

African Geological and Mineral Information System (GMIS) Strategy

Promoting Geological Knowledge as a Tool for Investment, Governance and Transparency

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EXECUTIVE SUMMARY

Development of the GMIS Strategy

The **Geological and Mineral Information System (GMIS) Strategy** has been produced by the African Mineral Development Centre (AMDC) to facilitate the strengthening of the African **production, management and dissemination** of geological and mineral information necessary for several important legal, economic, social and environmental applications.

Lack of geological and geospatial information has long been identified as a major constraint upon African nations' ability to maximise the potential of their mineral resources. These information gaps have resulted in countries being disadvantaged when it comes to: land use planning, the development of strategies for minerals exploitation, the development of infrastructure, and during contract negotiations.

The AMDC led development of the GMIS Strategy as part of its mission to implement the African Mining Vision (AMV), which sets out how mining can be used to drive continental development. Development of the Strategy was highly collaborative, and represents the first time that so many stakeholders in geological information at national, regional and continental level have come together to produce a pan-African strategy. The GMIS Strategy was approved by the AUC Specialized Technical Committee (Meeting of Ministers) on 24 May 2016.

How the GMIS Strategy will be used

The Strategy draws upon the AMV Action Plan to identify how the AMDC, its implementing partners (UNECA, AUC, UNDP and AfDB¹), other institutions such as Regional Economic Communities (REC's) and other relevant initiatives can best support African countries to promote geological knowledge as a tool for investment, governance, and transparency, in connection with the implementation of the AMV and the related Country Mining Visions (CMVs) being developed by AU Member States.

In this context, the GMIS Strategy was designed to guide AMDC and its partners to provide strategic operational support for AU Member States and their Geological Survey Organizations (GSOs) and Centres of Excellence (CEs) to improve GMIS. This should strengthen geological and geospatial information across the whole mineral value chain; facilitate price discovery for

¹ United Nations Economic Commission for Africa (UNECA), African Union Commission (AUC), United Nations Development Programme (UNDP) and African Development Bank (AfDB)

governments; support decision-making in contract negotiation and mining development; and facilitate a whole range of development processes.

The GMIS Strategy addresses the ‘problem statement’ pointed out by the CMV Guidebook and other documents, that Africa lacks sufficient geological map coverage, Geological Survey Organisations (GSOs), which are the custodians of geological information, are underfunded and poorly resourced, and that a large proportion of the continent remains unmapped and under surveyed in a systematic manner, at appropriate scales. For example, a rough estimate of Africa’s known subsoil assets per square kilometre remains barely a quarter of what is known for high-income countries with comparable geological potentials. In fact, while Africa’s share of global exploration budget, mainly from mining companies, has risen significantly to 17%, globally it remains the lowest in absolute terms - below five USD per square kilometre, in marked contrast with 65 USD per square kilometre for Canada (AfDB, 2012).

Contents of the GMIS Strategy

The preliminary section, ‘Summary of the Necessary Steps for the Establishment of the GMIS Strategy’, gives the chronology of the planning and approval process for the Strategy, and more information about participants in its development.

Sections 1 and 2 of the GMIS Strategy introduce the context and the potential areas for improved use of geological and geospatial information.

Section 3 explain the current use of GMI in Africa, and **Section 4** examines how GMIS activities can be strengthened, particularly in the context of the Africa Mining Vision and Country Mining Vision planning

Section 5 sets out the Strategy itself; **Section 6**, the Plan of Activities; and **Section 7**, the Functional Structure by which GMIS activities in Africa will be co-ordinated; **Section 8** offers some principles for formulating a communications strategy; **Section 9**, some final considerations.

The publication includes three annexes: GMIS Principles (Annex 1); the Scale of geological information (Annex 2); and the Questionnaire – a step-by-step diagnostic to help African regions and States to assess their capability/potential to produce, manage and disseminate GMIS in the context of the CMV process (Annex 3).

GMIS Strategy Plan of Activity

The GMIS Strategy proposes a **Plan of Activities** to be coordinated in cooperation between the AMDC, its partners and the various African GMIS initiatives. The Plan of Activity is designed to allow the implementation of activities at national, regional and continental levels, as well as in areas of special interest (for example, Africa's marine mineral resources).

At the national level, activities are proposed to be developed in connection with AU member States' engagement in the domestication of the CMV. This includes both the identification of gaps and areas of need in the member States GSOs' capability to produce, manage and disseminate geological and mineral information, and the assessment of expertise and information resources from a broad range of local and international partners.

At regional and continental levels, the GMIS Strategy proposes to guide AMDC and its partners, including the different GMIS initiatives in Africa to support projects, which will facilitate the strengthening of Centres of Excellence. This includes the development of Public and Private Partnership (PPP), South-South cooperation, as well as regional and continental data standardization, harmonization of nomenclature and resource classifications used, to enable more meaningful comparisons and tracking.

In areas of special interest, the GMIS Strategy aims to support activities and projects related to the African Blue Economy, artisanal and small scale mining (ASM), underground water resources, natural hazards of geological origin, infrastructure works, geo-heritage, geo-tourism, sustainable urban development, identification of areas with potential for agro-minerals and agricultural activities, environmental impact assessment, and waste management and disposal.

The Plan of Activities takes also into consideration the preparation of legal and regulatory guidelines and recommendations to strengthen African Member States' capacity to produce, manage and disseminate geological, mineral and environmental information and proposes principles for GMIS projects, activities and initiatives in Africa to be aligned and consistent with the AMV and the CMV.

Besides these activities, the Plan of Activities aims to facilitate training and capacity building and identify mechanisms to finance the production, management and dissemination of geological and mineral information by African GSOs, CEs and Universities. It also proposes a communication strategy to enable informed participation, promote effective partner's engagement and foster ownership by all partners.

The Plan of activities was designed to allow specific projects and activities to be proposed by the AMDC, its partners and African GMIS initiatives and to be validated by the GMIS Coordination Committee. When validated, projects and activities will become an integral part of the Plan of activities and will be presented as an annex of the GMIS Strategy.

GMIS Strategy – Planning and Implementation

The GMIS Strategy proposes a **Functional Structure**, which will facilitate joint coordination, provide sustainability and enable regular exchanges between all the partners involved in the implementation of its Plan of Activities. The Functional Structure is a mechanism to support a natural build-up of institutional understanding, which is essential to communicate, revalidate and monitor changing political priorities in GMISs.

The Functional Structure is organized to enable permanent and efficient planning, validation, implementation, monitoring, evaluation and updating of its specific activities and projects. It takes into consideration a long term assessment of issues contained in different documents related to the AMV, as well as consultations with GMIS partners and initiatives in Africa and other continents. It takes also into consideration the feedback and recommendations from related conferences, workshops and meetings, such as the AUC Technical Working Group meeting and the AMDC Technical Committee Meeting (AUC, AfDB, UNDP, UNECA), contributing to the visibility and transparency of the Strategy.

