on HR issues and disseminated of HRM gender Research data;
- (v) Nassuna Grace together with Joseph Okedi, Nakirijja Jackline, Stellah Pule, Mathias Mugere, John Kennedy Okewling, Morris Tabaro, Amina Kizza, Ariho, attended a meeting to carry out reconciliation of mineral production and royalties on 11th September 2020 at DGSM boardroom.

- (vi) Nassuna Grace together with Nakirijja Jackline, Stellan Pule, Mathias Mugere, John Kennedy Okewling, Morris Tabaro, reviewed the statistics/data collection guide by SPPAD/MEMD to assist in their data collection during fieldwork on 15th September 2020 at DGSM boardroom.
- (vii) Dorothy Namuli (LA), continues with a Master of Science in Information System management at Makerere University

### 3.2.3 Mineral exploration, promotion, production and value addition

#### 3.2.3.1 Licensing Status

Licence applications and returns were captured and reviewed, and granted licences maintained in the Mining Cadastre and registry System (Table 1). The table shows an observed 0.42% increase in the number of valid licences by close of FY 2020/2021 compared to FY 2019/2020 (Table 1). This is mainly attributed to the e-licensing system which simplifies licence application and management (returns) process remotely from the comfort of the licensee's offices and or homes globally.

However, the percentage increase is lower than anticipated. This is may be attributed to the global Covid-19 Pandemic which grossly affected most economic activities in the world, mining inclusive. This is further confirmed by decrease in mineral prospecting and dealing activities. Mineral prospecting and dealers licences respectively decreased by 10.6% (from 132 to 118) and 46.6% (from 50 to 38).

The ban on export of unprocessed minerals is also one of the local factors affecting mining and exploration activities. The ban demotivates the investor to acquire and or renew mineral rights.

Table 1: Licensing status as at 30/06/2021 compared to Licensing status as at 30/06/2020

Type of Licence	Licences as at 30/06/2020	Current as at 30/06/2021
Prospecting License	132	118
Exploration License	341	366
Retention License	4	8
Location License	121	134
Mining Lease	46	50
Mineral Dealers*	58	31

Goldsmith License*	11	9
<b>Total</b>	<b>713</b>	<b>716</b>

**Note: \* License expires on the 31<sup>st</sup> day of December of the year of issue**

### 3.2.3.2 Mineral production

Mineral production (Table 2) only dropped by about 1% in 2020/21 compared to that of 2019/2020. Although there was a production decrease in regularly mined minerals e.g. limestone (24.5%), gold (72.6%), syenitic aggregate (59.7%), kaolin (42.5%) and Tin (>100%) possibly due to covid-19 restrictions, there was also, more production of pozzolana, iron ore and vermiculite than usual that almost cancelled out the decrease in production leading to only 1% drop.

The more than double production of pozzolana is attributed to increased demand for pozzolana due to increase in cement factories from two to now five (5) which use pozzolana with imported clinker to produce cement for the ever expanding building and construction industry in Uganda.

Table 2: Mineral production of FY2020/2021 Verses 2019/2020

Mineral	Average Price per Tonne in 10 <sup>3</sup> UGX	Production/Tonnes				Average Value in 10 <sup>3</sup> UGX	
		Jul -Sept, 2020	Oct-Dec, 2020	Jan-Mar, 2021	Apr- Jun, 2021	FY 2019-2020	FY 2020 -2021
		Q1	Q2	Q3	Q4		
Limestone	120	275551.5	248918.6	277738.2	105843.08	144,368,820	108,966,169
Pozollana	21	472436.8	508177.7	495353.937	248796.87	17,778,686	36,220,072
Gold	151,030,270	0.001056	0.0001	0.00103614	0.000323	1,399,257	382,898
Vermiculite	579	4639.8	4482.5	5924.8	1902.5	1,907,579	9,813,818
Volcanic Ash	21	0	0	28304.14	3.143	0	594,453
Wolfram	34,575	0	0	0	0	1,808,273	0
Syenitic Aggregate	1.5	25966.88	2691.78	1312.34	2778.58	122,119	49,124
Kaolin	100	12505.6	3684.267	7036.4	3155.86	4,590,949	2,638,213
Iron Ore	271.29264	0	10000	5000	0	586,887	4,069,390
Granite	922.7625	102	149	142	75	0	431,853
Coltan (30% Purity)	28,413	96.67	64.21	30	71.714	358,998	7,461,083
Tin (75% Purity)	34,034	0	0	0	0	2,839,705	0
Beryl (1% Beryllium)	8,715	111	110.127	95.127	75.237	0	3,411,746
<b>GRAND TOTAL</b>						<b>175,761,273.30</b>	<b>174,038,820</b>

### **3.2.3.3 Mineral imports statistics**

There were no Mineral imports. This is mainly attributed to the limited market for minerals in Uganda and the global disruption of businesses by Covid-19 pandemic restrictions.

### **3.2.3.4 Mineral exports statistics**

There were no mineral exports reported due to ban on raw mineral exports in quest for value addition for the country to benefit from its mineral resources most. Covid-19 pandemic restrictions also played a big role.

### **3.2.3.5 Non-Tax-Revenue (NTR)**

NTR (Table 3) dropped by 5.79% in FY2020/21 compared to that of FY2019/20. This is attributed mainly to two factors:

- (i) The global Covid-19 Pandemic which adversely affected the prospecting, exploration, mining and mineral dealing activities globally. This is confirmed by a decrease in mineral prospecting and dealers' licences and hence fees (Tables 1& 2). Mineral prospecting and dealers licences respectively decreased by 10.6% and 46.6%
- (ii) 2) The ban on export of unprocessed minerals is also one of the factors affecting prospecting, exploration mining and dealing activities. The ban demotivates the investor to prospect, acquire licence and explore, apply for mining licence and or mine. With no mining and export, the mineral dealers are left with only import of minerals whose market here in Uganda is limited.

The main contributor to NTR is **ROYALTIES** from Mining and Mineral Dealers Licences. Royalties account for more than 50% of all the NTR. The contribution of **ROYALTIES** to NTR in FY2020/21 was 62.4%. Ban on export of minerals discourages mining and mineral export activities and hence decrease in royalties and NTR.

It is therefore recommended that the ban on export of unprocessed minerals be lifted to boost exploration and mining activities for better royalties and NTR contribution to government.

Table 3: Non-Tax-Revenue (NTR) for FY2020/21 compared with FY 2019/20

ITEM	ROYALTY/ITEM
ROYALTIES PAID BY HOLDERS OF MINERAL RIGHTS OR MINERAL DEALERS-	7,362,269,064
ANNUAL MINERAL RENTS(OTHER THAN FOR PROSPECTING LICENSE)-	3,487,556,500
MINERAL DEALERS LICENSE-	336,000,000
APPLICATION FOR A PROSPECTING LICENSE-	75,000,000
APPLICATION FOR EXPLORATION LICENSE-	136,000,000
APPLICATION FOR A LOCATION LICENSE-	38,400,000
APPLICATION FOR RENEWAL OF A LOCATION LICENSE-	29,000,000
REGISTRATION OF MINING INSTRUMENTS-	123,000,000
ANNUAL FEES FOR GOLDSMITHS LICENSE-	40,000,000
EXTRACT FROM ANY REGISTERED INSTRUMENT-	3,500,000
APPLICATION FOR A MINING LEASE-	25,000,000
TRANSFER OF MINERAL RIGHT OR OF SHARE OF THE RIGHT IN RESPECT OF-	32,000,000
APPLICATION FOR RENEWAL OF EXPLORATION LICENSE-	74,000,000
CERTIFICATE OF SURRENDER IN THE AREA COVERED BY A MINERAL RIGHT-	10,000,000
APPLICATION FOR RENEWAL OF RETENTION LICENSE-	10,000,000
SUSPENSION OF WORKING OBLIGATION FEES-	800,000
APPLICATION AND PREPARATION OF A RETENTION LICENSE-	10,000,000
MAPS	880,342
IN RESPECT OF AN IMPORT PERMIT UNDER SUB SECTION 3 OF SECTION 117 OF THE ACT-	10,909,449
COPY ISSUED FOR LOST OR DESTROYED CERTIFICATES-	1,000,000
MINERAL DEALERS LICENSE-	336,000,000
APPLICATION FOR A PROSPECTING LICENSE-	75,000,000
APPLICATION FOR EXPLORATION LICENSE-	136,000,000
<b>GRAND TOTAL (FY2020/21)</b>	<b>11,805,315,355</b>
<b>GRAND TOTAL (FY2019/20)</b>	<b>12,530,908,718</b>

### 3.2.3.6 *Monitoring and inspection of exploration and Mining activities*

Inspections and monitoring were carried out to check on compliance with License working obligations as stipulated in the Mining law, Validation of production and estimation, Environmental, occupational health and safety compliance and Employment records especially Number of employees, gender mainstreaming, and local to foreign content ratio. Technical advice was also offered to the exploration, mine development and mining operators.

Based on office and field observations, informed decisions such as mineral production reconciliation, licence approval, rejection, renewal, surrender and cancellation, etc. were taken.

**Sukulu Phosphate and steel project:** Construction of most of the required infrastructure is complete. One thousand two (1,200) workers are employed by the company and subcontractors, with a local content composition at 83% Ugandan with the rest (17%) being Chinese for installing, repair and maintenance of the plant machinery.

Activities including production of fertilizers and opening other lines of the plant have been largely affected by the case against Guangzhou Dongsong Energy Uganda Limited, a Chinese company that is undertaking the Sukulu phosphate mining project in Tororo district.

