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Malawi's mineral potential

○ Geological mapping bares real picture

○ Prospects for high value minerals noted

The project also provides on-the-job training for local geologists

By Marcel Chimwala

The ongoing Geological Mapping and Mineral Assessment Project (GEMMAP), which is being funded by the French Government to the tune of 10.8-million Euros, is proving beneficial in unveiling the true mineral potential of the country.

This was revealed at a recent conference organized by GEMMAP in conjunction with the World Bank and European Union-funded Mining Governance and Growth Support Project (MGGSP) in Zomba where experts from Geological Survey of France (BRGM), Geological Survey of Finland (GTK) and Council for Geosciences South Africa (CGS) of South Africa, who are providing technical assistance to GEMMAP made their presentations on the progress of the project.

GEMMAP is, among other things, interpreting data obtained from the countrywide airborne geophysical survey dubbed *Kauniuni* which was financed by the World Bank and European Union through MGGSP.

The results are so far confirming Malawi's potential for a number of minerals including rare earth elements, which are dubbed the vitamins of modern industry as they are very crucial in various modern high-tech applications including the production of magnets used in loudspeakers and computer hard drives, hybrid vehicles, rechargeable batteries and wind turbines.

Malawi has a number of prospects for rare earth elements mainly in the Chilwa Alkaline Province in the Southern Region and proven deposits include Songwe Hill in Phalombe, Kangankunde in Balaka and Lake Chilwa's Chisi Island.

GEMMAP, which is providing on the job training for Malawian geologists, is also working on anomalies for high value minerals including gold, diamond and platinum group metals.

In addition, GEMMAP is studying the geology of neighbouring countries in relation to that of Malawi and the results have so far confirmed that the geological environment in some mineral-rich neighbouring countries extends into Malawi.

Malawi's other significant mineral occurrences which are on the spotlight in the studies include uranium, coal, bauxite, copper, iron ore, gemstones, marble and graphite.

(Read the full GEMMAP project story on Page 6 and 7)

INSIDE

Shayona forges ahead with CSR despite poor business environment

Shayona's massive investment in Kasungu: *Left* is the 80m high soon to be completed imposing modern rotary plant

Padmanabhan: Shayona is just more than a cement company

By Chiku Jere

Shayona Cement Corporation has pledged to continue fulfilling its Corporate Social Responsibility (CSR) programme despite facing difficult times ushered in by 'the current bad business environment'.

The commitment was made at the company's factory in rural Kasungu by its Operations Manager, Prajeesh Padmanabhan, during a handover ceremony of drugs worth K2.5million to St Augustine Community Clinic and desks and teachers' furniture worth K6.5million to three schools - Ergo and Chamama Community Day Secondary Schools and Chigumba Primary School.

"The company is going through a very bad patch in terms of business. The situation on the market seems to be getting worse, but we cannot afford to pay a blind eye to matters of the community and matters of national interest because Shayona Cement Corporation is more than just a cement manufacturing company," said Padmanabhan.

He said Shayona is a true development partner of the Malawi nation, a fact which compels it to always take a leading role in implementing programmes to support the Malawi community.

The event also included a tree planting exercise that saw the planting and distribution of over 5000 Mahogany tree (*Khaya Anthothecca*) seedlings worth K2.5million to over 10 schools.

The K11.5 million pumped into the three components of the CSR investment - education, health and environment on that day was a finalization of Shayona's K18million allocated for the 2017 CSR programme.

Padmanabhan also announced that they have also allocated the same figure (K18million) for the year 2018 CSR activities.

"We were supposed to raise up the figure but the situation on the market is not permissible. Among other challenges, we still face stiff competition from unfair importation of cement and power also has become a major setback. The blackouts issue is affecting industrialization in Malawi. Imagine we have power just in four out of the seven days a week which is immensely affecting our production," he said.

Nevertheless, Padmanabhan said the company continues to put much effort to maintain standards and offer the market the best.

"We are still focusing on our expansion drive which is not only looking at the local market but we also want to compete at the regional level," he said.

Presiding over the function as guest of honour was Kasungu District Council Acting Director of Administration Thomas Mwafongo who stood in on behalf of the District Commissioner.

In his remarks, Mwafongo hailed Shayona for being a shining example when it comes to CSR as well as investing big in the country, which, he said, needs factories to grow its economy.

"Agriculture alone cannot help us change our economic fortunes. Selling of raw materials has become economically redundant and unattainable. We need to start adding value to produce through factories if we are to attain tangible economic contribution from our raw materials," he said

He, therefore, urged communities to support investors who come to set up factories in their areas saying for Malawi to develop, there is need for mindset change by communities.

"Communities need to reduce resistance to development. We need to be open-minded people who welcome and accommodate investors, because, through such massive investments, we will end up being winners as an area, a district, as well as a country," said Mwafongo.

Shayona Factory Administration Manager Austin Mvula attributed the resilient and success of Shayona to the visionary leadership of the company's directors with support from management and staff.

"Everyone can see we have grown. From a mini struggling cement manufacturing plant, producing just a little above 80 tons of cement per day, we have become a big cement manufacturing plant, with modern equipment," he said.

He said the vision of the owners of the entity urges to remain steadfast and focus towards achieving big.

"We refuse to be compared with any plant in the country because our focus is no longer limited to our country. We know if we have to be the best, we have to have our focus in the regional market and compete effectively there and surely Shayona Cement Corporation has become one of best in the region," said Mvula.

Even with that, the Factory Administration Manager said they are not yet satisfied and they are pushing harder until Shayona becomes the very best of them all.

He, however, acknowledged that the journey has never been easy and they do not expect it to be easier now.

"It is a challenging vision but we believe it is achievable," he said.

Mvula said since early days, even when they had not started producing cement, CSR has always been at the heart of Shayona Management.

Donations to the education sector, the health sector and of course environment form part of the company's central policy which is about serving the people.

"You will all, therefore, discover that Shayona Cement Corporation is not just about business; we are about total human care," said Mvula.

Meanwhile, the company has confirmed that works on its new 80 metre high state of the art hi-tech rotary plant which was branded as phase two of factory development is almost done and will be commissioned this year.

Currently Shayona produces 300 tonnes of clinker and 650 tonnes of cement which translate to 13 thousand 50kg packets of cement per day, making it the biggest cement producer in the country. But with the completion of the new rotary plant, the output is expected to rise to 400 tonnes of clinker and 1200 tonnes – 24 thousand of 50kg bags per day, making Shayona one of the biggest cement producers in the region ■

Shayona officials symbolically making a drug donation to St Augustine Clinic representatives

Padmanabhan and Mwafongo (*right*), handing over desks to schools representatives (*left*)

Govt. lauds strides in formalising ASM operations

Delegates at Inter-Governmental Forum on ASMs in Geneva, Switzerland

By Deborah Manda

Government says it is making strides in its quest to formalise Artisanal and Small-scale Mining (ASM) operations so that they adequately contribute to the country's economy.