Benefits of the GMIS Strategy

It is expected that the GMIS Strategy and its outcomes will be particularly important to:

- a) Improve the elaboration and the application of policies, regulations and fiscal regimes for mining activities;
- b) Provide better decision-making options and improve management capacity of mineral resources and mining sector activities;
- c) Better assess the potential of mining projects and design optimal tenders with the real value of mineral resources;
- d) Facilitate price discovery for governments and support decision-making in contract negotiation through information on quality and quantity of ores in the subsoil.
- e) Provide governments with better options for concession of exploration and mining permits;
- f) Establish judicious taxation rates and ensure that countries receive a fair share of the mineral related revenues.

- g) Allow a better assessment of environmental impact and sustainability of mining projects and activities;
- h) Monitor licenses of contracts and follow up mineral exploration and exploitation projects and activities.

Ultimately, the GMIS Strategy is expected to enable African countries to exercise governance over their mineral wealth, and deal with mineral resources in a sovereign manner for the benefit of all their citizens

ACRONYMS

AAWG	African Association of Women in Geosciences
AEGOS	African-European Georesources Observation System
AfDB	African Development Bank
AMDC	African Minerals Development Centre
AMGC	African Minerals Geoscience Centre (former SEAMIC)
AMGI	African Minerals Geoscience Initiative
ANESI	African Network of Earth Science Institutions
AMV	Africa Mining Vision
AMSI	African Minerals Skills Initiative
AU	African Union
AUC	African Union Commission
BGR	Federal Institute for Geosciences and Natural Resources
BGS	British Geological Survey
BRGM	French Geological Survey
CE	Center of Excellence
CN-SAD	Community of Sahel-Saharan States
COMESA	Common Market for Eastern and Southern Africa
CMV	Country Mining Vision
EAC	East African Community
ECA	Economic Commission for Africa
ECCAS	Economic Community of Central African States
ECOWAS	Economic Community of West African States

EGS	EuroGeoSurveys
EU	European Union
GIRAF	Geoscience Information in Africa Network
GIS	Geographic Information System
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GSOs	Geological Survey Organizations
GMIS	Geological and Mineral Information System
GMI	Geological and Mineral Information
GSAf	Geological Society of Africa
IGAD	Intergovernmental Authority on Development
IGCP	International Geoscience Programme
IGC35	The 35 th international Geological Congress
ICGLR	International Conference of the Great Lake Region
IM4DC	International Mining for Development Centre
IPR	Intellectual Property Rights
OAGS	Organisation of African Geological Surveys
OGC standard	Open Geospatial Consortium standard
ONEGEOLOGY	OneGeology
PanAfGeo	Geoscientific knowledge and skills in African Geological Surveys
PPP	public private partnership
RBA-UNDP	Regional Bureau for Africa-UNDP
REC	Regional Economic Community
SADC	Southern African Development Community

SDI	Spatial Data Infrastructures
SEAMIC	Southern and Eastern Africa Minerals Centre
TWG	Technical Working Group
UMA	Arab Maghreb Union
UNECA	United Nations Economic Commission for Africa
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNFC	United Nations Framework Classification
UNIDO	United Nations Industrial Development Organization
WAXI	West African Exploration Initiative
WB	World Bank
WBG	World Bank Group

KEY STEPS IN THE CONSULTATION PROCESS FOR DEVELOPMENT AND APPROVAL OF THE GMIS STRATEGY

The GMIS strategy represents the first time that so many stakeholders in geological information at national, regional and continental level have come together to produce a pan-African strategy (for more about key stakeholders in this sector, see Section 7.4). The key steps in the consultation process coordinated by the AMDC are set out below. The GMIS Strategy was approved by the AUC Specialized Technical Committee (Meeting of Ministers) on 24 May 2016.

Step 1: Assessment undertaken of all GMIS issues outlined in: AMV and its Plan of Implementation, AMDC Business Plan, CMV Handbook, decisions taken by the African Union Conference of Ministers responsible for Mineral Resources Development (CAMRMRD), AUC expert meetings and other documents related to GMIS initiatives in Africa. This assessment included: (a) mapping and reviewing existing institutions, initiatives and capacities related to GMIS in Africa to establish repositories of expertise and their comparative advantages; (b) identifying existing approaches that potential partners are using; (c) capturing outstanding capacities and gaps that exist in the area of GMIS; and (d) planning how the AUC/AMDC might strategically engage with partners on these issues.

Step 2: Background papers, concept notes and outlines were prepared as the starting point for discussion and preparation of the GMIS Strategy. This included providing programmatic, administrative and technical support for the development of the GMIS Strategy.

Step 3: The first technical meeting, with a small group of technical experts, was held in Addis Ababa, Ethiopia, on 15-17 September 2015 to:

- a. review the relevant information and prepare a detailed draft annotated outline for the GMIS Strategy;
- a. map out initiatives and institutions, and their current roles in relation to geology and mineral information systems under the AMV;
- b. identify priority issues and interventions for the benefit of African GMIS;
- c. propose and review terms of references for different activities related to the elaboration and implementation of the GMIS Strategy;
- d. draft principles for GMIS compliant with the AMV, taking into consideration the best practices on Africa and other continents on geological and mineral information production, processing, management and dissemination;

- e. identify and propose alternatives to finance GMIS activities in Africa;
- f. review the options for addressing GMIS from the CMV Guidebook, the Action Plan for Implementing the AMV, and other documents;
- g. prepare a first draft of the GMIS Strategy, including principles.

Step 4: A GMIS “think-tank” capacity was established and promoted to collect feedback and recommendations for the updating of the draft GMIS Strategy. These included stimulating discussions in conferences, workshops and meetings, such as:

1. AUC-Technical Working Group (TWG) of the AMV Meeting, Bamako, Mali, 28 September to 2 October 2015.
2. International Forum on Madagascar Mining & Petroleum, Antananarivo, Madagascar, 23-24 September 2015.
3. Geo-Information for Africa Network (GIRAF) Meeting. Maputo, Mozambique, 5-9 October 2015.
4. Deep Seabed Mining: An Initial Multi-Stakeholder Dialogue Meeting. Bellagio, Italy, 7-9 October 2015.
5. Workshop on the African Blue Economy Handbook. Rubavu, Rwanda, 23-27 November 2015.
6. AMGC Evaluation Mission, Dar es Salaam, Tanzania, 7-11 December 2016.
7. Mining Indaba discussions on GMIS Strategy with the World Bank and other partners and delegations from various countries. Cape Town, South Africa, 6-11 February 2016.
8. Internal UNECA/AMDC meetings, including participants from Governance and Participation, Policy and Licencing, Artisanal and Small-Scale Mining, Linkages, Investment and Diversification, Human Capital and Institutional Capacities and Communication and Advocacy workstreams.