### **Kilembe Mines Limited**

Following Tibet Mining Company Limited's underperformance of their debt and work obligations, The Minister of Finance, Planning and Economic Development issued the Company a Termination Notice and later THMCOL's Concession Agreement.

Technical Working Group (TWG) to prepare documentation to aid in identifying a partner to re-develop Kilembe Mines, using the Mineral Production Sharing Agreement model was constituted and is composed of members from the Ministry of Energy and Mineral Development (line Ministry), Ministry of Finance, Planning and Economic Development (responsible Ministry), Ministry of Justice and Constitutional Affairs, the Privatization Unit (PU) and Kilembe Mines Limited. The TWG is headed by PU considering that Kilembe Mines is still classified under class III of the PERD Act 1993.

The main legal documents giving direction to the tender documentation, structuring, procurement and conclusion of the redevelopment of the Kilembe Mines Project are the Public Enterprises Reform and Divestiture Act 1993 (PERD); and any other applicable or relevant laws.

Considering the above facts, the TWG drafted an Expression of Interest (EOI); a Request for Proposals (RFP); and Mineral Production Sharing Agreement (MPSA) that will be used to identify a potential investor for Kilembe Mines. It is envisaged that all necessary services, technology and financing are to be furnished or arranged by an Investor to be procured through the MPSA. The delivery of the project is conceptualized for both Greenfield and Brownfield areas.

The TWG conducted a Virtual MPSA Benchmarking conference that was held between the TWG and the Government of Gabon in September 2020 to analyze and evaluate how a change in any variable can impact on what the investor or government take is in a Mineral Development Project such as the Kilembe Mines project.

TWG reviewed a list of potential investors that showed interest in the Project. These were submitted to the Financial Intelligence Authority (FIA) for preliminary due diligence on financial capacity. FIA has recommended that a deeper and more comprehensive financial and technical due diligence on the potential investors be conducted after the shortlisting exercise has been completed.

The TWG agreed to commence the procurement process for an investor for the revamping of Kilembe Mines in accordance with the PERD Act and any other applicable Law

### **3.2.3.7 Mineral Traceability and Certification**

**The process is in advanced stages:**

**Support the ICGRL mineral certification system :** The Federal Ministry of Economic Cooperation and Development (BMZ) through the Federal Institute for Geosciences and Natural Resources (BGR) agreed on the extension (Phase II) of the technical cooperation project with the Government of Uganda to support the ICGRL mineral certification system in the framework of the Regional Initiative to Fight against the Illegal Exploitation of Natural Resources (RINR), for a duration of thirty (30) months from 1st July 2020 to 31st December 2022.

**Recruitment of staff:** A team staff members including inspectors, IT offers and Lawyer was recruited. DGSM together with GIZ compiled a demand for training of Inspection and Certification Unit Staff and the required specifications and budget plan for the advised hiring of Certification Unit Staff both field and Entebbe office.

**Terms of Reference:** The Terms of Reference (ToR) for the design and printing of ICGLR certificates has been finalised. The next step will be for procurement process to commence.

**Chain of Custody ToR:** The Terms of Reference (ToR) for the listing of qualified service providers for Chain of Custody (CoC) was finalized and procurement process started by advertising. The next step will be finalizing the procurement process and listing the recognized service providers.

**Way forward:** A plan for way forward with regards to resuming project with BGR after Covid19 disruption focusing on implementation of RCM was developed.



## **Formalization of Artisanal Mining Sector**

Formalizing Artisanal Miners is being implemented under the Biometric Registration of Artisanal and Small-Scale Miners (BRASM) project. The consultant was procured to undertake a biometric registration of all artisanal and small-scale miners, labourers, dealers, agents and issue them with renewable certificates and or permits.

The project has been working with the National Identification and Registration Authority (NIRA) and ICT experts to create the biometric tools to register the miners and get them special Identity linked to their database managed by the Mines Department and NIRA. An MoU between MEMD and NIRA drafted and forwarded to the Solicitor General for approval.

The consultant developed a web-based system to be used in the registration and management of ASM, however, financial implications have delayed the implementation of the actual Biometric Registration.

### **3.2.4 Health and Safety**

Equal opportunities and gender issues affecting communities in mining areas were mainstreamed in the work plans.

## **3.3 GEOTHERMAL RESOURCES DEPARTMENT**

### **3.3.1 Policy Formulation Regulation**

The geothermal policy was formulated and consolidated into the National Energy Policy 2020 which is ready for presentation to Cabinet. The Mining and Mineral Policy 2018 and the Mining and Mineral Act (now Mining and Mineral Bill 2020) shall regulate upstream exploration for geothermal resources, mineral extraction and direct uses in industry, agriculture and tourism; while the National Energy Policy and Laws shall regulate downstream geothermal development for electricity generation.

**Panyimur awareness meeting:** People Rwanga village in Panyimur subcounty, Pakwach District, where a mud flow took place in 2019 were sensitized (Figure 9) about geothermal energy development. This was to mitigate social concerns, environmental misconceptions, and also to secure community support as MEMD plans to drill fifteen (15) TGH in Panyimur geothermal prospect in the FY 2021-22.



Figure 9: A local community leader explaining to the participants on how to detect gas emissions using a portable gas monitor

### **3.3.1.1 Kibiro Community Engagement Meeting**

a meeting was held with Kibiro village LC1 Executive of 8 people to update them on the status of the geothermal project at Kibiro and the on-going court cases (Figure 10).



Figure 10: Photograph showing meeting between GRD staff and Kibiro LC 1 Executive Committee.

### **3.3.2 Institutional Capacity**

#### **3.3.2.1 Infrastructure Development**

Purchase of Specialized Machinery & Equipment: The following equipment were procured under the Geothermal Component of the WB ERT-III programme in the Ministry of Energy and Mineral Development:

- i) Gas analysis apparatus, the Orsat Gas Analyzer, for use in analysis of gas samples for carbon dioxide;
- ii) six (6) handheld field computers equipped with GIS and global positioning system (GPS) technology to be used for digital data capture and mapping in the field;
- iii) two (2) high end computers to handle and manage the huge database arising from structural geology, drilling, well lithology, fluid geochemistry and geophysics, data analysis and interpretation; and
- iv) Personnel Protection Equipment (PPE).

In addition, the following equipment were procured under the recurrent budget and include one (1) Desktop computer, three (3) laptops, three (3) printers.

#### **3.3.2.2 Human Capacity Development**

- (i) Two (2) GRD technical staff (Mr. Eriya Kaahwa, Geologist and Ms. Jacinta Achieng, Chemist) completed a three (3) year's Masters of Science degree in Earth Resources Engineering at Kyushu University in Japan in April 2021.
- (ii) On-the-job training of three (3) Geothermal Resources Department (GRD) technical staff in geothermal drilling technology, at Nakuru, Kenya was completed and a training completion report submitted to the MEMD by the trainer, Geothermal Development Company of Kenya (GDC).
- (iii) Two (2) GRD technical staff attended an on-line training in slim hole drilling technique organized in collaboration with New Zealand Geothermal Facility from 27th July to 11th August 2020.
- (iv) Eight (8) DGSM staff participated in the virtual African Rift Geothermal Conference (ARGeo-C8) held in Nairobi, Kenya, from 1st to 6th November 2020. The Conference was hosted by the Government of the Republic of Kenya in partnership with United Nations Environment Programme (UNEP). The conference discussed and recommended:

- a) Integration of geothermal energy in the long-term national and regional power development master plans;
  - b) Development of harmonized energy policies, laws (including geothermal) and regulations with a view to diversifying the use of geothermal resources to drive the various catalytic sectors to meet Sustainable Development Goals (SDGs);
  - c) Formulation of clear and coherent policies and institutional frameworks that attract private sector participation to accelerate development of geothermal energy resource in the region;
  - d) Allocation of adequate national budgetary funds for exploration and development of geothermal resource to mitigate the risk of resource exploration; and
  - e) Support cooperation and collaboration with regional energy development projects for power generation and direct use, e.g., East African Power Pool (EAPP), South African Power Pool (SAPP), and Central African Power Pool (CAPP).
- (v) On 5th November 2020, staff attended a virtual International Geothermal Association – Africa Regional Branch (IGA-ARB) annual general meeting held in Nairobi, Kenya which recommended:
- a) Formation of Africa Geothermal Association (AGA) registered in Kenya for Africa Region but still maintain IGA-ARB in place;
  - b) To promote Africa Women in Geothermal (AWING);
  - c) Contribution of the Country Geothermal Associations from membership fee for running of the AGA.
- (vi) On 6th October 2020, GRD Staff attended a virtual workshop on Geothermal Database Management.
- (vii) Between 21st to 25th September, 2020, two (2) GRD staff participated in a five (5) days online Training in Geothermal Project Management. The main objectives of the training were to:
- a) improve the success rate of various geothermal projects in Africa through timely planning, risk mitigation and replicating accomplishments;
  - b) increase the number of successful geothermal projects in Africa that contribute to the national and regional power grid, utilizing natural resources which are professionally managed; and
  - c) Engage stakeholders at all stages of the project in order to cultivate responsibility, create an attractive investment environment and demonstrate positive results from geothermal resources.