Director of Geological Survey Department Jalf Salima told *Mining & Trade Review* upon his return from an Inter-Governmental Forum (IGF) on ASMs in Geneva, Switzerland that despite some difficulties that the Malawi government is experiencing in managing ASM activities, at the meeting Malawi was one of the shining examples of countries that are progressing in formalising the activities.

The meeting's theme was "Managing Artisanal and Small Scale Mining" and Salima told the delegates that Malawi has already developed a draft ASM policy, which is a guideline to manage ASM activities.

The draft policy, which the Ministry of Natural Resources, Energy and Mining has developed with funding from the World Bank and European Union under the auspices of the Mining Governance and Growth Support Project, is currently being scrutinized by government officials before its adoption.

In the draft policy unveiled in March 2013, the government says it recognizes the contribution of the ASM subsector to the economy which includes the discovery of mineral occurrences, mineral production, creation of employment and generation in the rural communities.

Salima said in view of this, the government is committed to support the subsector by facilitating the transformation of the ASM activities into more organized and modernized mining practices, and further promote modalities of mineral marketing which encourage transparent business transactions and discourage smuggling.

"Malawi will integrate the knowledge gained at the IGF to integrate informal ASM activities into the legal, formal economic systems and reduce the social and environmental impacts of ASM," said Salima.

He said the government is also formalizing ASMs by encouraging them to obtain Non-Exclusive Exploration Licences (NEPL) and Mining claims for them to operate legally.

"We are also facilitating the formation of mining cooperatives to enable them access technical services and financing as groups rather than individuals. There is also a provision of training in basic geology, mining, mineral processing and marketing done jointly with other organizations such as Technical Entrepreneur Vocational Education and Training (TEVET) and Ministry of Trade," said Salima.

He said that the Ministry is also promoting legal marketing of minerals and local value addition besides monitoring ASM activities to ensure that they are operating according to basic health and safety standards and following environmental regulations.

He said that at the IGF meeting, Malawi gained some knowledge and experience through presentations, panel discussions, plenary, and sharing experience with participants on how to manage ASM, which they will put to use.

"The Guidance to Governments on managing ASM document was discussed and shared, its content will complement the ASM Policy being drafted by the Ministry of Natural Resources, Energy and Mining in coming up with an ASM implementation strategy for Malawi," said Salima.

But he said although government is progressing in managing ASM, there are a lot of challenges just like in many other countries as ASM is a poverty driven activity.

Many people are engaged in ASM to sustain their livelihoods and this usually follows crop failure or is practised due to unemployment or the desire to supplement household income.

"Most ASM are informal thus they operate without licences and they lack basic geological knowledge that can help them in prospecting and mining which leads to destruction of the environment ," he said.

Salima also bemoaned the ASMs use of rudimentary methods of mining which results in low production and poor quality products since the small-scale miners cannot purchase proper equipment for mining to produce high quality minerals.

"With lack of capital to invest in exploration, equipment and mining, banks are reluctant to provide loans to ASMs hence they fail to process minerals and, therefore, most of them sell rough minerals usually at low prices which leads to illegal trading of mineral products," said Salima.

There is also the challenge of conflict with land owners and large scale exploration and mining companies as ASM say that large scale companies encroach in their territory.

Chikomeni Manda a Small Scale Miner from Mzimba who also attended the IGF said that the meeting emphasized on ASM formalization and financing as a lot of ASMs operate without proper documents and if they could be formalized it will help to boost government revenue in form of taxes.

"About 1% of ASMs are licensed while the rest are operating illegally. If they could be formalized it will help the government to have reliable data on how much we are extracting and exporting," said Manda.

He also added that if ASMs are formalized it can be easier to acquire good technology and loans from financial institutions through associations and cooperatives.

The Intergovernmental Forum is an interactive meeting that gathers representatives from members and observer member governments, mining companies, industry associations and civil society and academia to discuss the linkages and interaction between artisanal and small scale mining and Development.

The IGF, Minerals, Metals and sustainable Development 13th Annual General Meeting focused on Guidance to Governments on managing ASMs and was attended by delegates from over 60 countries across the globe■

Sovereign Metals constructs boreholes for Malingunde community

Kruger handing over a borehole to community through Kawinga, flanked by the Lilongwe DC Lawford Palani and area MP Dimba

By Deborah Manda

ASX-listed resources group Sovereign Metals has constructed two boreholes for Kumalindi and Ndumila villages and repaired one for Chiyamika Village in Malingunde area in Lilongwe where it is prospecting for flake graphite.

Sovereign Country Manager Andries Kruger said at the official hand over of the boreholes that the company has executed the works in response to a request from members of community, who have been complaining of lack of access to portable water.

"Group Village Heads Pindeni and Chitsulo approached us to assist them with boreholes as their subjects used to walk long distances to fetch portable water so Sovereign, as a socially responsible corporate citizen, decided to help. Today we are very happy to be handing over the boreholes to the community," said Kruger.

Member of Parliament for the area Peter Dimba said that he is very grateful to the company for the boreholes adding that he expects Sovereign to implement more development projects in the area as part of corporate social responsibility.

"We expect to have a community development agreement in place so that we, people of this area, adequately benefit from this treasure beneath our ground," said Dimba.

Guest of honour at the function Lilongwe District Council Chairperson John Kawinga said the boreholes will go a long way in providing portable water which is very significant at this time when the country has been hit by an outbreak of cholera.

Kawinga said: "The Council is very thankful for the timely gesture from Sovereign because access to safe water is a right for everyone."

"I urge the communities to take good care of the boreholes." said Kawinga.

He also touched on the issue of compensation for the people affected by the project assuring them that they will get their full compensation package when the company starts mining as in exploration stage their entitlement is just a disturbance allowance.

Sovereign Metals operates in Malawi through its subsidiary Sovereign Services.

The company has been conducting exploration at the Malingunde site which has confirmed the presence of sizeable quantities of high grade flake graphite, and is now planning to launch a feasibility study■

EDITORIAL

BY MARCEL CHIMWALA, *PUBLISHING EDITOR*

Malawi needs more marketing of its mineral potential

As reported in our lead article, the results coming out of the Geological Mapping and Mineral Assessment Project (GEMMAP) are quite exciting.

The project, which is funded by the French government, is coming up with results that are confirming that Malawi is endowed with numerous mineral resources that can be exploited for the benefit of the country.

The mineral resources include bauxite, uranium, gold, gemstones including the most expensive rubies and sapphires, marble, coal, iron ore, niobium, tantalum, graphite and rare earths which have been discovered in large quantities in the Southern Region's Chilwa Alkaline Province.

There are also anomalies for diamonds and platinum group metals which would require follow up studies.