Step 5: Based on the results of the different meetings and workshops outlined above, an updated draft of the GMIS Strategy was prepared, containing a clear:

- a) **Plan of Activity** to be coordinated by the AMDC in cooperation with its partners and the various African GMIS initiatives. It allows the implementation of activities at national, regional and continental levels, as well as in areas of special interest (see Section 6).
- b) **Functional Structure** to facilitate joint coordination, provide sustainability and enable regular exchanges between all the partners involved in the implementation of its Plan of Activities. It is a mechanism to support a natural build-up of institutional understanding, which is essential to communicate, revalidate and monitor changing political priorities in GMISs. The Functional

Structure is organized in such a way that it allows permanent efficient planning, validation, implementation, monitoring, evaluation and updating of its specific activities and projects (see Section 7).

Step 6: Large-scale consultation undertaken with GMIS partners and initiatives to present, debate, and obtain support, as well as building partnerships for the development and implementation of the GMIS Strategy. Partners and initiatives included: Division of Energy and Extractives of the World Bank; UNESCO's Division of Natural Sciences and the Intergovernmental Oceanographic Commission (IOC); Commission for the Geological Map of the World (CGMW), European Geological Surveys (EGS), including PanAfGeo; Geological Society of Africa (GSAf); African Minerals and Geosciences Centre (AMGC); Organization of African Geological Surveys (OAGS); UNESCO African Network of Earth Science Institutions (ANESI); The African Association of Women in Geosciences (AAWG); and others. As a result of this consultation, the AMDC prepared an updated draft GMIS Strategy.

Step 7: The updated draft GMIS Strategy was presented to, and discussed at, the AUC Technical Working Group meeting in Dar-es-Salaam, Tanzania, on 24-26 March 2016. This meeting (a) defined the conditions required of geological initiatives needed to be considered as AMV compliant; (b) discussed areas of collaboration between the existing geological initiatives; and (c) issued recommendations to the AUC Specialized Technical Committee (meeting of Ministers) for the establishment and implementation of the GMIS Strategy Functional Structure.

Step 8: The final draft GMIS Strategy was prepared, taking into consideration all the inputs from the AUC Technical Working Group meeting (as Step 7, above).

Step 9: The GMIS Strategy was approved by the AUC Specialized Technical Committee (meeting of Ministers) on 24 May 2016, with recommendations for the establishment and implementation of the Strategy, its Plan of Activities and Functional Structure.

Step 10: The final draft GMIS Strategy was presented and discussed at the GMIS Coordination Meeting held in Cape Town, South Africa on 24-26 August 2016. This meeting reviewed and endorsed the GMIS Strategy; validated the Functional Structure and coordination mechanisms; adopted the draft Principles for GMIS; adopted the United Nations Framework Classification for Fossil Energy and Mineral Reserves and Resources (UNFC 2009); discussed areas of collaboration between the existing geological initiatives; deliberated on a GMIS Strategy coordination plan; and decided that AMDC should prepare a proposal for an African GMIS database and GIS infrastructure.

1.- INTRODUCTION

The African Heads of State and Government adopted the Africa Mining Vision (AMV) in 2009. The AMV is Africa's own response to tackling the paradox of great mineral wealth existing side by side with pervasive poverty. The primary and long-term goal of the AMV is the *“transparent, equitable and optimal exploitation of [Africa's] mineral resources to underpin broad-based sustainable growth and socio-economic development”*. Geological and mineral information has a vital role to play in achieving this aim.

The AMV is a strategy for integrating Africa's mining sector into its broader social and economic development processes, and thereby addressing its persistent poverty and underdevelopment. The Vision advocates thinking outside the “mining box”. That means thinking about how mining can contribute better to development, by making sure workers and communities see real benefits from large-scale industrial mining and that their environment is protected. The AMV is an attempt not only to address the sector's isolation from mainstream social and economic activities, but also to create win-win outcomes for all stakeholders.

The AMV as a catalyst for improved GMIS

At the core of the AMV is the question of how to improve development outcomes related to Geological and Mineral Information Systems (GMIS): how can GMIS better support the achievement of local, national and regional development goals?

For GMIS, the AMV represents a shift from geological information just for mining development to *geological information, which supports broad-based sustainable growth and socio-economic development*.

The AMV's holistic approach means that geological information cannot be separated from issues of governance, policy and licensing, linkages and beneficiation, artisanal and small-scale mining (ASM), and capacity development. Thus the goal of all AMV-compliant geological initiatives, projects, activities and strategies is *“to improve geological and geospatial information and its use in mining and broad development processes in Africa”*.

The role of the African Mineral Development Centre (AMDC)

The AMDC was established in 2013 to support the coordination and implementation of the AMV. It aims to become the facilitator of choice to enable AU member States to achieve the Africa Mining Vision.

The core Mission of the AMDC is to work with AU Member States and their national and regional organisations, including the African Union Commission (AUC) and Regional Economic Commissions (RECs), to enable mineral resources to play a greater transformative role in the continent's development through increased economic and social linkages, and in this manner, help address its intractable poverty and limited development.

The proposed GMIS Strategy provides a guiding framework for AMDC activities in this area over a five year period, and is also designed to serve as a guide for other institutions and initiatives engaged in GMIS and related activities in Africa.

Among the high-level and long-term development impacts expected from GMIS Strategy activities is the enhancement of the use of geological and geospatial information to manage long-term development outcomes in African mining countries. This approach is guided by a series of documents: pivotally, the Action Plan for Implementing the Africa Mining Vision (AMV), the AMDC Business Plan, and a Country Mining Vision Guidebook. Specifically in relation to geological and mineral information, there was an African Union Expert Group Meeting (EGM) on Geology and Mineral Information Systems in Africa (held on July 2014) that resulted in a series of recommendations on how to improve geological information and its use in mining and broad development in Africa. In addition, the AMDC produced a Desktop Review of African Geological Survey Organisation Capacities and Gaps, which served as an input to the development of the GMIS strategy. A range of other initiatives also support development of a GMIS strategy. These include the African Mineral Geosciences Initiative (AMGI), the African-European Georesources Observation System (AEGOS) project, the PanAfGeo project, and the West Africa Exploration Initiative (WAXI).

GMIS and Country Mining Visions

The AMDC supports countries in the implementation of the AMV by facilitating the development of Country Mining Visions (CMVs), using a participatory process to establish the expectations of government, business, communities and civil society around minerals, their extraction and use, and how these will benefit society and development more widely.

The CMV Guidebook reinforces the importance of the AMV goal for geology and mineral information systems to support broad development processes in Africa. This reflects the multipurpose nature of geological information. For example geological maps can be used to inform the most suitable locations for further minerals exploration; where groundwater might be found; the location of

geological hazards; soil properties; and where to best locate and invest in infrastructure.