- (viii) Strater logging software training: During the 1st week of March 2021, the staff were coached in the use of the borehole logging software by one staff who had attended a three (3) months training course at the Kenya Geothermal Development Company (GDC) in Nakuru, Kenya in 2019. The training took three (3) days but further demonstrations shall be conducted in future in order to internalize the software applications.
- (ix) Training Graduate Students: On 13th February 2021, two (2) graduate students were trained in identification and mapping of surface geothermal features at the Kibiro geothermal prospect.
- (x) Geothermal Training in Iceland: On 31st May 2021, one staff (Mr. Fred Ssemuyaba) commenced six (6) months specialized training at the GRÓ Geothermal Training Programme (GRÓ-GTP) in Reykjavik, Iceland. The Fellowship is from the Government of Iceland.
- (xi) Online course on geothermal energy: From 20th to 21st April 2021, staff attended an on-line course on geothermal energy organized by the GRÓ Geothermal Training Programme (GRÓ-GTP) in Iceland under the auspices of UNESCO. The intent of this course was to highlight the possibilities and benefits associated with geothermal utilization, as well as provide an overview of the process of geothermal development from start to finish. The development of geothermal resources can contribute to the ongoing combat on climate change as well as provide multiple opportunities for social and economic wellbeing.
- (xii) African Geothermal Centre of Excellence (AGCE) Business Plan: A workshop to validate the Business Plan was held on 19th May 2021. The workshop attracted 20 participants from
- (xiii) 14 member countries of the African Rift namely; Burundi, Comoros, Djibouti, D.R. Congo, Ethiopia, Kenya, Malawi, Mozambique, Nigeria, Rwanda, Somalia, Tanzania, Uganda, and Zambia. Other participants came from Kenya Electricity Generating Company
- (xiv) (KenGen), Kenya Geothermal Development Company (GDC) and Ministry of Energy of the host country, Kenya. The business plan and harmonized laws shall be submitted to the African Union (AU) for approval before the AGCE becomes operational.
- (xv) Online training by the African Union in collaboration with the University of Auckland, Newzealand: The geothermal staff participated in online series of webinars on geothermal energy in May 2021. The courses were intended to reach a range of professionals across the geothermal technical disciplines. They were open to both the public and private East Africa Energy Sector workforce including energy experts such as

- Geoscientists, Reservoir and Drilling Engineers, Power Plant Engineers and other technical specializations, Directors/Managers, Project Managers and Developers, Ministry staff, Energy Agencies, Companies, Regulatory Bodies, Universities, Transmission and Distribution entities.
- (xvi) World Geothermal Congress: Six (6) staff participated in the World Geothermal Conference (WGC2020+1) virtual event which started on 13th April and will run for six (6) months until October 2021 when the final meeting will be held in Reykjavik, Iceland.
- (xvii) Workshop on Temperature Gradient Measurement: On 24th May 2021, a workshop was conducted at DGSM Boardroom to review TGH data so far collected at Kibiro. Results and interpretation were presented and discussed. Two anomalous areas were identified, one as an out-flow zone between the hot springs and the Lake Albert, and the second as an up-flow zone towards the Kachuru peninsular between the fumaroles at the escarpment and the Lake Albert. The two areas were recommended for further investigations.
- (xviii) Economic assessment of the commercial viability of the selected geothermal direct use technologies at the identified sites in Uganda: Under the Climate Technology Centre & Network - United Nations Industrial Development Organization (CTCN-UNIDO) East Africa Geothermal Technical Assistance, a second progress report was submitted by the Consultant, M/s GreenMax Capital Advisors. The Consultant categorized direct use included Kibiro (Vegetable/grain drying, fish drying, Balneotherapy); Buranga (Fish drying, Tea and Cocoa & Palm processing, Balneotherapy) and Panyimur (Fruit drying, Tea processing, Rice drying, Fish farming & drying).
- (xix) MT and EM-power on-line Training: From 8th to 9th June 2021, staff attended an online training on how to use the New Geophysical data processing software EM-power by M/s Phoenix Geophysics Limited. A video to guide installation and operation of the new MT equipment (MTU-5C) supplied by M/s Phoenix Geophysics Limited was shown to the participants. The equipment and software were procured under the geothermal sub-component of WB funded ERT-3 program in the MEMD.
- (xx) Geothermal Tourism Workshop: On 6th May 2021 staff together with Ministry of Tourism, Wildlife and Antiquities (MTWA) organized a workshop on geothermal tourism at the DGSM. This followed a request by MTWA to consult DGSM in order to come out with clear development plans for spas in a selected number of hot springs across the country. Staff from MTWA presented their project outputs and solicited inputs

from staff of DGSM. The workshop was followed by a field trip from 26th to 28th May 2021 by MFPED, MTWA and DGSM to Kitagata, Buranga and Kibiro geothermal sites located in Sheema, Bundibugyo and Hoima Districts respectively (Figure 12 and 13).



*Figure 11: Civil works on-going at Kitagata (Ekyomugabe hot spring) as part of the geothermal spa development plan.*



Figure 12: MFPED, MTWA and MEMD staff at Buranga geothermal site.

### **3.3.3 Mineral exploration, promotion, production and value addition**

#### **3.3.3.1 Geothermal Exploration**

##### **Temperature gradient drilling**

Temperature Gradient Holes (TGH) can be very useful in revealing near-surface hydrothermal characteristics of a geothermal system, ultimately decreasing the risk associated with drilling deeper, larger diameter wells for further exploration or production. TGH are used for locating evidence of anomalous heat over relatively large areas, and as a tool to target deeper wells when combined with other available exploration data, including fluid geochemistry, geology and structure, and geophysics. TGH are drilled with light truck-mounted rotary or diamond coring rigs up to 500 m depth; however, the majority are typically <150 m deep.

TGH are not designed to flow, so they cannot be used to predict reservoir temperatures or depths. Surface maps and cross sections showing temperature gradient information can provide data on shallow hydrologic flow and heat that can point to the presence of a deeper potential resource at relatively low cost. GTH can therefore increase the confidence and likelihood of targeting a geothermal resource.

##### **Temperature gradient measurement at Kibiro**



Following the drilling of eight (8) TGH at Kibiro in March 2020. A number of measurements have been done and measurement is continuing by the GRD. Field Personnel undertook temperature gradient data measurements in seven (7) Temperature Gradient Holes (TGH) in the Kibiro geothermal prospect (Figure 3). The eighth hole is submerged by the overflow from the Lake Albert caused by rising lake waters and has never been measured (Figure 4). The results will be used to update the geothermal conceptual model of the area that will be used to locate deep exploration wells. Higher gradients than the global average of 30°C/km suggest a temperature anomaly that could be a potential heat source for a geothermal system.

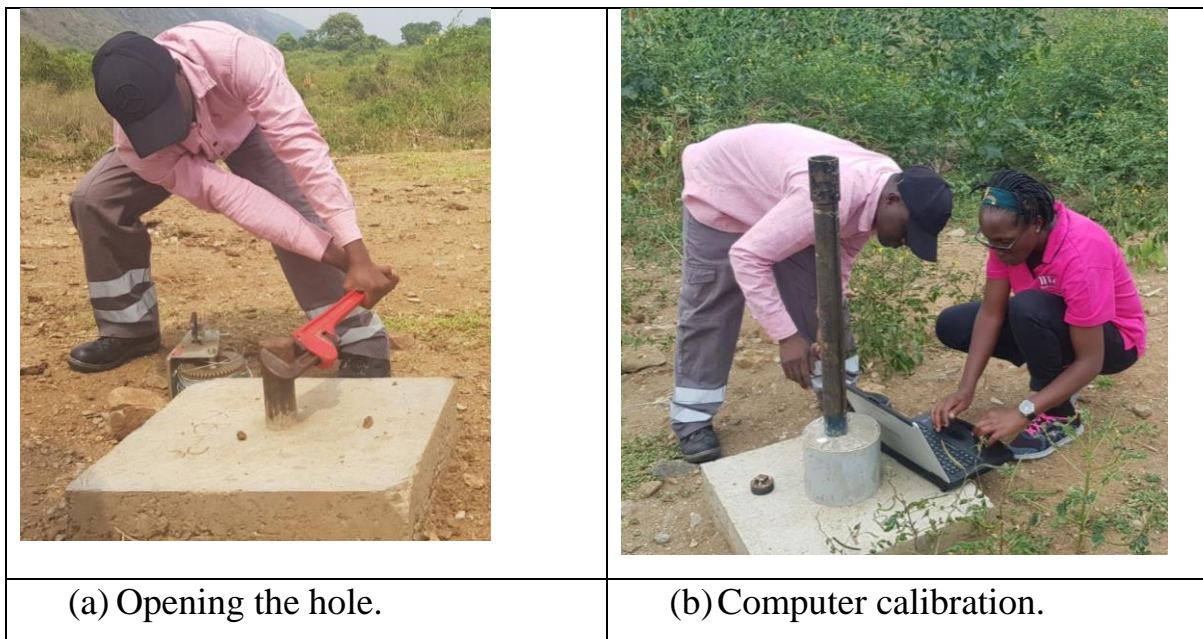


Figure 13: Staff conducting Temperature data logging at Kibiro.