GEMMAP is, among other things, interpreting the high resolution data acquired through the recent Countrywide Airborne Geophysical Survey dubbed Kauniuni, which was funded by the World Bank and European Union as part of the Mining Governance and Growth Support Project (MGGSP), and other similar surveys executed in the past.

We commend the government and its cooperating partners namely the World Bank, European Union and the French government for funding GEMMAP and MGGSP, which are proving that Malawi just like its neighbouring countries with similar geological environments is also a mineral rich country.

Listening to the presentations that were made at the recent GEMMAP/MGGSP conference in Zomba, one would indeed tell that with these projects in full throttle, Malawi is on course to transform its minerals sector.

The interpreted data from these projects will surely be an asset for Malawi in attracting investment in the minerals sector.

One interesting aspect of GEMMAP is that it is also overhauling the data storage system at Geological Survey Department so that data is stored in digital and not analogue form as has been the case.

This is very important as it has been cumbersome for investors to access data with the analogue system.

It is also commendable that GEMMAP is providing on-the-job training to Malawian geologists as this will ensure that Malawi has practically equipped geologists who will be up to the task even when the international experts engaged to execute the project finish their work.

MGGSP on its part has also played a great role in several aspects including reviewing the curricula for mining related courses in the country's tertiary institutions so that they are in tandem with practical requirements of the industry, development of the cadastral licensing system at the Department of Mines and financing the review of the archaic Mines and Minerals Act.

We feel these reforms are enough to transform Malawi's mineral sector to be at par with that of neighbouring countries in these days when nations are competing for investment in the sector.

However, it is imperative that Malawi scales up its marketing campaign to attract investors in the sector as the country does not have a rich mining history.

In order to attract investors, the government must also be decisive in handling of licence applications for large scale mining ventures because mining investors will always favour a country where fellow investors are undertaking successful mining operations.

It is absurd for the government to just shelve applications for mining licences because it is scared that there will be outbursts from the civil society■

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EYE ON MALAWI'S EXTRACTIVES

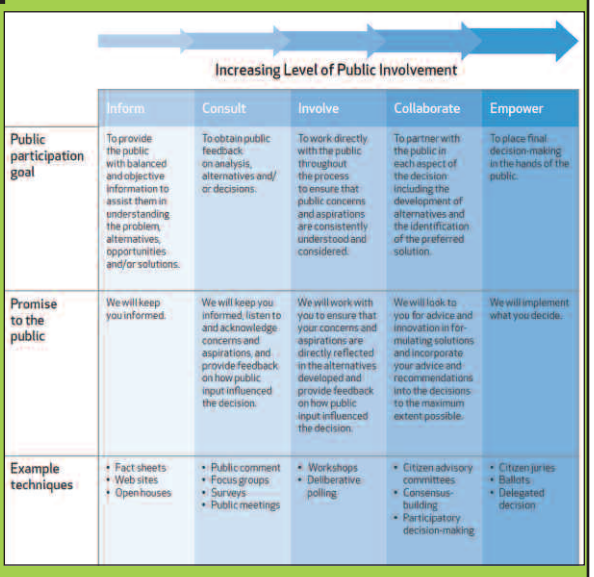
With Rachel Etter Phoya

What is the role of the public in Malawi's ESIA?

Malawi has a new Environmental Management Act (2017). The law guarantees public participation broadly in environmental management (Section 5) and access to information (Section 85); under old legislation, the Director of Environmental Affairs was given the discretion to determine if public hearings should take place. Now the Environmental Social Impact Assessment (ESIA) – as opposed to just an Environmental Impact Assessment (EIA) – is a compulsory process for all companies.

The purpose of ESIAs is to help public authorities (including representatives of citizens, such as Members of Parliament) weigh the potential of economic development through an activity like mining against the potential environmental, cultural and social impacts. It also provides information to subsequently monitor activity and take precautionary action and may give the public the opportunity to influence or stop a project.

The EIA was first introduced as an environmental management tool in the 1960s in the United States. Since then, most countries include it as a requirement for certain types of projects, particularly in the extractive industries. The way the public is defined in national legislation, the purpose, type and duration of public participation, and the possible outcomes for a project due to public participation vary, of course, from country to country.



Guidelines on Public Participation in EIA in the Mekong Region

In fact, in a recent study [1], nine different potential objectives of public participation in the EIA process were identified: public participation to allow those affected to influence decisions (1), to increase democratic capacity (2), to encourage social learning (3), to empower and emancipate marginalised people and groups (4), to improve the quality of the decision through public participation by harnessing local knowledge and information (5), to incorporate experimental and value-based knowledge (6), to test the robustness of information from other sources (7), to generate legitimacy for a project (8), and to resolve conflict (9).

Malawi first introduced the EIA with the 1996 Environmental Management Act. There has been only limited published research to date on the EIA process. However, Mhango concludes that there needs to be mandatory regulations to ensure the EIA is a useful tool and society and the environment are safeguarded.[2] At present, there are guidelines from 2011 that help direct the EIA process, but these are not binding. That said, international companies and financial institutions have often gone beyond the law (e.g. implementing ESIAs where only EIAs are required in the past) as part of their stakeholder and risk management approach as well as due to international financing regulations and expectations of shareholders. This cannot be said for all projects though.

The most extensive study [3] of sixty EIAs and environmental audit reports concluded that 'public participation is not adequate at most of the key stages of the EIA process in Malawi which puts the human and ecosystem health at risk' (307), and for one mining project this resulted in popular disapproval.

To ensure meaningful public participation, the following are some basics established by international organisation Pact [4] in its work in the Mekong Region in Southeast Asia

- Clearly define the objectives of public participation as this affects how the process is defined, who is counted in the 'public' and potential outcomes of participation
- Distinguish between different groups in the 'public' to design appropriate means of inclusion (e.g. to ensure that not only community leaders or adult males are consulted), considering characteristics such as literacy levels, expertise, availability and infrastructure
- Determine the type of participation (a range exists from informing and consulting to involvement, collaboration and empowerment); Free, Prior and Informed Consent is the most inclusive form of public participation, but this is not guaranteed under any of Malawi's laws at present (see image)
- Public participation goals and ensuing process design must be considered along six steps of the ESIA process: screening, scoping, EIA investigation and preparation, review of EIA report and EMP, decision making, and compliance, monitoring and enforcement
- Government, as it has the mandate to regulate and oversee the process, should have a checklist for meaningful participation to be used to assess participation from the perspective of stakeholders at each stage; although distinct questions are required for each stage, they should include questions about the type and objectives of engagement, who was involved, what and how has information been shared and collected, what were the desired outcomes and if these have been met
- Companies should develop a public participation plan for approval and review by government and stakeholders

The ESIA process provides an opportunity for building consensus around a project. Public participation can help to ensure key environmental, economic and social considerations influence project development if a project is given the go-ahead, which is desirable for all involved or affected.