The CMV Guidebook also sets out the ‘problem statement’: that Africa lacks sufficient geological map coverage and that Geological Survey Organisations (GSOs), which are the custodians of geological information, are underfunded and poorly resourced. A large proportion of the continent remains unmapped and under-surveyed in a systematic manner, and/or at appropriate scales. For example, a rough estimate of Africa’s known subsoil assets per square kilometre remains barely a quarter of what is known for high-income countries with comparable geological potentials (Gelb, Kaiser, & Vinuela, 2012). In fact, while Africa’s share of global exploration budget, mainly from mining companies, has risen significantly to 17%, it remains the lowest in absolute terms, below five USD per square kilometre in marked contrast with 65 USD per square kilometre for Canada (AfDB, 2012). This is consistent with the findings of AMDC’s Desktop Review, and the AUC Expert Group Meeting held in 2014. The chronic inadequacy of geological and geospatial information has resulted in countries being disadvantaged in land use planning, the development of strategies for minerals exploitation, the development of infrastructure, and during contract negotiations. Unfortunately, these problems are not new; they were identified as long ago as 1963, in an extensive “Review of the Natural Resources of the African Continent”. More than fifty years on, it becomes imperative to question what we are going to do differently to address these recurrent challenges.

Benefits of a GMIS Strategy

The CMV problem statement serves as an important reference for the AMDC and to guide the development of the GMIS Strategy. The CMV Guidebook, the Desktop Review and the 2014 Expert Group Meeting all noted options for improving GMIS in Africa including:

- (a) sustainable and adequate funding of GSOs as well as other geology related institutions, such as universities;
- (b) improvements in the acquisition and storage of geological information;
- (c) the efficient coordination of government geology related activities; and,
- (d) the coordination of international initiatives and institutions and their geology related activities.

The Action Plan for Implementing the AMV addresses some of these issues along with the need for geological information standards and the standardisation of geological information across borders. However, since the adoption of the Action Plan in 2012, new institutions and initiatives have emerged, with

strategic implications for the AMV. Two other important considerations related to the GMIS are the scale of information and related applications, and the types of minerals, which include agro-minerals, construction related minerals, industrial minerals, gems and semi-precious stones, metallic minerals and energy minerals.

The GMIS Strategy addresses the problem statement posed by the CMV Guidebook and other documents, and revisits the Action Plan for Implementing the AMV, with the purpose of identifying how the AMDC, AUC, RECs, other institutions and initiatives can best support African countries and centres of excellence to improve geological and mineral information systems, and hence encourage investment in exploration, mining development and broad development processes.

In line with the Action Plan for the Implementation of the AMV, the GMIS Strategy should:

- (a) facilitate the enhancement of the capacities of African geological survey organizations (GSOs);
- (b) contribute to regional mapping and exploration activities to upgrade mineral inventories and geo-scientific information data bases;
- (c) enhance the contribution of geological information for informed policy and decision-making across the mineral value chain;
- (d) strengthen system-wide capacity for effective geological information management on the continent; and therefore,
- (e) promote broad development processes in Africa.

2.- THE GMIS IN THE CONTEXT OF THE AMV AND THE CMV

2.1- DEFINITION OF TERMS

The “**GMIS**” consists of GSOs, universities, and other national and sub-national agencies with geological functions, the private sector and civil society groups that generate, hold or use geological information, along with Regional Economic Communities (RECs), centres of excellence and other international institutions and initiatives that undertake or support the generation, management or sharing of geological information. Together these entities, their activities and their data form a system.

2.2- USE AND SIGNIFICANCE OF “GEOLOGICAL AND MINERAL INFORMATION”

Geological and mineral information is defined as complex, multiform, multi-scale and multi-dimensional records of the dynamics and physical proprieties of the earth, the rocks, and the minerals. GMI enables better understanding of the physical, chemical and biological changes that the earth and rocks have undergone or are undergoing. It supports the identification of different environments and mineral deposits.

Geological and mineral information can be captured in maps, reports, electronic files and databases, and can be disseminated for different applications across governments and by the private sector.

Geological and mineral information is crucial for several important legal, economic, social and environmental applications with regard to the African continent, as well as to the African continental shelf and adjacent international seabed areas. It is essential for the formulation and implementation of public policies in resource development, environmental protection, public health and safety, land use, and infrastructure planning.

The true worth of geological and mineral information is not in its inherent commercial value, but in its contribution to stimulating inward investment to a country

Geological and mineral information loses value if kept confidential or access to it is restricted. Such information realises its full potential if it is made widely accessible. Geological and mineral information can help to reduce illegal mining, allows transparency and can be used as means of holding public officials accountable and of fighting corruption. However, while safeguarding the free flow of geological and mineral information, there is also a need to ensure accountability, security, and product confidence and trust.

2.3. BENEFITS OF IMPROVED GMIS: GOVERNANCE AND TRANSPARENCY

Geological and mineral information is essential for improving transparency of the mining sector. It makes it easier for others to see what actions are performed and serves as a marketing window for the potential mineral resources of the country. It has an impact on the entire minerals value chain: for example, the level and types of capital to invest in, the inputs required and the outputs produced. Geological knowledge and information are a necessary condition for

African countries to exercise governance over their mineral wealth. It is essential for:

- a) Improving the elaboration and the application of policies, regulations and fiscal regimes for mining activities;
- b) Providing better decision-making options and improving management capacity of mineral resources and mining sector activities;
- c) Better assessing the potential of mining projects and designing optimal tenders with the real value of mineral resources;
- d) Facilitating price discovery for governments and supporting decision-making in contract negotiation, based on better information on quality and quantity of ores in the subsoil;
- e) Providing governments with better options for concession of exploration and mining permits;
- f) Establishing judicious taxation rates and ensuring that countries receive a fair share of mineral related revenues;
- g) Allowing a better assessment of environmental impact and sustainability of mining projects and activities;
- h) Monitoring licenses of contracts and following up mineral exploration and exploitation projects and activities.

Geological and mineral information is essential to enable African geological institutions to deal with mineral resources in a sovereign manner. It also reduces risks for investors and should therefore alleviate investor tendencies to require highly favourable tax regimes.

The knowledge of the full extent of the quantity and quality of mineral resources is also a tool for conflict management and confidence building between bordering states.

2.4- BENEFITS OF IMPROVED GMIS: EXPLORATION AND INVESTMENT

AMDC's Desktop Review of African Geological Survey Organisation Capacities and Gaps provides many useful insights on the relationship between minerals and development; sets forth options for supporting geological and mineral information systems; assesses the effectiveness of geological support; and illuminates potential traps. It also demonstrates the potential benefits of using geological information well beyond the 'mining box'. While the primary focus of AMDC is developmental, additional benefits may be achieved through geological mapping, geophysical surveys and other data collection activities. For example:

- Minerals information can attract investments in industrial and artisanal mining; meanwhile, better resource rents coupled with good governance can be used for public services and infrastructure investment;
- Energy information can help countries initiate or extend petroleum exploitation, or help identify new and renewable hydro-electricity and geothermal energy resources to power industrialisation, agriculture and households;
- Hydrogeological and hydrological information can assist with the discovery of new water resources in water-scarce areas and foster better management of water resources for agriculture, mining, electricity and other uses;
- Hazards and geotechnical data can be linked into planning processes to improve the resilience of all forms of development.