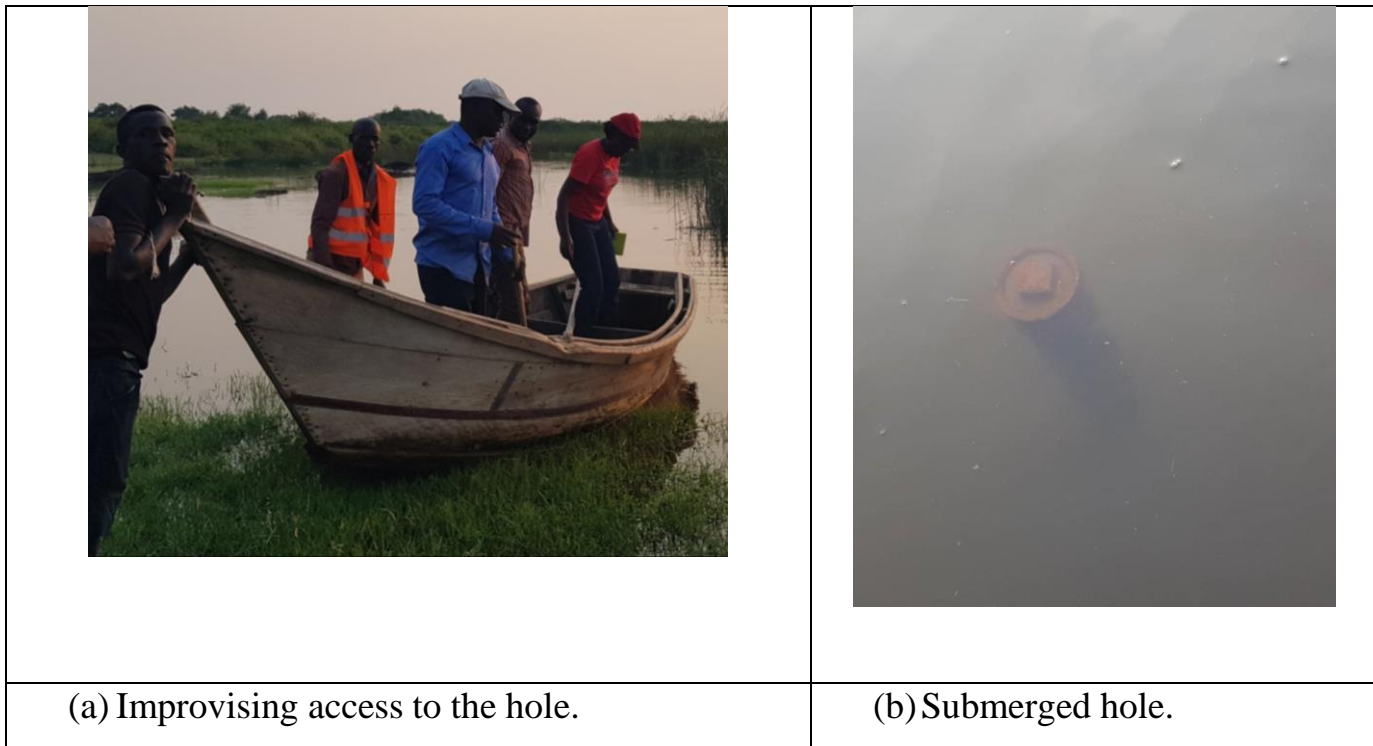


Figure 14: A submerged TGH that could not be measured.

The following is the average temperature data collected in July 2020 (Table 4). The results were plotted and the curves presented in Figure 15. This was followed by calculating the temperature gradients (TG) which are also presented in Table 5.

Table 4: Temperature and depth measurement at Kibiro, July 2020.

Depth (m)	KB-1	KB-2	KB-3	KB-4	KB-5	KB-6	KB-7	KB-8
25	48.4	32.9	34.8	49.3	32.1	31.9	32.3	Hole
50	56.0	31.6	38.3	56.1	33.6	32.8	34.9	Inundated with water
75	54.8	32.8	41.6		36.4	34.9	38.7	
100	55.2	34.8	46.1		40.3	37.7	39.5	
125	56.6	37.0	49.9		43.8	40.4	39.5	
150	58.4	38.9	54.6		47.6		39.5	
175		40.9	58.8		49.6		39.5	
200		43.5	62.2		51.5		39.5	
225		46.5	65.4		53.9			
250		48.1	68.1		54.6			
275		50.4	70.6		54.6			
300		52.4	72.7					

Table 4 show a measuring interval of 25 meters which is very high and can miss out some temperature anomalies. The GRD has acquired a new thermometer which can allow measurements at an interval of 2 meters and is yet to be used. This is expected to improve the quality of the measurements and calculated Temperature Gradients.

### TEMP LOGS ON 21.07.2020

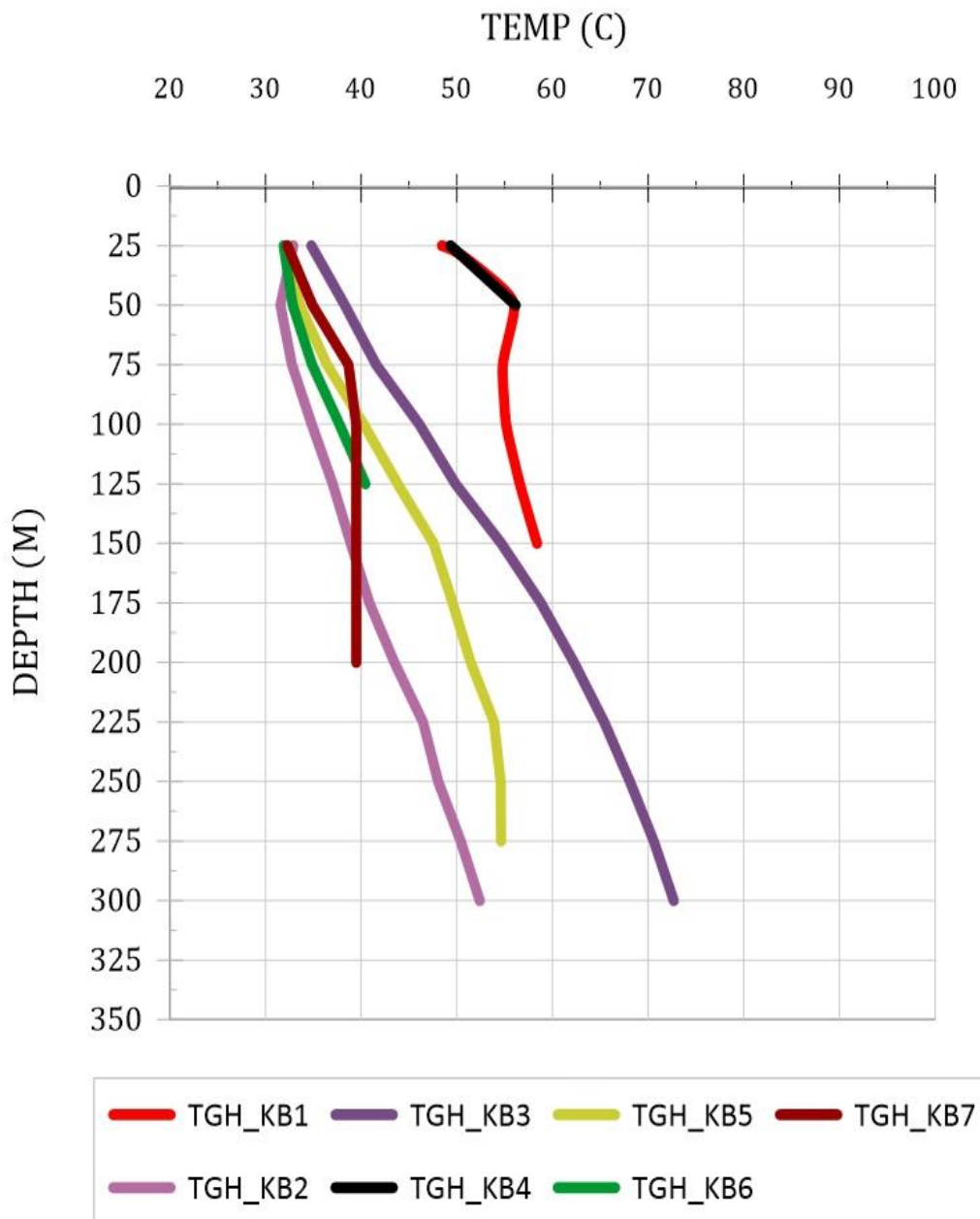


Figure 15: Temperature data logging on 21th July 2020.

Figure 15 shows increase in temperature with depth which has been consistent. Borehole KB-1 and KB-7 are behaving differently because of the broken 2-inch pipes and entry of cold flow. This is evidenced by the negative gradient between 50 and 175 m in KB-1 and beyond 75 m in KB-7, and the water levels controlled by the water table. Boreholes KB-4 and KB-7 were affected by collapse of the holes during drilling and hence the few measurements. The two boreholes represent the Kachuru peninsular which looks to be more promising than the rest of the Kibiro geothermal prospect considering the high Temperature Gradients in KB-4 and KB-3. This area needs drilling of more TGH before it is recommended for drilling of exploration wells. Table Results of Temperature Gradients (TG):.

*Table 5: Temperature gradient for the Bore Hole*

SNo	TGH	TG (°C/Km)
1	KB-1	69.6
2	KB-2	71.0
3	KB-3	140
4	KB-4	344
5	KB-5	100
6	KB-6	74.6
7	KB-7	70.6

From the interpretation of the results in Table 2, the findings show the presence of heat in the subsurface at Kibiro with high temperature gradient in the region of 70 to 350°C/Km which is above the global average of 30°C/Km. Two anomalous areas have been identified as follows:

- (i) An outflow zone in the region of the hot springs and between the hot springs and the Lake Albert (KB-1 and KB-2), and
- (ii) an up flow in the region of Kachuru peninsular (KB-4, KB-3 and KB-7).