For further reading, take a look at

1. Glucker, A.N., Driessen, P.P.J., Kolhoff, A., and Runhaar, H.A.C. 2013. Public participation in environmental impact assessment: why, who and how? Environmental Impact Assessment Review 43: 104-111.
2. Mhango, S.D. 2005. The quality of environmental impact assessment in Malawi: a retrospective analysis. Development Southern Africa 22(3): 383-403.
3. Kosamu, I.B.M., Mkandawire, A.A., Utembe, W. and Mapoma H.W.T. 2013. Public participation in Malawi's environmental impact assessment (EIA) process. African Journal of Environmental Science and Technology 7(5): 307-311.
4.Pact. March 2017. Guidelines on Public Participation in EIA in the Mekong Region. http://www.pactworld.org / download/2822/nojs/Regional%20EIA%20Guidelines_Final2.pdf ■

Malawi reports satisfactory progress in geomapping project

- We will now understand better the country's geology-Salima

Salima: Results will give a new picture of Malawi's geology

By Marcel Chimwala

The Malawi Government has reported satisfactory progress in the 10.8-million Euros Geological Mapping and Mineral Assessment Project (GEMMAP), which is funded by the French Government.

The Government, which is implementing GEMMAP through Geological Survey Department (GSD) and the Department of Mines in the Ministry of Natural Resources, Energy and Mining (MNREM), contracted a consortium of the Geological Survey of France (BRGM), Geological Survey of Finland (GTK) and Council for Geosciences South Africa (CGS) of South Africa to provide technical assistance to the five-year project.

GEMMAP was officially launched on June 15, 2016 by the then Minister of Natural Resources, Energy and Mining, Bright Msaka. It comprises six components namely geological mapping, mineral resources potential mapping, natural risks mapping, support to artisanal and small scale mining, provision of laboratory equipment and construction of documentation centre, and training of staff.

The implementation of these components is based, among other things, on the interpretation of the country-wide high resolution airborne geophysical data, which was acquired through a survey funded by the World Bank and European Union as part of the Mining Governance and Growth Support Project (MGGSP). A GTK-BRGM consortium is in charge of the interpretation of the acquired radiometric and magnetic data.

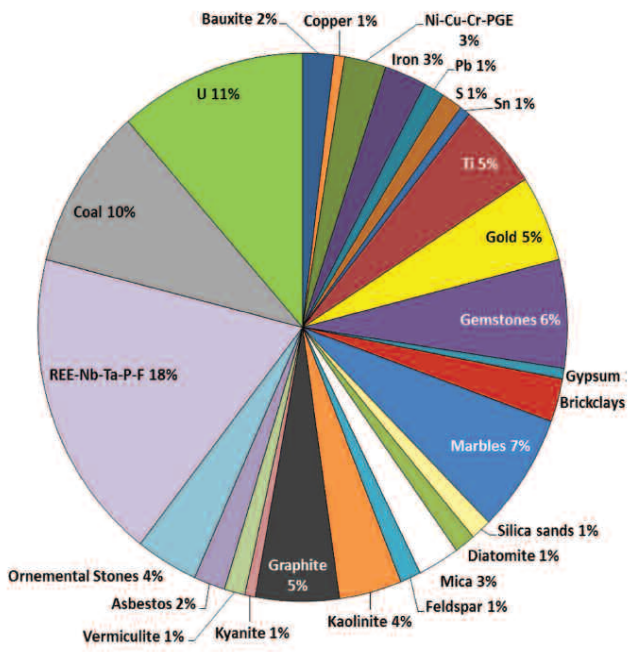
GEMMAP and MGGSP, therefore, jointly held a conference at University of Malawi's Chancellor College in Zomba last month to update stakeholders and the interested public on the progress of the project.

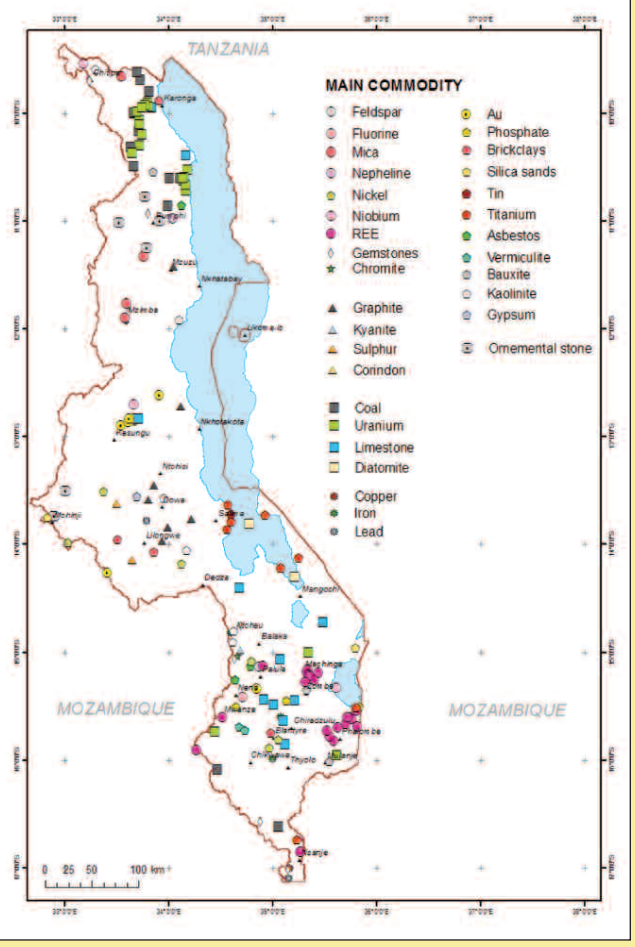
Director for Malawi's Geological Survey Department (GSD) in the MNREM, Jalf Salima, told the gathering at the two-day conference that the project is coming up with satisfactory results, which will be vital in improving the understanding of Malawi's geology.

"The results coming through GEMMAP and MGGSP, will give a new picture of Malawi's geology and its history," said Salima.

In the initial phase, lasting from September 2016 to February 2017, GEMMAP has compiled relevant geographical, satellite and geoscientific data from Malawi and surrounding countries. The review and analysis of these data have been presented in the GEMMAP inception report. It includes the overview of the Malawian geology in relation with that of surrounding countries, mineral resources assessment of Malawi, geohazards catalogue, review of Artisanal and Small Scale Mining (ASSM) sector, production of provisional 1:1 million scale geological and structural maps, metadata of GSD Technical Reports, transfer of past geochemical surveys into GIS and georeferencing of historical 100k geological maps.

KNOWN MINERAL OCCURRENCES





Around 157 already identified mineral occurrences: energy, rocks and industrial minerals, base and precious metals,....

Thomas Fullgraf, GEMMAP Project Manager, addressing the conference gathering at Chanco's Great Hall

The GSD archive has more than 1,000 technical reports that concern all modules of the GEMMAP project including geology (detailed geological maps), mineral resources (exploration works including geochemical surveys), metallurgical tests, resource evaluation, geohazards and small-scale mining. Their analysis throughout GEMMAP are considered fundamental for the evaluation of the mineral potential of Malawi.