The gap analysis shows that many countries with existing mineral industries are risking the sustainability of those industries due to a lack of public geological information. Furthermore, other countries with the potential for minerals development may also be postponing the establishment of new artisanal and industrial scale minerals development due to a lack of geological information. Across Africa there are a series of potential co-benefits that could be realised if sufficient geological information were available (e.g. along the Rift Valley in East Africa there is significant geothermal energy potential). It is important to note that different data needs exist for different types of minerals, including various ore minerals, industrial minerals, agro-minerals, gems and semi-precious stones.

GMIS applications can be characterised as falling into three broad categories:

- Resource assessments including minerals, energy and water;
- Improving the resilience of development interventions. For example, geological information allows for; the siting of infrastructure and relocation of people away from hazards; identification of aggregate that will prolong the life of infrastructure investments' environmental protection, including control of pollution and other harmful substances; and
- Wider public good and transparency: for example in support of taxation, mineral revenue protection or contract negotiations. This also includes geological information feeding into wider policy discussions and decisions, for example regarding government budgets or policies around transport including resource corridors.

2.5- BENEFITS OF IMPROVED GMIS: BROAD-BASED DEVELOPMENT AND LINKAGES

In Africa geological information has been dominated by minerals and mining related initiatives, yet geological information has a universal value and is crucial for several other important legal, economic, social and environmental applications. As the goal of all AMV-compliant geological initiatives, projects and activities is to improve geological information and its use in mining and broad development processes in Africa, different types and applications of geological information should be taken into consideration.

Geological information is critical to support, improve and follow up **artisanal and small-scale mining (ASM) activities** and to help them to be integrated into local and regional economic development and land-use plans and strategies. Geological information is also critical to strengthen the capacities of ASM operations to operate viably with minimum environment and social damage. Geological information can support the formalisation of ASM and the scaling up of programmes to upgrade knowledge, skills and technology in the ASM sector. It also helps efforts to develop continental policies, laws, regulations, standards and codes to promote sustainable ASM.

Geological information is useful not only for traditional large scale mining projects, which attracts the greatest attention from policy makers and investors due to their very high commodity value, but also for **assessing industrial minerals, which have low value but very high linkage potential**, including:

- **agro-minerals to improve agricultural development in Africa** that can be used for soil rehabilitation and fertilizers, such as carbonates, potassium and phosphorite;
- **minerals that can support African industrialisation** as inputs into the manufacturing of cement, ceramics, glass, paints, toothpaste, and many other products;
- **aggregate and other materials for construction and infrastructure development in Africa**, such as sand and gravel. Good quality aggregate and the use of geotechnical information significantly improve the resilience and lifespan of infrastructure investments.

Geological information is also essential for the **sustainable development of the African Blue Economy** – underwater and under-sea resources. Africa possesses about 19 million square kilometres of Economic Exclusive Zone (EEZ) and

outer continental shelf. These have a huge potential for strengthening the economic development of African coastal and island states, and also through inter-linkages of landlocked countries in Africa.

Marine geological information that is professionally obtained, updated regularly, and effectively organized and publicised, can significantly improve marine mineral exploration in African coastal countries, help increasing the level of investment for the development of the mineral sector as a whole, contribute to coastal and oceanic management to be much more efficient, be used as a guide for identification of potential areas for fishing and bio-prospecting activities, and support the delimitation of African countries outer continental shelf, a crucial affirmation of sovereignty of African coastal states.

Geological information is also vital for **identifying underground water resources and planning for its use and management**, for example:

Identifying, monitoring, and impact mitigation of natural geological hazards such as landslides, erosion, earthquakes, natural emissions of hazardous gases, land motion and subsidence;

Highlighting characteristics of the ground when planning and performing infrastructure works such as development corridors, dams, ports, roads, pipelines etc;

GMI informs the correct use and occupation of **urban and rural land, sustainable urban development and safe construction**. It is important for **agriculture**; beyond the identification of areas with potential for agro-minerals (see above) geological and mineral information can be used to identify favourable areas for different types of agricultural activities.

There are also more specialised opportunities for **geo-heritage** for example, through museums, or the development of geo-tourism related to volcanoes, hot pools, spectacular rift landscapes etc.


Finally, GMI is critical for environmental impact assessment and management, as well as for waste management and disposal.

2.6- GEOLOGICAL INFORMATION FUNCTIONS ACROSS GOVERNMENTS

The availability of geological information allows the public and private sectors to take appropriate decisions. The more accessible the information, the lower the risk of investment in mineral exploration and development; and the greater the possibility of its practical use in areas of social and environmental interest, including territorial planning and management.

Geological information is important not only for mining but also for a wide range of related functions across government. The fact that geological information is spread across institutions means that there are many opportunities for building synergies between programmes and expertise. For example groundwater and hydrogeology is often the responsibility of the ministry of water, agriculture or natural resources. Minerals will usually be the responsibility of the GSO or ministry of mines. Environmental impact related mining activities concern the ministry of environment, while petroleum related geology may be in yet another ministry such as energy, and geotechnical information may reside in public works departments.

Bringing together geological information functions creates synergy: for example, between petroleum geology, minerals, geotechnical work and hydrogeology. However, each country has different institutional arrangements depending on its statutes and history. In many cases, countries are not aware of all the geological information functions they have across government. Therefore, it is suggested that, at a minimum, governments or a geological information coordinating body within government should keep an inventory of existing geological information functions and activities across government.



3.-CURRENT SITUATION OF GMIS IN AFRICA

The report “A review of the natural resources of the African continent” (UNESCO 1963) begins:

At the end of its first session, held at Addis Ababa from 29 December 1958 to 6 January 1959, the Economic Commission for Africa reported that it considered that there was a great need in Africa for certain types of scientific surveys such as hydrological, geological, geodetic and other surveys of resources including resources for industrialization and sources of energy such as solar energy.

Fifty years later, the 2009 Africa Mining Vision (AMV) noted:

Most African states lack basic geological mapping or, at best, are poorly mapped.

The reason for the lack of progress by many African countries to map their geology appears to be due to a fundamental lack of capacity in many African GSOs (AMDC 2015). Nearly half of African economies rely on mining, quarrying and petroleum for 5% or more of their measured GDP, yet at the same time only six African GSOs are rated² as having either a strong capacity (South Africa) or the “*capacity to undertake major geoscientific surveys and disseminate data efficiently*” (Egypt, Ethiopia, Morocco, Namibia and Tanzania). All other countries are rated as either having some capacity; limited capacity; or no information or GSO was detected. Most African GSOs are deficient in capacity and geological information, and thus can only help countries reach a fraction of their minerals and development potential.

A key recommendation of the AMV (2009) for tackling the “knowledge infrastructure” challenge was:

Increased investment in improving the resources knowledge infrastructure.