The results will be used to update the subsurface conceptual model of the area that will be used for locating deep exploration wells. Preliminary findings show two potential areas; (i) an outflow zone between the hot springs and the Lake Albert at Kibiro, and (ii) an upflow zone between the fumaroles along the escarpment and Lake Albert at Kachuru. Further temperature measurements

and investigations are needed to update the conceptual model for Kibiro. The updated model will aid in locating sites for deep exploration wells. There is a need to drill more TGH at Kibiro; two (2) in the up flow zone near KB\_1 which was affected by cold water inflow and another hole; and another two (2) in the up flow zone in the Kachuru area near KB-4 and KB-7 which were affected by blowouts.

### **Infrastructure assessment**

A team of Engineers from Ministry Works and Transport and MEMD conducted a field trip to Kibiro to assess the road to Kibiro to be used in future geothermal activities. Two (2) alternatives were surveyed: (i) Kigorobya to Kibiro through the escarpment, and (ii) Biiso to Runga and then to Kibiro along the shores of Lake Albert. The Biiso to Runga and then to Kibiro route was considered expensive as it will entail constructing several bridges to cross the numerous stream gullies caused by the flooding Lake Albert waters. It was, therefore, recommended that the Kigorobya to Kibiro alternative be prioritized for future development.

### **Geological mapping at Panyigoro**

Field reconnaissance mapping of surface geothermal features was conducted northeast of Panyimur in the Panyigoro area to assess diatomite deposits near a borehole discharging warm water. The diatomite is believed to be associated with high silica laden geothermal fluids. Two boreholes with abnormal water temperature (322509 E, 266326N DWD 35664 by Total E&P; 324461 E, 264965N Riwu community BH) were located and sampled. The temperature measured at the later was 36.9°C. This show that the thermal activity at Panyimur extends to Panyigoro suggesting that the geothermal area could be somewhat larger than originally thought. Alternatively, the borehole could represent a geothermal area in Panyigoro.

### **Investigation of an alleged volcanic eruption**

It was alleged in the media that there was a reported eminent volcanic eruption at Rwanga village in Panyimur Town Council. The area was reported to spew out mud and sending tremors in the area. The scene was visited on 30<sup>th</sup> March 2021. It was found out to be mud flow/eruption coming out of sediments possibly fueled by high pressure zones in the subsurface (Figure 16).



Figure 16: The source of the mud flow/ejection and geothermal grass (thermophilic grass) at Rwanga, Panyimur Town Council.

The force is likely to be compressed gas in the sediments. The presence of geothermal grass suggests that the area could have been a geothermal area which has since cooled down with time. The suspected gas pockets in the area could cause problems in future during the proposed TGH drilling at Panyimur. There is, therefore, a need to investigate this area further by measuring the surface temperatures and presence of gas in the neighboring environment before drilling at Panyimur is undertaken.

Reconnaissance surveys of the geothermal areas in Southwestern, Western, Northwestern and Northeastern Uganda

The Geothermal Resources Department (GRD) undertook reconnaissance surveys of the geothermal areas in Southwestern, Western, Northwestern and Northeast Uganda in order to determine their potential for detailed exploration and select more areas for the pre-feasibility studies that would in future feed into cascaded geothermal development. The activities would include updating the current status of the areas in terms of access, status of electricity connection networks, current direct uses of geothermal, change in physical parameters of the hot springs (temperatures, conductivity, TDS, flow rates etc.) The information shall be used to determine which areas shall follow the already studied four areas in cascaded detailed exploration and development. The team also gathered information from local leaders and communities on how best the geothermal heat can be used and various potential uses. During the reconnaissance, new staff were trained in geochemical sampling and field analysis of water and gas samples (Figure 17). The samples are currently being analyzed in the laboratory at the DGSM for major elements before final interpretation and reporting.



Figure 17: Analysis of volatile components of geothermal water at Karungu hot springs, Rubanda District.

### **Panyimur information and awareness meeting**

Local communities in Rwanga village in Panyimur subcounty, Pakwach District, where a mud flow took place in 2019 were sensitized about geothermal energy development and the effects of gaseous emissions to allay fears about a possible volcanic eruption in the area. The sensitization was to mitigate local population concerns, environmental misconceptions, and to secure community support and acceptance to the geothermal project (Figure 8). The MEMD is planning to drill fifteen (15) TGH in Panyimur geothermal prospect in the FY 2021-22.



Figure 18: A local community leader explaining to the participants on how to detect gas emissions using a portable gas monitor.

### **Kibiro community engagement meeting**

On 16<sup>th</sup> April 2012, a meeting was held with Kibiro village LC1 Executive of 8 people to update them on the status of the geothermal project at Kibiro and the on-going court cases (Figure 9). They were informed on the ongoing court cases which affect the progress of the project at Kibiro. Four court cases were lodged in courts of law following an incident that took place while drilling the last TGH at Kibiro on 29<sup>th</sup> March 2020. Two court cases have been heard, one in the High Court at Masindi and the second one at the East African Court of Justice (EACJ) in Arusha, Tanzania. The one in EACJ was heard on 22 June 2021 for the first time. The one at Masindi has a court injunction issued on 8<sup>th</sup> August 2020 stopping the drilling project at Kibiro until the main suit is heard. The remaining two cases one at Kampala High Court and the second one at Masindi High Court have not been heard. The court cases shall delay the progress of geothermal exploration at Kibiro.





Figure 19: Meeting between GRD staff and Kibiro LC 1 Executive Committee.

### **Visit by the staff from the Attorney General's office**

In March 2021, the Commissioner/GRD visited the Kibiro prospect with staff from the Attorney General's office who is handling the court cases at Kibiro. The staff from Attorney General interviewed the project affected person, Mr. Julius Kiiza Lubanjwa, who claimed that his compensation had been blocked by some staff from the MEMD who sided with official from the Local Government to block his compensation. He told the visitors that he had to go to court after being frustrated by the MEMD staff and also stopped the cleaning exercise which was to kill the evidence. The Attorney General assured him that the court shall determine his compensation once the case is heard and disposed of.

### **3.3.3.2 Promotions**

On 15th March 2012, Staff gave a talk about geothermal energy development in Uganda to fifteen (15) staff of African Center of Media Excellence at Bunga in Kampala. This was meant to enhance understanding of benefits of geothermal energy development in Uganda.

### **3.3.3.3 Inspections and Monitoring**

#### **Inspection at Panyimur**

The Commissioner/GRD inspected the Panyimur geothermal prospect to check on the TGH drilling sites proposed to be drilled in the FY 2020/21 after completion of the ESIA studies. It was observed that two (2) TGH sites have been submerged by the River Nile/Lake Albert and may not be drilled in the near future (Figure 11).



*Figure 20: One of the two submerged TGH site at Panyimur.*

The lake waters have displaced a number of families within 200 – 300 meters from the old lake level. The floods have also crossed the Pakwach to Panyimur road at one point in the project area (Figure 12).



Figure 21: The Chairman Panyimur LC III at the point where the lake water crossed the road.

The Commissioner also met the local leaders led by the Panyimur Sub county LC III Chairman Elect who explained the magnitude of the flood problem in the area that has displaced a number of families including the Paramount Chief of Panyimur and submerged the loading pad of the Ferry that was used for transport between Panyimur and Wanseko in Buliisa District on Lake Albert. The Chairman LC III, however, promised to promote and sensitize the communities to accept the project and pledged support to the coming TGH drilling program at Panyimur.

### **3.3.3.4 Licenced companies**

The following were the licences in geothermal exploration that were monitored by GRD closely:

**GIDS Consult Ltd**, a company holding a Retention License (RL) at Buranga Geothermal Prospect won a grant to drill Temperature Gradient Holes (TGH) and undertake additional surface survey at Buranga from the African Union Commission – European Union – Geothermal Risk Mitigation Fund (AUC-EU-GRMF). The company is negotiating with the AUC for a Grant Contract (GC) which once agreed on will lead to drilling of eight (8) TGH at Buranga in FY 2021-22.

**M/s Bantu Energy (U) Limited**, a company holding an Exploration License at Panyigoro geothermal area, Pakwach District, has carried out geothermal surveys but its license expired in 2020 and is in the process of renewing the license. The company is also applying for grant from the African Union

Commission – European Union – Geothermal Risk Mitigation Fund (AUC-EU-GRMF) to complete surface exploration at Panyigoro.

Following the expiry of an Exploration License at Ihimbo by Moto geothermal Projecting 2019, a new company (Zikaya Engineering Ltd.) is applying for the area covering 110 km<sup>2</sup> around the Ihimbo hot springs in Rukungiri district which also covers the area previously held by Moto Geothermal Project Ltd.

### **3.3.4 Health and Safety**

#### **Environmental and Social Impact Assessment (ESIA)**

On 25th June 2020, the MEMD signed two contracts to conduct ESIA at Kibiro and Panyimur with M/s Green Impact Development Services Limited (GIDS). GIDS completed the assessment in June 2021 and submitted Draft ESIA Reports for the proposed Geothermal Exploration Drilling Operations at Kibiro and Panyimur Sites to the MEMD. The MEMD after reviewing the draft reports, and GIDS making necessary changes, submitted the final reports to NEMA on 7th June 2021. NEMA is currently reviewing the reports after which she will give certificates of approval to the MEMD.

#### **Cleaning of deposited material at Kibiro**

On 6<sup>th</sup> June 2020, the MEMD signed a contract with Clean Waste Management Services, to clean-up the material deposited at Kibiro. The company submitted an Inception Report, carried out sampling and analyzed the soil and water samples. The analytical report was submitted to the MEMD and the results communicated to the stakeholders at Kibiro on 29<sup>th</sup> January 2021. Among the stakeholders present were the MEMD, NEMA, Local Government of Hoima district and the community at Kibiro. The results indicated presence of low concentrations of heavy metals and other compounds from both soil and water samples which were of negligible environmental significance. The report recommended cleaning and disposal of the deposited material in a non-hazardous/inert Land fill. The report was accepted by the community at Kibiro who agreed with the stakeholders present that the area should be cleaned. Later we learnt that the Principal project affected person (PAP) and a section of the residents objected to the cleaning exercise and lodged a case in the High Court at Masindi claiming for compensation for environmental damages.