Furthermore, GEMMAP, in conjunction with MGGSP, will greatly improve the data storage and data access at GSD through (1) digitising analogue data which presently are available in hard copy format only (2) organisation/ classification of these data (3) creation of metadata, (4) selected data treatment and analysis (historical geochemical and geophysical surveys, technical reports).

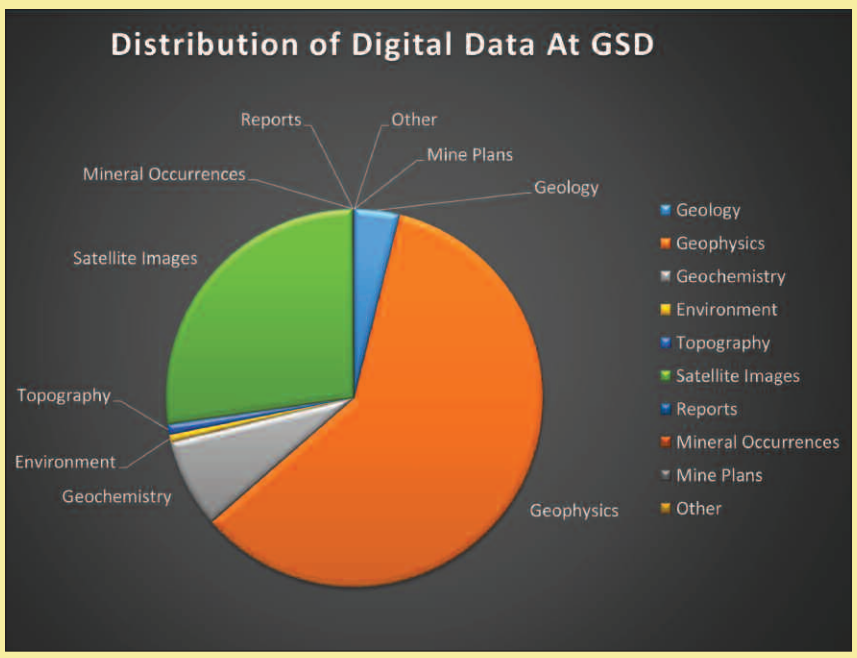
The geological mapping component of the project involves systematic mapping of the geology of Malawi, doing field observations including structural analysis, and collecting samples for petrographic, geochemical and geochronological studies, combined with the interpretation of high-resolution geophysical data and satellite multi-spectral data. The Deliverables include updated geological maps at scales of 1:1,000,000 (1 map); 1:250,000 (10 maps) and 1:100,000 (40 maps) and accompanying reports.

GEMMAP is also progressing in its second component of mineral resources potential mapping whose objectives are to asses the potential of mineral resources of Malawi, attract international major/junior mining companies through the identification of prospective areas and identify mineral resources for country development.

"While MGGSP is working on fulfilling its objective to rise the contribution of the mining sector to gross domestic product (GDP) through a number of reforms such as updating of mining law, development of the cadastral licensing system and the acquisition of high-resolution airborne geophysics, GEMMAP has emerged as an important project in assessing the mineral potential of the country," said Salima.

Assessment of the mineral resources concerns energy commodities (coal, uranium), industrial rocks and minerals, base and precious metals and gemstones. Work under this component involves re-investigation of already identified mineral prospects (around 160) through field surveys, sampling, petrographic and geochemical analyses. The identification of new prospective areas will be performed by sampling and analysis of around 3,000 stream and soil samples in areas poorly covered by historical geochemical surveys. The surveys will take into account the interpretation of newly acquired high-resolution airborne geophysics data set which allowed identifying around 85 radiometric and magnetic anomalies.

The data of all mineral occurrences will be stored in a dedicated database containing the exact location, the mineral/commodity, shape/morphology of the ore body, description of the host rock, estimated size of the deposit, status in terms of past, present and future exploitation, and relevant information regarding mineralogy, ore grade and past production.



Based on this information, a 1:1000,000 scale map of the mineral potential of Malawi and another one detailing the inferred mineral potential of the country will be produced.

Said the Project's team in a report: "A lot of information has to be extracted from existing reports and stored in a dedicated database."

"Petrographical characterization, geochemical analysis and geochronological data will bring new information in terms of origin and typology of mineral occurrences."

"We hope to produce a fresh/actualized view of the mineral potential of Malawi and to identify new prospective areas for future exploration/exploitation."

The results of the Geohazard component will assist the government to implement and manage the prevention policies of the country's structural development plan. The final products comprise one synthetic map at 1:1,000,000 scale and 10 geohazard maps at 1:250,000 scale illustrating the areas that are prone to various types of geohazards encountered in Malawi (floods, landslides, earthquakes…). The accompanying reports will include detailed descriptions of the geohazards encountered on each map.

The ASSM sub-sector has a significant potential to contribute towards the rapid economic growth and development of the country through rural job creation and providing alternative economic activities. However, there are several challenges that exist in the sub-sector and need to be addressed. These include limited access to modern technologies, capital for investment in mining and mineral value addition and established markets. The artisanal and small-scale miners have inadequate marketing skills, their mining operations are informal, they are unable to understand geological information and usually disregard basic mining occupational health, safety (OHS) and environmental considerations. The GEMMAP Project is intended to compile an inventory of ASSM in Malawi, to assess the methods used by ASSM operators together with possible environmental challenges and environmental issues at the mining sites, give recommendations for their improvement and provide training related to gemstone activities.

The GEMMAP 2018 programme started by implementing the analytical program for samples collected in 2017. This comprises, amongst others, selection of samples and laboratories, geochronological and geochemical analysis, quality control, data treatment and interpretation and thin section petrography.

The project manager, Dr. Thomas Fullgraf (BRGM), informed that the programme in 2018 furthermore includes preparation of twelve draft geological maps (100k scale) of southern Malawi, start of sheet explanations, geological mapping of northern to central Malawi, Karoo mapping of Malawi and completion of geological mapping of southern Malawi.

In the mineral resources component, the project will carry out the mineral assessment of northern and central Malawi. Geochemical surveys will be conducted in three areas, which will involve definition of sample areas and points, preparation and execution of one major field campaign lasting about 10 weeks during which about 1500 stream and soil samples will be collected and processed.

In the geohazards component, GEMMAP has planned in 2018 to conduct mapping of cenozoic sediments, field study visits of geohazards sites, development of geohazards catalogue and production of Seismo-tectonic map.

In the training component, GEMMAP, will organise training for officers at Geological Survey and Mines Departments on artisanal and small scale mining operations and prepare training manuals for artisanal miners.

The ASSM training programme for the government officials will involve sending one officer for specialised training in gemstone certification in Madagascar, 12 officers for lapidary training and four officers for ceramics to Tanzania.