The AMV goes on to note that:

There have been numerous studies that have clearly shown extremely high returns to the state from investment in basic geological surveys. In addition to investing in physical infrastructure, Africa and its bilateral & multilateral donors need to also consider investments in

²by Geoscience Australia (2012)

their resource knowledge infrastructure. It stands to reason that the more a state knows about the potential value of a resource the greater will be its ability to strike an equitable deal on the division of future rents and benefits accruing from the exploitation of the resource.

The GMIS Expert Group and Consultative Meeting (EGM), held from 9 to 11 July 2014, in Addis Ababa, recommended reviewing funding and financing arrangements for earth science institutions in government, along with institutional arrangements (e.g. for Universities and GSOs). The meeting also recommended that countries and Country Mining Vision processes give consideration to all types of minerals and their uses (e.g. industrial minerals and agro-minerals).

The availability of geological and mineral data allows both the public and private sectors to make informed decisions on mineral sector development, therefore lowering the investment risk for exploration and mine development. The key challenge, as noted in the CMV Guidebook, is the currently limited availability of, and access to, basic geological information and mineral inventories in Africa. A large percentage of the continent is yet to be geologically mapped and explored in a systematic manner and at an appropriate scale. This is mainly due to the inadequate capacity in most member States to carry out exploration activities and store these in digital geological information systems.

The CMV Guidebook further notes that the inadequacy of geological and mineral information has resulted in African countries being disadvantaged during negotiations with mining companies because the essential basis for assessing the real value of mineral projects (and granting exploration and mining permits) is missing.

The CMV notes that African countries currently face some major challenges that prevent government ability from collecting, centralising storing geological information. These are:

- a) The production, maintenance and management of geological information require a lot of field work and the use of modern exploration technologies and skills that are usually in short supply in Africa.
- b) Systematic geological mapping in many African countries, when available, are not detailed enough to attract investors in mining exploration.

- c) The lack of appropriate laboratory facilities to make analyses of samples constrains better inventory of the quality and quantity of the mineral resources of a country, and does not allow carrying out a second opinion on analyses performed abroad.
- d) Most African GSOs are not functional and lack of funds prevents upgrading of physical infrastructure and human capacity needed to carry out geological mapping, analyse samples, process data and manage geological and mining information.
- e) The absence of binding mechanisms to require companies to deposit the geological data with the government, and the lack of capacity for storage and handling of this data, prevents African countries from incorporating new geological information into their (already precarious) databases .
- f) Investors face difficulties of access to databases and geological information from the government, which does not encourage the investment of foreign capital in the country.
- g) Small-scale mining is not sufficiently developed, despite the enormous potential of industrial minerals that can be used in conjunction with other sectors of the economy for the country's development.
- h) The formulation of tenders in many African countries is hindered by the lack of geological information, which should enable a real assessment of the proposed deposits.
- i) Many African countries with new legal frameworks for sustainable exploitation of mining resources do not yet have the capacity and analytical infrastructure for monitoring regulated activities.

The GMIS Strategy should promote and facilitate the identification of gaps and areas of need in member States' capability to produce, manage and disseminate geological and mineral information and access expertise and information resources from a broad range of local and international partners.

4.- STRENGTHENING GMIS ACTIVITIES IN THE CONTEXT OF THE AMV AND THE CMV

4.1- The AMV and the CMV process

The AMDC is supporting African countries to implement the AMV by facilitating the development of CMVs, using a participatory process to determine the expectations of government, business, communities and civil society around minerals, their extraction and use, and how they will benefit society and development more widely.

The AMDC sees the CMV process as a way of bringing agriculture, infrastructure, manufacturing and other sectors together with earth sciences to address broader development issues. Furthermore, when a country undertakes a CMV, the highest levels of government are engaged and it is an opportunity for the earth sciences community to raise key issues related to earth sciences functions across government. This includes highlighting the functions of GSOs, universities and other institutions as well as issues of funding, capacity retention, filling of data gaps and the arrangement of earth sciences functions across government.

The alignment of the AMV to a country's overall development vision requires member States to promote and implement a new paradigm that serves medium and long-term objectives for structural economic transformation and inclusive growth.

4.2- Spatial data infrastructure as a tool for GMIS management

Spatial data infrastructure, including hardware, software, networks, databases and data processing capacities, allow geological and mineral information to be gathered, organised, standardised and made available in a single geo-referenced environment in a digital format. This makes possible a sustainable process of exchange, update, analysis and dissemination of geological and geospatial data.

Thus, large number of people and companies can access that harmonised data, obtain information, conduct research and have the necessary knowledge to allow them to make investments in the mining sector in a safer and better informed way.

The Geological and Information System (GIS) environment allows graphical information to be linked quickly with its attributes, making searches more dynamic; allowing maps to be not only on paper format, but digital and interactive; and enabling constant updating. Thus, both the transfer and update

of data are greatly improved, saving resources and generating income through acquired investments.

A relational and spatial database allows diffusion, search, and storage of information organized previously in a GIS environment. The business rule of the database allow to modify the method of operation of the African Geological Surveys Organizations (GSOs), especially with regards to methods for collecting information from the field, storing and disseminate it.

Such databases rely on several data sets, such as outcrops, mineral resources, structural geology, geochemical analysis, geochronological dating, fossil occurrences, and litho-chronostratigraphy (i.e. determining the age of rock layers). These data sets can then be organized with standard terms and arranged to enable regular communication of data between African GSOs. It allows existing maps to go through a process of standardisation of terms, to be accessible for remote online searches, with the possibility of downloading maps and related information.

A centralized relational database containing all available data and information on geology and mineral resources and accessible online, could be used as a reference and a guide for technical and scientific activities to be carried out in Africa by the international scientific community, prospectors, future applicants for plan of work for exploration of different mineral resources, and government agencies.

This type of access to geological and geospatial data in African countries would:

- increase interest for mining activities in Africa by showing its geological features and mineral resource potential;
- increase confidence in, and reduce the time required to take, decisions on scientific research and prospecting of mineral resources in Africa, and consequently contribute to increased activities in this region;
- reduce the amount of data and information required to understand African geological processes and thus reduce costs and time involved in scientific research and prospecting activities;
- create better understanding of the inter-relationship between geological processes and development of mineral deposits;

- establish a geological reference and a guide for technical and scientific activities to be carried out by African governments, mining companies and scientific community;
- improve decision making and the ability to negotiate sustainable mineral development agreements with foreign investors;
- allow the public and private sectors to make informed decisions on the development of the mineral sector, and thereby reducing the risk of investment in exploration and mining development; and
- increase the capacity of African countries to manage geospatial and geological information to facilitate development of the mineral sector.

4.3.- Transfer of corporate data and data held by foreign institutions

The CMV proposes that a mechanism be established to require all private exploration companies to lodge all geo-information, data and samples/cores (not consumed in analyses) with the national geo-survey entity. This will substantially reduce future exploration costs over the same location, but will require the allocation of substantial resources to the geo-survey entity for establishing the infrastructure to hold such data and samples (storage warehouses, computer storage, etc.). Regional storage facilities could also be explored, especially for smaller countries, to reduce costs. The transfer of these datasets to national archives would represent equivalent data acquisition expenditure of US\$1B across Africa (IM4DC).