The clean-up exercise was suspended after the PAP went to court and refused any further negotiations with the MEMD. The MEMD is seeking guidance from the Solicitor General on how to terminate the Cleaning Contract.

#### **Environmental monitoring**

The GRD conducted environmental monitoring activities around Temperature Gradient Holes (TGH) at Kibiro. The activities included ascertaining gas levels around TGH, fumaroles and hot springs using newly acquired portable gas detectors. No dangerous gasses were detected around the TGH. The equipment only detected presence of hydrogen sulphide at Kibiro hot springs. The hot springs have been discharging hydrogen sulphide for thousands of years without complaints, the concentrations of dissolved hydrogen sulphide are low and do not pose any danger to animal life.

**Panyimur local community engagement**

The Paramount Chief of Panyimur, Local Council leaders and Landowners from Panyimur visited Kibiro geothermal project (Figure 20).

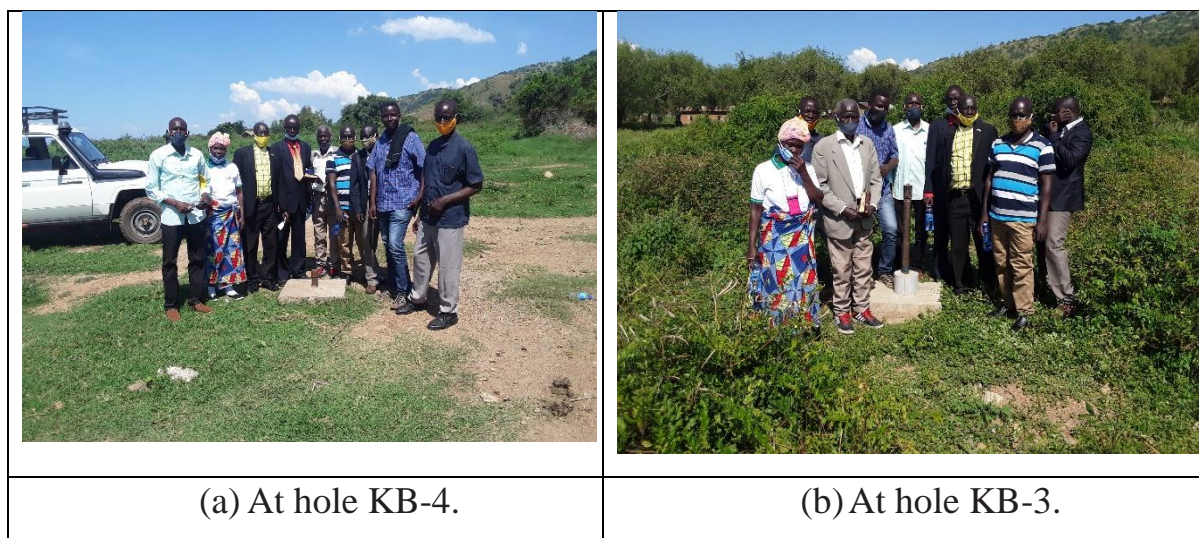


Figure 22: Local community representatives from Panyimur Sub-County at Kibiro TGH sites.

The visit was aimed at creating awareness and on a fact-finding mission on the potential environmental effects to expect during the planned TGH drilling program at Panyimur. The team was received by LC1 Chairperson of Kibiro and the Assistant Commissioner/GRD who briefed them about the TGH drilling project at Kibiro which was concluded in March 2020. The issues discussed between the two parties included environment impacts, public safety and access to drill sites for TGH. The visitors noted that good relations between landowners and the MEMD were based on open, honest and transparent communication where each party clearly understood the interests and objectives of the other.

## 4 PROJECTS

DGSM had Four (4) government funded projects being implemented. These included:

- (i) **Mineral Wealth and Mining Infrastructure Development MWAMID**  
– Project supports most of the Directorate activities that cannot be met using recurrent budget, such as: Policy formulation and regulation, Mineral Exploration activities and institution capacity development
- (ii) **Mineral Laboratories equipping and Systems Development**, for building the capacity of the Mineral Laboratories to international accreditation standards
- (iii) **Design, Construction and Installation of Uganda National Infrasound Network (DCIUNIN)**, for establishing an infrasound Network country wide
- (iv) **Uganda Geothermal Resources Development Project**, establishing Geothermal Resources in Uganda .
- (v) **Airborne Geophysical Survey of Karamoja Project**, to complete the remaining 20% of Uganda (mainly Karamoja, parts of Elgon and Lamwo) that has not been flown. The project will also cater for ground geological mapping and mineral resources assessment to reduce on uncertainty in suching for a particular mineral in those areas.
- (vi) **ACP-EU Development Minerals Project**,

DGSM also is pleased to be an associate beneficiary of the of African, Caribbean, Pacific (ACP) Group of States, the European Union (EU) and the United Nations Development Programme (UNDP) Project in Development Minerals (industrial minerals; construction materials; dimension stones; and semi-precious stones) sector. The project is in 40 countries in Africa, the Caribbean and the Pacific. The Programme is implemented in partnership with the Ministry of Energy and Mineral Development in Uganda.

During the FY2020/21, the project bought DGSM a plotter machine for pprinting big maps up to A0 paper size. The project also supported DGSM in organizing the Centenary celebrations.

The projects very much support the Directorate in realising its mandate. However, the projects have got pre-set gaols, outputs and reporting obligations. Therefore Independent project performance briefs are compiled by project coordinators and submitted separately.

## **5 CHALLENGES AND RECOMMENDATIONS**

### **5.1 CHALLENGES**

- (i) Ban on export of raw minerals discourages exploration, mining, mineral trade and inflow of new investors
- (ii) Limited funding to undertake planned activities and recruitment of staff in positions for the newly approved Directorate structure.
- (iii) Limited staff to carryout activities in newly approved Directorate structure.