Under GEMMAP, GSD geologists are also trained on-the-job by learning through observing and carrying out tasks assigned by the consortium geologists.

The organisation, financing and supervision of five Master's study programs as well as collaboration with the Earth Science Department of Chancellor College is part of the academic training.

"This training shall enable us continue geological mapping of Malawi after termination of GEMMAP," says Salima ■

MINING & Social Issues

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An Overview of Environmental Impacts of Mining Operations to the Surrounding Communities

Mining operations are perceived to have more overall negative impacts to the communities than the positive ones. In the long run it is the communities that are left with nothing but sinkholes, displaced families, polluted environment, erosion of culture, social obligation and economic status as time passes, just to mention but a few.

In particular, these impacts are documented in the Environmental and Social Impact Assessment in line with government legislation as a requirement before any mining operation takes off and is commissioned. It is also envisaged that the government spearheads the signing of development Agreements with the mining company on behalf of the communities where mining operation shall take place.

It is a requirement by mining companies in most countries to follow strict environmental, bio-remediation measures and rehabilitation codes in order to minimize environmental and human health impact. These codes and regulations require the common steps of environmental impact assessments, development of environmental management plans, mine closure strategies, planning and environmental monitoring plans or mechanisms. All these assignments are a requisite before mining, during operation and after mine closure. It is envisaged that of particular interest, most governments in developing countries, neglect these regulations through irregular monitoring and enforcement procedures. Mining operations usually create a negative environmental impact hence, most of the countries have passed regulations to decrease the impact together with safety measures that do not prolong environmental pollution from released toxic chemicals even if after the mines are abandoned or closed.

Environmental impacts should ideally be identified and mitigated according to the phase in the mining life cycle. This is a more practical way of dealing with environmental impacts since the scale of impact differs according to stage (e.g. impacts made during exploration are much less than those made in the operational phase). In addition, the environmental monitoring and management varies with each stage of the mining life cycle.

Environmental Impacts during Mineral Exploration Stage

The first stage on management of environmental impacts of mining comes with exploration for a new deposit. Exploration activity usually impacts the least on the environment in comparison to other stages of mining. However, in the past, prospecting and exploration was the domain of non-professional prospectors, who because of lack of knowledge of the market and requirements of the processing industry, coupled with the absence of professional exploration skills seldom conducted formal investigations or evaluations prior to opening mines. This has led to many ugly scars/sinkholes on the landscape around the world, as full scale mining commenced without any knowledge of the underlying geology, mining methods, pit optimization, grade control, tailings facilities and in these circumstances, mining was often unsuccessful.

Successful mines provide sufficient information to make an informed decision as to whether or not to proceed to the next stage taking the risks of a negative outcome into account. At each step of this sequence, the environmental impacts are taken into account, and the minimum possible footprint is disturbed. From an environmental point of view this approach has the benefit that environmental disturbances are minimized considering the possibility of a negative outcome. Thus if an exploration project is abandoned after drilling, the environmental impact is that the order of magnitude are lower.

The field evaluation stage of exploration has minimal impact on the environment and impact is caused mainly by the exploration team's vehicles when they clear existing flora for pathways and drill pads. Should the team choose to establish exploration camps close to the site then further environmental impacts will be caused by fires, sanitation and domestic waste disposal. This also has a minimal impact.

At the detailed mapping stage environmental impacts may start to intensify, particularly if it is necessary to mechanically clean mapping traverses. This may result in removal of vegetation and soil. In other mining types, e.g. quarrying, it is not often necessary to clear paths for mapping as fairly large solid outcrops of stone are often the exploration target and these have minimal cover if at all. Minerals extracted at this stage do not have significant impact, and the extraction sites can be concealed by replacing topsoil, or backfilling. If after detailed mapping is completed it is decided not to pursue the project further, it is relatively easy to replace the removed soil and seed with appropriate vegetation.

From the drilling stage the environmental impacts begin to become more significant, but can still be limited. The most severe environmental and social impact is land clearance caused by road construction for easier access for vehicles and air compressors resulting in damage to natural resource base, possible damage to sites of archaeological, religious or historical importance and health and safety risks to community members, livestock and wildlife.

At the bulk sampling stage the impacts are not considerably more than during the drilling phase, as a relatively small area is disturbed to extract the one or two blocks required. The impacts of bulk sampling are however limited by the relatively small area disturbed. Should a decision be made to proceed from bulk sampling to test mining, the environmental impacts are not significantly different from full scale mining, with the exception that at this stage no permanent infrastructure such as offices, workshops and other houses would be constructed.

Impacts on the natural resource base during the exploration phase may include impacts on soil, agricultural land, forest or woodland resources and surface and groundwater resources. Impacts on soil may result from vehicle traffic, drilling and materials storage resulting in soil erosion; impacts on soil structure (mainly compaction) and soil chemistry (as a result of petrochemical spills). Impacts on agricultural land may result in short term destruction of crops or grazing land or long term impacts due to disturbance of soil or vegetation which may affect long term agricultural viability The quality and quantity of surface or groundwater resources may be impacted by poor storage of chemicals and fuels resulting in spillage; inappropriate waste disposal practices; stream damming or diversion; land clearance in the upstream catchment and soil erosion.

Impacts on biodiversity may include loss of habitat, fatalities resulting from direct contact with exploration equipment and supplies (vehicles, bulldozers, chemicals, waste); Damage to or impacts on access to sites archaeological, religious or historical significance can be incredibly emotive and inflict major damage on the relationship with the local community. Exploration poses a risk to the health and safety of community members, livestock and wildlife through contact with machinery and vehicles; excavations and contact with chemicals and fuels.

Environmental Impacts during the Development Stage

Development is the preparation of the facilities, equipment, and infrastructure required for extraction of the valuable mineral material, and the phase includes land acquisition, equipment selection and specification, infrastructure and surface facilities design and construction, environmental planning and permitting, and initial mine planning. During this phase of many mining projects, there may also be a need for involuntary relocation of communities located in proximity to the proposed mining area. This can be a fatal flaw of a project and should be facilitated by qualified and experienced consultants. Given the nature of the mining methods employed, it is possible to mine safely much closer to human settlements than with most other surface mines and quarries.

In equipment selection, it is necessary to consider the sources of power to be used for the equipment. If the project is situated at high altitude, consideration must also be given to the fact that the engines of diesel powered earthmoving equipment may require modification in order to operate efficiently. Roads should be designed in such a way as to avoid soil erosion and to cause as little disturbance to flora as possible. Maintenance workshops should be designed to avoid contamination of soil and water by spilled fuel and lubricants.

The construction phase is associated with a number of environmental impacts resulting from excessive site clearance, poor waste management, poor site water management and socio-economic impacts. Impacts that may be caused by excessive site clearance during the construction phase, in addition to those mentioned in the exploration phase, are excessive dust problems, increased soil erosion and increased noise due to vehicle traffic and the use of explosives. The buffer (mainly vegetation), limited noise and dust to local communities may also be removed.