4.4- Partnerships for the implementation of the GMIS Strategy

Partnerships are essential for the success of the AMV. The sustainability of the GMIS Strategy will be crucially anchored by, and dependent, on AMDC's ability to build, manage and maintain partnerships. The GMIS Strategy will look at existing initiatives and relevant organisations, with a view to building partnerships to improve geological and geospatial information and its use in mining and broad development processes in Africa.

Carrying out the diversified activities of the AMDC will necessarily require a broad range of partnerships. A key component of the AMDC mandate, therefore, will be the co-ordination of expertise from other organisations, based on their comparative advantage, and placing it at the disposal of the AU member States. The AMDC will develop various modes of cooperation with its partners, including funding, joint research, secondment of staff, and

partnerships in capacity building, education and training. All cooperative activities will need to be AMV-compliant and the AMDC will maintain control over joint activities.

The primary partners of the AMDC GMIS Strategy are the AUC, AfDB, RBA-UNDP and UNECA, who will also provide operational support in their own right. However operational support is expected to come from numerous sources, including RECs, Member states, African institutions, such as the African Minerals Geoscience Centre (AMGC), Geological Survey Organisations (GSOs), African earth science professional associations (GSAf, AAWG), universities and geological research centres, international institutions and initiatives, such as the World Bank, UNESCO Earth Sciences Section (Paris and Nairobi), and a range of other initiatives.

African GSOs require special attention. They are vital to the economy of each nation, as well as to the protection of its environment and of its population. The information they collect and disseminate is used by other state agencies, by consultants, industry, developers, and the public as critical input in local and regional economic development plans, resulting in an economic advantage to the country and its society. As we have seen, shared information is essential for the safe, responsible and sustainable development of a country's mineral, energy, and water resources and a wide range of related functions, all of which are significant to the economy of the country by providing jobs and revenues, minimising losses due to hazards and natural disasters, and by increasing understanding of natural resources and their use.

4.5.- Capacity development to strengthen GMIS in Africa

The Action Plan for Implementing the AMV mandates the AMDC to improve geological and geospatial information and its use in mining and broad development processes in Africa. The AMDC should therefore provide strategic operational support for AU Member States and their GSOs, to enhance their skills and knowledge in production, processing, interpretation management and dissemination of GMI. This implies the promotion and facilitation of training and capacity building of GSOs to produce manage and disseminate GMI.

4.6.- Financing the strengthening of the GMIS in Africa

The GMIS Strategy was conceived in order to allow the identification of mechanisms to finance the production, management and dissemination of GMI, as well as facilitate South-South and triangular cooperation between African States and partners.

The CMV states that African states need to urgently find mechanisms to fund geological survey departments directly from a portion of mineral revenues or to replenish the national resources base as current operations deplete it. The CMV suggests the following mechanisms to finance GMIS in Africa:

- 1) Organizing an efficient geological institution by transforming the geological survey entity from a government department (civil service) into a state agency with its own governing board. This usually requires an Act (law) to establish a “Geo-survey Agency” (GSA);
- 2) Configuring a mechanism to directly fund GSOs from mineral revenues. Options could include:
 - a. a portion of mineral fees, levies, ground rent, etc.;
 - b. a portion of mineral royalties – this would be the most logical, as royalties are applied to compensate the state for assets (resources) lost through extraction (mining). It would thus be logical to use a portion of royalties to replenish the national mineral asset base through systematic geological surveys to identify new exploration targets;
 - c. a dedicated “national mineral resources replenishment levy” on all extraction (operating mines) of, for instance, 0.5% to 1% of the value of minerals extracted/foregone (equivalent to a small second royalty);
 - d. selling data and services to raise funds – this would be facilitated through the creation of a free-standing agency (GSA); and
 - e. configuration of additional resources/funding through partnerships with donors; regional institutions; PPPs; and multilateral institutions.

5.- THE GMIS STRATEGY

5.1- PURPOSE

The purpose of the GMIS Strategy is to strengthen the AU member States’ capacity to produce, manage and disseminate geological and mineral information.

It will address the problem statement posed by the CMV Guidebook and other documents, and revisit the Action Plan for implementing the AMV to identify how the AMDC, AUC, other institutions (e.g. RECs) and initiatives can best support African GSOs and centres of excellence to produce, manage and

disseminate geological and mineral information necessary for several important legal, economic, social and environmental applications to allow African countries to exercise governance over their mineral wealth, hence encouraging investment in mineral exploration, mining development and broad development processes.

5.2- MAIN OBJECTIVES

The main objective of the GMIS Strategy is to guide the AMDC and the AUC during the next five years to:

- a) Coordinate and provide strategic operational support for AU Member States and their GSOs to improve geological and geospatial information and its use in mining and broad development processes in Africa.
- b) Track, link up, engage, set direction, create alignment, build commitment, promote collaboration, establish trust, mobilize and facilitate activities from different GMIS initiatives in Africa to:
 - i) construct comprehensive databases with geo-referenced information on geology and mineral resources;
 - ii) develop GIS technologies among African countries;
 - iii) build capacity of African GSOs for delivering geospatial data and information from geology and mineral resources to both public and private sectors;
 - iv) strengthen regional and national mapping and exploration activities; develop a continent-wide mapping and mineral inventory.
- c) Assist African member States to grow their national databases via repatriation of data and transfer of corporate geoscience data.
- d) Identify gaps and areas of need in member States' capability to use GMIS in mining and broad development processes and access expertise and information from a broad range of local and international partners.
- e) Support countries in generating and applying geological information for informed policy and decision-making across the mineral value chain.
- f) Promote and facilitate training and capacity building of GSOs to produce, manage and disseminate GMI.

- g) Identify and propose mechanisms to finance the production, management and dissemination of GMI by African GSOs.
- h) Facilitate South-South and triangular cooperation between African States and partners to improve national and regional capacities to manage geological and geospatial information for broader development objectives.
- i) Propose and implement a continuous communication strategy, including maintaining websites and discussion *fora* to engage stakeholders, and help to create awareness of GMI functions across governments and their importance for broad development processes in Africa.
- j) Propose and communicate principles for GMIS projects, activities and initiatives to be compliant with AMV and CMV, undertake monitoring and evaluation activities and, when applicable, propose corrective action to maintain consistency with AMV principles.
- k) Provide a “think-tank” capacity to make it possible for GMI to promote mining and broad development in Africa.
- l) Set principles to strengthen the implementation of the AMV and guide GMIS activities.
- m) Guide and encourage activities from African GOSs, universities, research centres and private companies to contribute to the improvement of the blue economy sector in Africa.

5.3- EXPECTED OUTCOMES

The following outcomes are expected from the GMIS Strategy:

- 1) Improve geological and geospatial information and its use in mining and broad development processes in Africa.
- 2) Promote transparent, equitable and optimal development of mining activities.
- 3) Improve the capacity of African GSOs to standardise and manage geological and geospatial information.