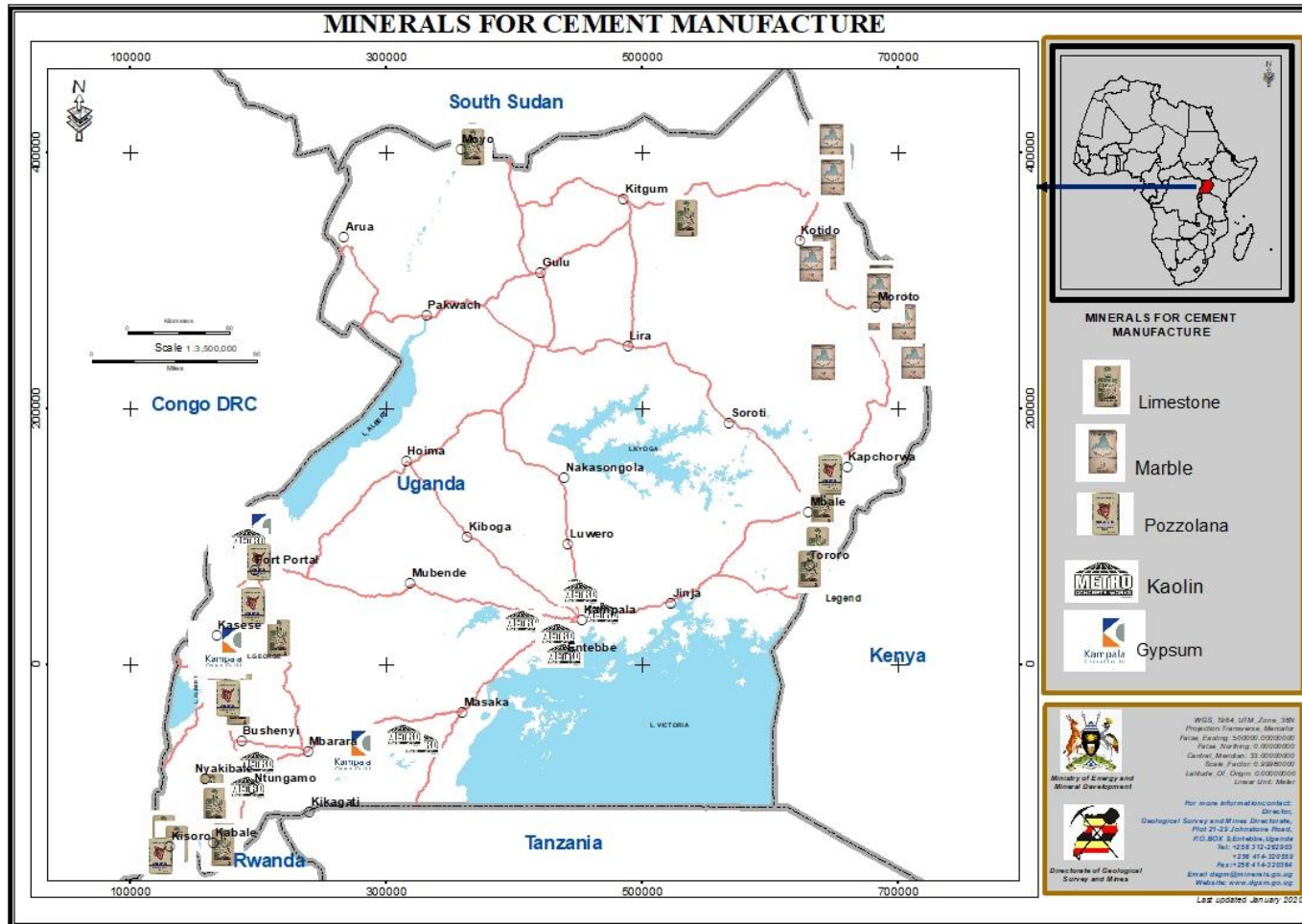
### **5.2 RECOMMENDATIONS**

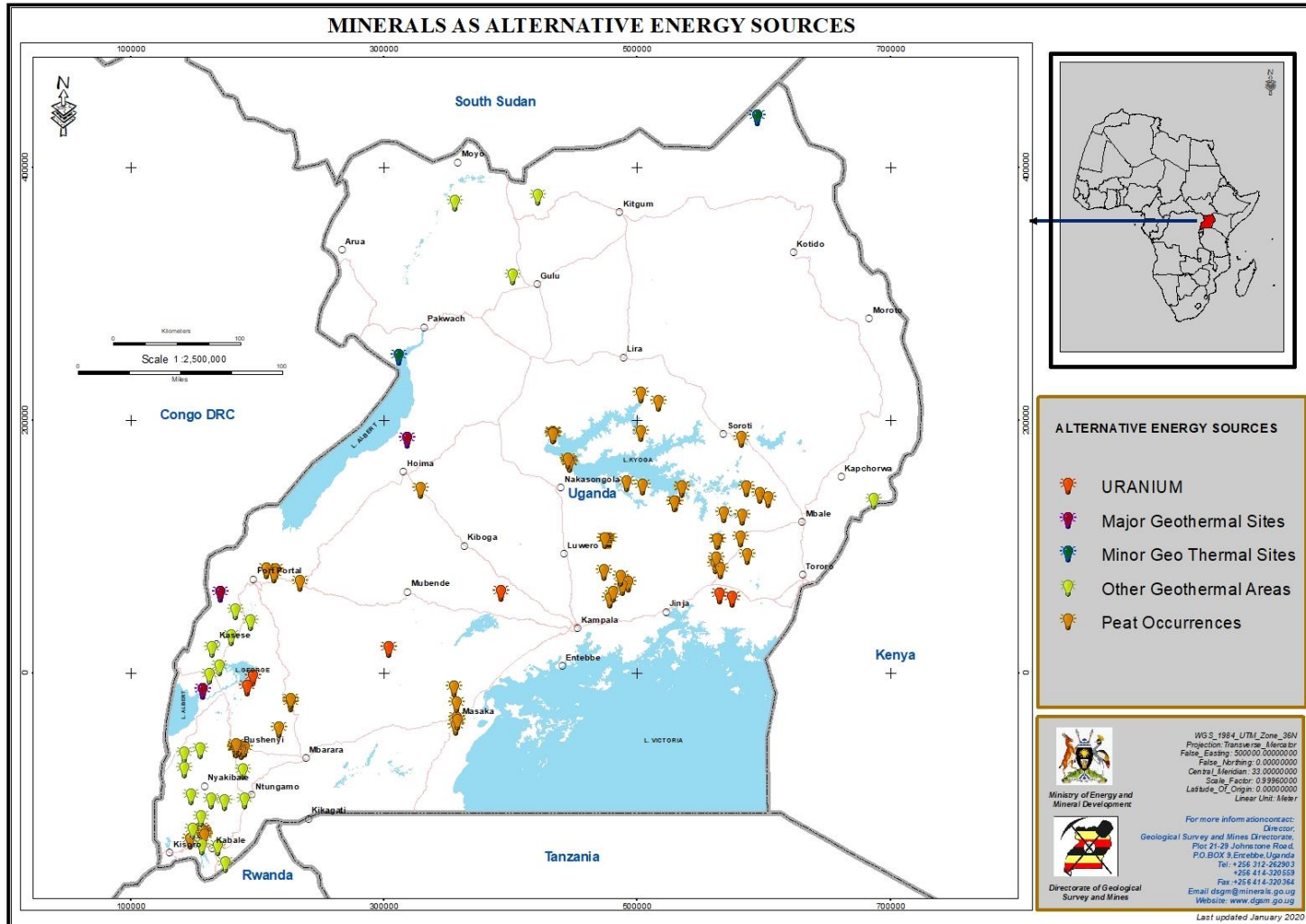
- (iv) Ban on export of raw minerals should be lifted;
- (v) The vacant posts especially those already catered for in the wage/salary budget should and filled on replacement basis should be filled as soon as possible to lessen the gap;
- (vi) Increase budgetary allocation to DGSM to allow for financial facilitation of the planned activities and recruitment of staff in positions for newly approved Directorate structure.