Poor waste management practices at this stage are particularly extensive due to a lack of established waste disposal facilities, ignorance of how to dispose of certain waste streams and failure to train the construction workforce in appropriate waste disposal. The types of waste that need to be disposed of at this point are construction waste, packaging material, oils and greases from construction fleet, tyres and domestic refuse (should there be camps around the site).

The main environmental impact resulting from poor site water management is associated with storm water management; especially in high intensity rainfall areas. Poor site water management can undermine or destroy structures, limit or even suspend site access, cause major soil erosion and lead to widespread contamination if flood events wash away poorly contained hydrocarbons or chemicals.

Impacts of construction on the social environment have to also be taken into consideration, especially if there is a pre-existing community near the proposed mining project. These impacts include public health risk caused by increased vehicle traffic (dust, hydrocarbon spillage, greenhouse gas emissions) and access to unsecured infrastructure under construction; nuisance factors such as noise, dust and vibration; adverse impact on traditional lifestyle of local communities for example alcohol abuse, prostitution, introduction of a cash economy, in-migration and breakdown of traditional tribal culture.

Environmental Impacts during the Extraction Phase

The major impact of mining on the environment is the aesthetic visual impact upon the landscape. Any mining activity which disturbs the surface of the earth will have a visual impact for its duration. Environmental impacts not associated with infrastructure include impacts to groundwater, surface water and communities. Groundwater inflow in surface mining operations can flood the lower sections of the pit – provided that the pit has surpassed the depth to the water table. High pore pressures in side walls can trigger collapse, leading to catastrophic events.

Disturbance of the earth's surface by any form of mining will result in complete removal of existing vegetation and ecosystems within the disturbed area, and dimension stone mining is no exception. The impacts are significant, but localized to the disturbed area, and the overall extent of the impact is determined by the concentration of mining and the sensitivity of the disturbed ecosystems. A proper environmental impact assessment (EIA) process will however identify areas where mining would cause irreparable damage, and mining should be excluded from such areas■

TECHNICAL FILE

by Grain Wyson Phillip Malunga **FIMMM**
Mining and Environmental Management Expert

The Geology and Mineral Potential of Malawi

Abstract
Malawi offers exploration and mining companies' new hope of investment opportunities. The country has just undertaken airborne geophysical survey for the whole country and the data is being interpreted and ground follow up is underway to confirm the geology of Malawi and over 85 geophysical anomalies that have been detected.

A few mining companies have made progress in pursuing their mineral rights and are looking for financial and technical partnership to open up mines. The new Mines and Minerals Bill is awaiting enactment.

1. GEOLOGY

The geology of Malawi is part of Kibaran orogeny that was formed through continental collision that constructed Rodinia as known in Africa (Dirks et al, 2011). Malawi is mainly composed of Archean and Paleoproterozoic (Ubendian) terrain. This terrain is dominated by what is known as Basement Complex rocks which were later overlain by Karoo sedentary rocks and intruded by basaltic/dolerite dykes and sills.

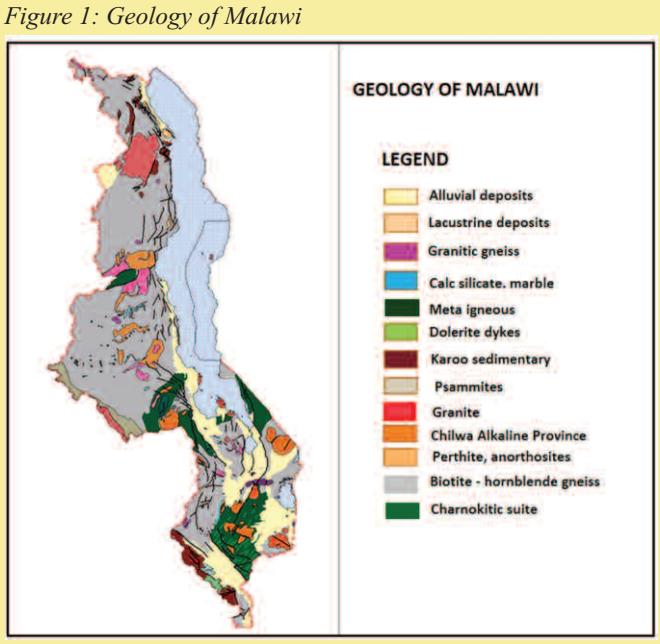
The Permo-Triassic period was later followed by Upper Jurassic – Lower Cretaceous period which saw the intrusion of syeno-granitic and nepheline syenite rocks that were later intruded by volcanic rocks infilled by carbonatite and alkaline dykes. The Southern part of Malawi is dominated by these rocks and have been grouped as Chilwa Alkaline Province. The same period saw sedimentary deposition characterized by Dinosaur Beds.

The above rocks have been overlain by Tertiary – Pleistocene rocks characterized by consolidated to semi consolidated beds grouped into Timbiri, Chiwondo, Chitimwe and Alluvial. Minor volcanic activities have been witnessed through existence of Songwe Volcanics. Figure 1 shows the geology of Malawi.

2. STRUCTURE

The structural set up of Malawi is influenced by Lake Malawi rift structure. Main faults strike north – south while transform faults strike north – east. The southern part of the country, within the Chilwa Alkaline Province, radial faulting may be encountered due to volcanic activities related with intrusion of carbonatite rocks and other infracrustal ring structures.

Figure 1: Geology of Malawi



3. MINERALS

Mineral resources in Malawi are attached to the Basement Complex and the Chilwa Alkaline Province. The Basement Complex hosts economic deposits of marble for lime and cement, graphite, niobium. The Chilwa Alkaline Province hosts rare earths, strontianite, fluorite, manganese, rock phosphate and barite. Coal and uranium exist in Karoo rocks. Bauxite occurs as residual deposit on Mulanje and Zomba Mountain.

Table 1 summarises the lithographic evolution of the geology of Malawi.