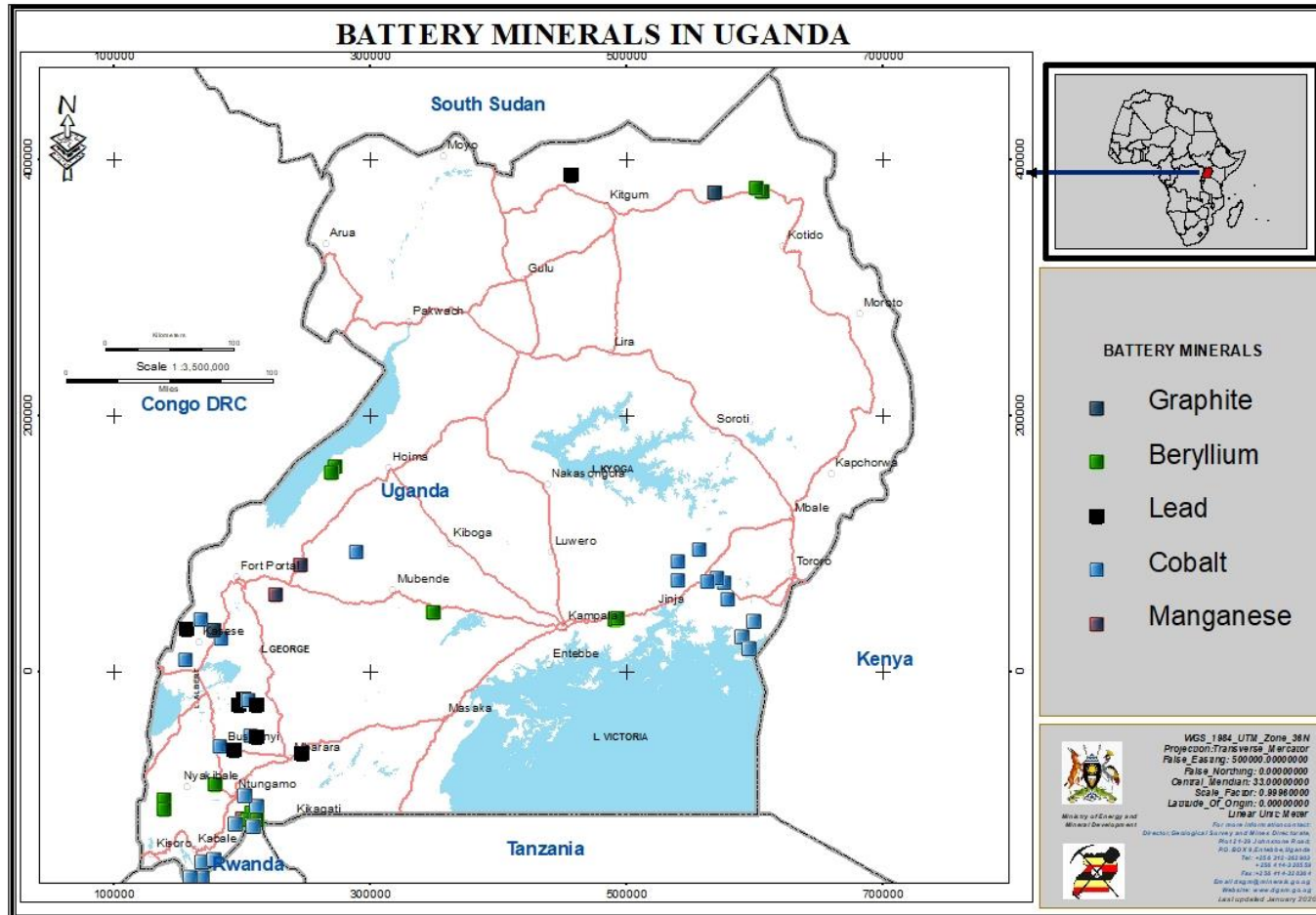
## **6 Appendices**

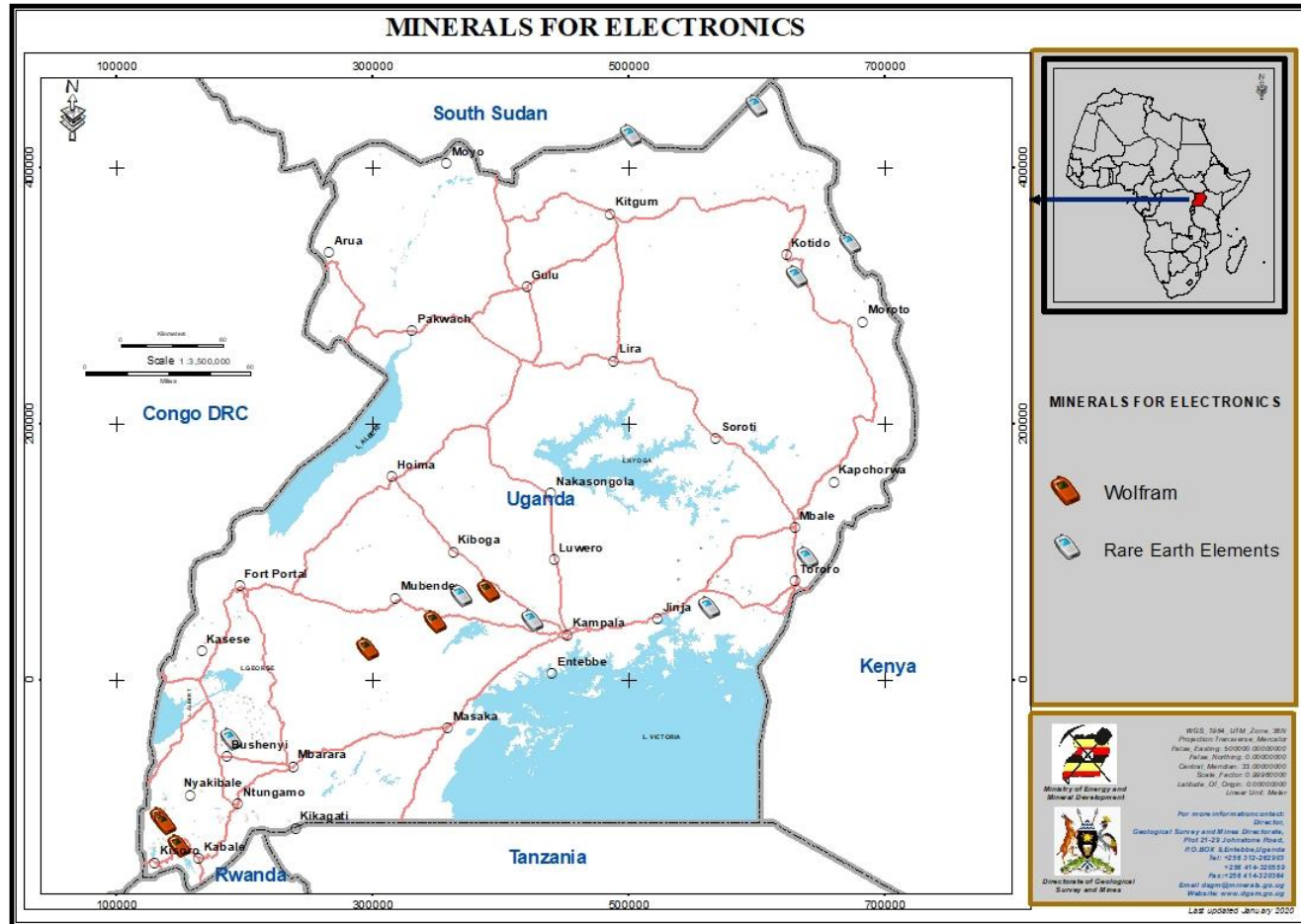
### **6.1 *STRATEGIC MINERALS IN UGANDA***

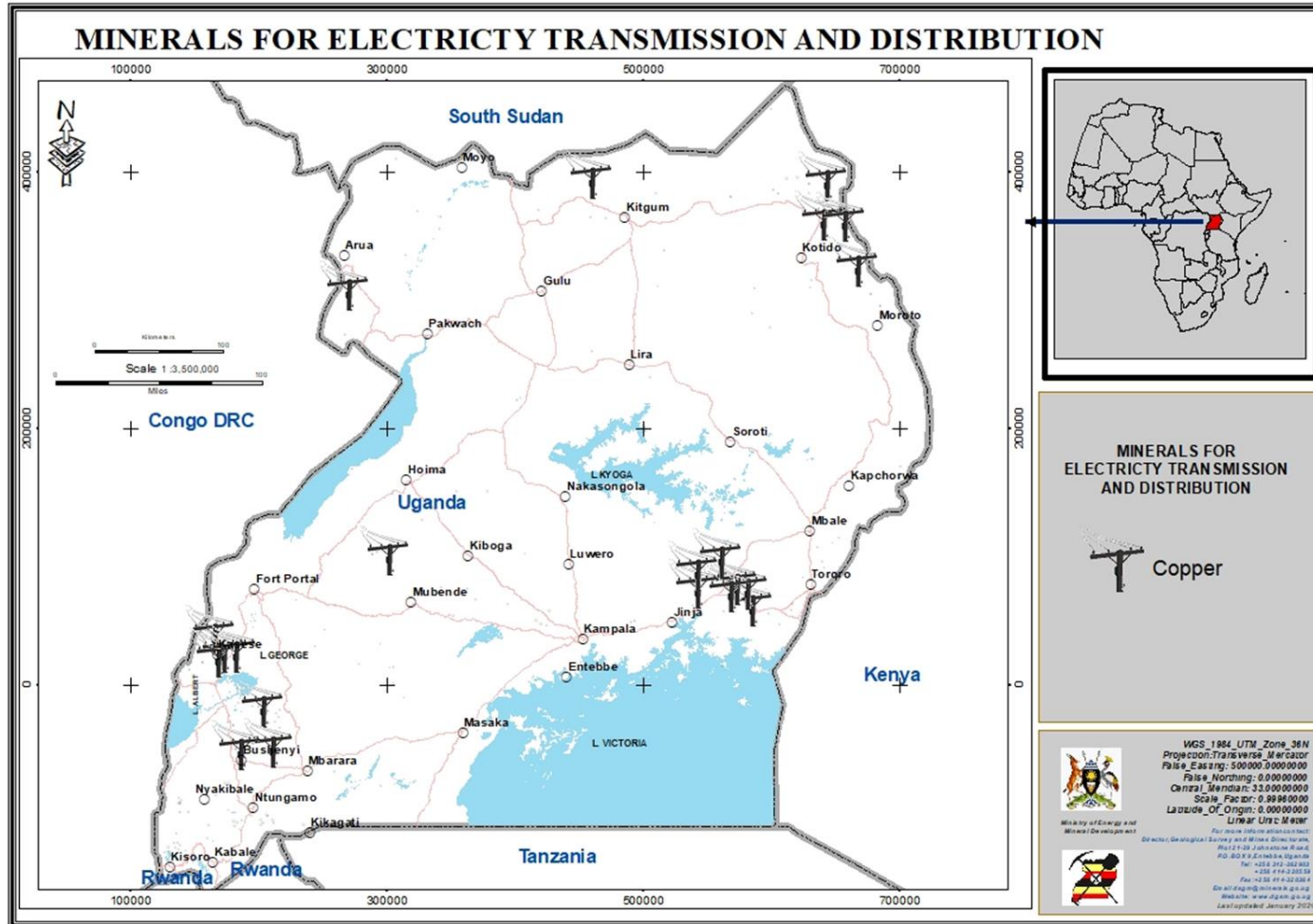












**6.2 SEISMICITY OF UGANDA AND THE SURROUNDING REGION DURING THE PERIOD JUNE 2020 – 30 JUNE 2021.**

<i>S/No.</i>	<i>Date DD.MM.YY</i>	<i>Event Time UTC (HH:MM:SS)</i>	<i>Latitude (deg)</i>	<i>Longitude (deg)</i>	<i>Body wave Magnitude (mb)</i>	<i>Focal Depth (Km)</i>	<i>Geographical Region of Location</i>
1.	02.06.2020	05:44:13	-4.632	35.8795	4.6	10	Kondoa, Tanzania
2.	02.06.2020	05:48:59	-4.4214	35.6219	4.5	10	Endasak, Tanzania
3.	08.06.2020	22:34:15	1.6150	30.8804	4.5	10	L. Albert, Hoima, Uganda
4.	21.06.2020	13:56:49	-1.5756	28.549	4.2	10	Sake, D.R.C
5.	21.06.2020	21:54:58	0.8089	29.9312	4.3	10	West of Bundibugyo, Uganda
6.	11.07.2020	23:17:59	-2.3509	24.4106	4.4	10	Lodja, D.R.C
7.	16.07.2020	01:23:20	-2.6865	29.1019	4.4	10	Cibitoke, Burundi
8.	06.08.2020	02:17:46	0.1063	29.9632	4.4	10	Kilembe, Kasese, Uganda
9.	12.08.2020	17:13:16	-7.3327	39.8126	6.0	17.6	Kilindoni, Tanzania
10.	12.08.2020	18:01:32	-7.2190	39.5551	4.4	10	Vikindu, Tanzania
11.	13.08.2020	14:54:54	-7.3912	39.8924	5.0	10	Kilindoni, Tanzania
12.	20.08.2020	11:23:30	-0.3947	28.5012	4.6	10	Butembo, D.R.C
13.	24.08.2020	07:03:49	-11.219	34.6397	5.0	10	Liuli, Tanzania
14.	24.08.2020	10:13:56	-3.7613	29.2592	4.2	10	Rumonge, Burundi
15.	24.08.2020	14:13:13	-3.7469	29.2579	5.0	10	Rumonge, Burundi
16.	11.09.2020	17:52:10	-5.8573	29.7566	4.4	10	Kalemie, D.R.C

17.	04.10.2020	06:47:33	0.8083	29.7003	4.3	10	Katibombo, D.R.C
18.	06.10.2020	19:11:34	-7.2969	39.7801	4.6	10	Vikindu, Tanzania
19.	10.10.2020	16:38:55	4.9332	32.1276	3.9	10	Juba, South Sudan
20.	15.12.2020	19:10:11	0.302	32.336	3.5	10	L. Victoria Region, Uganda
21.	17.06.2021	17:49:07	-0.807	33.170	4.3	10	L. Victoria Region, Uganda