PRECAMBRIAN – LOWER PALAEOZOIC	**BASEMENT COMPLEX** • Mafic, Ultramafic meta-igneous • Charnokitic suite • Biotite and Hornblende gneisess • Quartz feldspathic granulites, gneisses and quartzites • Calc silicate rocks and marbles • Mica schists and gneisses • Granitic and pegmatitic gneisses • Aegerine and nepheline gneisses • Conglomerates, quartz sandstones, phillites and siltstones (Mafingi group) • Phyllonites, quartzite, granites	**MINERALS** Nickel, Platinum Copper Graphite, pyrite, Gold Galena, gemstones Niobium, Uranium, Zircon Bauxite
PERMIAN-TRIASSIC	**KAROO SYSTEM** • Conglomerates • Sandstone • Mudstones • Carbonaceous Shales • Basalt/Dolerite dykes and sills	Uranium Coal Agates
UPPER JURASSIC – LOWER CRETACEOUS	**CHILWA ALKALINE PROVINCE** • Syenites • Carbonatites **SEDIMENTARY** • Dianosuar beds	Rare Earths, Rock phosphate, fluorite and manganese
TERTIARY-PLEISTOCENE	**Various Beds (Miocene)** • Pebbly sandstones • Conglomerates • Marls • Sands • Gravel	Nodular limestone Oil and gas (?) Gravel
RECENT	• Lacustrine • Alluvial • Colluvial	Nickel, platinum

4. MINING COMPANIES

Malawi has several exploration companies looking for uranium, rare earths, niobium, graphite, rock phosphate, coal and titanium minerals (Table 2). All minerals except uranium are at pre-feasibility study. Uranium mining was halted and the mine was put under care and maintenance.

Other companies are exploring for gold, titanium, dimension stone and limestone.

Paladin Africa Limited has uranium mining under care and maintenance due to low prices of uranium on the world market.

Mkango Resources have done detailed exploration for rare earths at Songwe in Phalombe District. They are looking for technical and financial partners to go into bankable Feasibility Studies.

Globe Metals and Mining are exploring for niobium and have credits of zircon and uranium at Mabulabo in Mzimba District. They are looking for serious technical and financial partners to go into mining.

Sovereign Metals have done detailed exploration for flake graphite in Lilongwe and surrounding districts. They have found world class deposits and are going into pre-feasibility study where they will undertake socio economic and technical studies in order to go into mining and processing of saprolite graphite.

Optichem (2000) Limited and Mota-Engil are jointly assessing Tundulu Phosphate on Nanthache Hill, Phalombe, in order to mine and process phosphoric acid and rare earths.

Crown Minerals are exploring for heavy mineral sands (titanium) at Tengani in Nsanje. They are at pre-feasibility study level and are looking for technical and fincial partners to come up with a process flow sheet for separating rutile from ilmenite.

Other junior companies are looking for heavy mineral sands at Makanjila Mangochi, gold in Mangochi, Lisungwe Valley in Neno/Balaka and Dwangwa in Nkhota Kota.

Table 2: Current Reserve Data Base for Certain Minerals

LOCATION	CUT-OFF GRADE	RESERVE TONNAGE (Million tonnes)	RESOURCE TONNAGE (Million Tonnes)
Mkango Resources	1.60 TREO	13.2	18.6
Globe Metals and Mining	3,000 ppm Nb	55.0	Open ended
Paladin Africa Limited	0.17% U	0.01	Open ended
Kangankunde	2% TRE 8% Strontianite	11.0	Open ended
Sovereign Metals	7.2% (TGC)	77.3	Open ended
Crown Minerals	0.72 Ti02 (Rutile)	0.47	1,969
Kasikizi – ZAGAF Cement JV	4500-6800 cal/Kg	7.0	Open endedn

Several small companies are mining coal in northern Malawi. Kasikizi Coal Mine is mobilizing to mine coal at Vungu in Mwankenja coalfield. This is expected to be the main producer of coal in Malawi by end of 2018. The company intends to supply coal for the manufacturing industry and thermal power industry.

5. IMPROVED PROSPECTIVITY

Recent Airborne Geophysical Survey popularly known as Kauniuni has given hope into improvement of the knowledge of the geology of Malawi and over 85 geological anomalies have been detected and are being pursued by a consortium of Geophysical Surveys of France and Finland. Most interesting are prospectivity for gold in Central Malawi and northern Malawi, rare earths in southern Malawi and niobium in south and central Malawi.

6. FISCAL REGIME

The fiscal regime associated with mining investment was enacted by Parliament in 2014 and provides a long term stability period to accommodate long term payback period associated with mining investment. The provisions in this fiscal regime will become effective once the new Mines and Minerals Bill is enacted by parliament. Issues of benefit sharing and community engaged have also been addressed ■

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GAM bemoans lack of govt. support in gemstone marketing

By Deborah Manda

The Gemstone Association of Malawi (GAM) has bemoaned lack of government efforts in coming up with strategies which would help small scale miners identify profitable markets for their products.

GAM President John Chikokoto told *Mining & Trade Review* in an interview that unlike in other countries, Malawi does not have established markets and recommended prices for gemstones hence miners just sell their products at their own desired prices.

"One of the challenges facing us, ASMs, is that we do not have established markets where we can showcase and sell our gemstones so if a buyer comes, we just sell without considering whether we are making a profit or loss," said Chikokoto.

Chikokoto said GAM has, therefore, proposed to the Department of Mines in the Ministry of Natural Resources, Energy and Mining to facilitate the establishment of market centers for gemstones in all the three regions of the country.

"It is sad that up to now the government is still mum on the proposal and miners continue to be robbed by middlemen who buy the stones at unrealistically low prices to sell at whooping profits," he said.

He explained that it was high time Malawi emulated the cases of countries like Zambia and Tanzania which have well organized ASM cooperatives who are well trained in processing of stones to sell at established market centers.

Chikokoto: Lack of established market is the problem

"Zambian and Tanzania are benefitting a lot from gemstone mining because they are well advanced in the trade but here we have nothing to show and we just sell rough stones to middlemen from these countries who add value to the stones to sell for a huge profit," he said.

Chikokoto, therefore, said it is high time the Malawi government trained the ASMs in modern value addition technologies so that more rough stones are cut and fashioned within the country.

"The government has to take prompt action on this issue because it is losing lots of revenue as these middlemen do not pay any taxes since they just smuggle the stones to the neighbouring countries," he said.

Meanwhile, the Association is currently liaising with Auction Holdings Limited Commodity exchange (AHLCX) to introduce gem fairs.

Chikokoto said AHLCX has welcomed the idea but are only looking for experts who will be engaged to organize the fairs.

Yamikani Jimsole, a small scales miner concurred with Chikokoto that with proper marketing strategies, the gemstone industry can bring more revenue to the country since it has quality gemstones such as rubies, garnets and acquamarine that can compete with the best in the industry.

"There is a lot of secrecy in the Malawi market and traders are never on the same page about the value of gemstones. Gem dealers and miners set their own prices with no set valuation standards," said Jimsole.

But Director of Geological Survey, Jalf Salima, said under the Geological Mapping and Mineral Assessment Project which is funded by the Government of France, the Malawi government has planned to train government geologists on quality assessment of stones to certify them for the international market.

"Certainly, this will help a lot in the marketing of local gemstones," Salima told delegates at the conference in Zomba which was organised by GEMMAP and the World Bank and European Union funded Mining Governance and Growth Support Project.

Through smuggling, Malawi gemstones find their way to international markets with other countries getting recognition and credit as producers■

Artisanal and Small-Scale Miners looking for gemstones markets at 2016 Malawi Investment Forum

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