- 4) Improve the use of GIS technologies among African countries as a substantial step for database creation, mapping and geological exploration.
 - 5) Support the construction of comprehensive regional and national databases with geo-referenced information to enable better decision-making and increase the ability to negotiate sustainable mineral development agreements with foreign investors.
 - 6) Facilitate data sharing and distribution policy across users at continental, regional and national levels and in different sectors, including the private sector, government agencies and civil society agencies.
 - 7) Strengthen continent-wide mapping and mineral inventories and provide a range of visualization tools, mapping and publications online and via local services.
-

6.- THE GMIS PLAN OF ACTIVITY

The GMIS Strategy has a **Plan of Activity**, to be coordinated in cooperation between the AMDC, its partners and African GMIS initiatives. It covers all the areas and activities related to the AMV and the CMV (see table below).

The Plan of Activity was designed to allow the permanent and efficient planning, validation, implementation, monitoring, evaluation and updating of its various elements. Specific projects and activities may be proposed by the AMDC, its partners and African GMIS initiatives and should be validated by the GMIS Coordination Committee. When validated, projects and activities will become an integral part of the Plan of Activity and will be presented as an annex of the GMIS Strategy.

The Plan of Activity is structured into four main areas, which should guide the AMDC and its partners, including the different GMIS initiatives in Africa to support the production, management and dissemination of GMI engaged in the implementation of the AMV and the domestication of the CMV. They are:

- 1- GMIS at national level: Domestication of the CMV
- 2- GMIS at regional and continental levels: Implementation of the AMV
- 3- GMIS in areas of special interest
- 4- Legal and regulatory framework for African GMIS activities

6.1.- NATIONAL LEVEL: DOMESTICATION OF THE CMV

At the national level, activities are proposed to be developed in connection with AU member States' engagement in the domestication of the CMV using a participatory process, to determine the expectations of government, business, communities and civil society around minerals, their extraction and use, and how they will benefit society and development more widely. This includes: identification of gaps and areas of need in the member States' capability to produce, manage and disseminate GMI; and the assessment of expertise and information resources from a broad range of local and international partners. This takes into account the country's needs for geological and geospatial information to support legal, economic, social and environmental improvement in mining and broad development processes. It also considers the functions of GSOs, universities and other institutions; and issues of funding, capacity retention and the arrangement of earth sciences functions across government.

The main objective of this area of activity are:

- a) Fill gaps of particular interest to member States, where actions should be taken to strengthen capabilities to produce, manage and disseminate GMIS.
- b) Develop background and feasibility studies, recommendations and guidelines on specific topics related to Member States' GMIS gaps and interests.
- c) Compile and compare GSOs' best practices from within Africa and abroad on production, management and dissemination of GMI, to identify templates that GSOs might adapt to their needs.
- d) Support the capacity building of national GSOs to produce, manage and disseminate GMI.
- e) Strengthen the GMIS at African universities.

6.2.- REGIONAL AND CONTINENTAL LEVELS: IMPLEMENTATION OF THE AMV

At regional and continental levels, the GMIS Strategy will guide AMDC and its partners, including African GMIS initiatives, to support projects, These will facilitate the establishment of regional policy, international agreements, regional integration, large scale infrastructure planning and improved communication, relationship and cooperation.

The main objectives of this area of activity are:

- a) Facilitate the strengthening of GMIS centres of excellence at continental and regional levels (such as the AMGC, which will host the GMIS Strategy database).
- b) Support the strengthening of GMIS facilities at RECs.
- c) Support the strengthening of the Organization of the African Geological Surveys (OAGS)
- d) Support regional and continental data standardization, harmonization of terms, resource classification and facilitate global projects in collaboration with RECs.
- e) Develop Public and Private Partnerships (PPP), South-South and triangular cooperation.

- f) Support GMIS projects at regional and continental scales.
- g) Support Continental Geological Societies (e.g. GSAf).

6.3.- GMIS IN AREAS OF SPECIAL INTEREST

Areas of special interest are those, not necessarily directly related to mining, that require special attention from the AMDC and its partners, including African GMIS initiatives, to promote broad-based development and linkages. Areas include: the blue economy; artisanal mining and industrial minerals; underground water resources; natural geological hazards; geo-heritage and geo-tourism; geological knowledge for infrastructure works and occupation of urban and rural land, agriculture, environmental impact assessment, waste management and disposal.

The main aims of using GMIS in this area of activity are to:

- 1- Support projects for the production, management and dissemination of GMI for areas of special interest, across Africa, the African continental shelf and adjacent ocean, to leverage their high linkage and development potential. .
- 2- Support activities and projects related to the areas of special interest, including the establishment of African centres of excellence.
- 3- Identify African and other continents' best practice for producing, managing and disseminating geological information in areas of special interest.

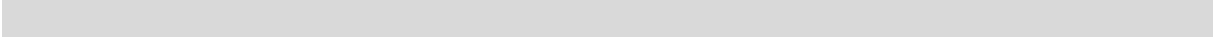
6.4.- LEGAL AND REGULATORY FRAMEWORK

The preparation of legal and regulatory guidelines is essential, in order to strengthen African Member States' capacity to produce, manage and disseminate GMI. This area of work covers: recommendations for funding GSOs from mineral revenue; production of information for contract negotiation; strengthening of taxation and tenders; transfer of corporation geodata, data sharing and distribution.

The main objective of this area of activity are:

- 1- Prepare recommendations, background studies and guidance for the improvement of the legal framework of member States' regulations related to GMIS.

2- Propose principles for GMIS projects, activities and initiatives in Africa to be aligned and consistent with the AMV and the CMV.



7.- GMIS STRATEGY FUNCTIONAL STRUCTURE

The GMIS Strategy Functional Structure proposes a governance structure and system of networks by which the GMIS Strategy and its activities may be planned and managed (see organogram below).

The Functional Structure is proposed to facilitate the joint coordination of GMIS activities in Africa and support co-ordinated and efficient planning, implementation and monitoring. It should also facilitate a technical dialog and a mechanism for regular exchanges between all the partners involved in implementation of the Strategy, to support the growth of institutional understanding essential to address changing political priorities in GMIS in the longer term.

The Functional Structure looks at existing stakeholders, organizations, projects and initiatives, with a view to building synergetic partnerships at three interactive levels: Supervision and Coordination Level; Project Management Level; Implementation/operational Level.

7.1.- SUPERVISION AND COORDINATION LEVEL

Supervision and Coordination Level activities will ensure that the resources and organizations related to GMIS in Africa are used efficiently and operate synergistically to support the specific objectives of the AMV, CMV, GMIS Strategy and related documents.

Specialized Technical Committee (STC)

The STC is composed of Member States' Ministers responsible for the AUC's trade, industry and minerals. Its competences include:

- 1- Oversee the overall implementation of the GMIS Strategy
- 2- Approve the recommendations from the AUC-TWG (see below);
- 3- Prepare projects and programmes to be submitted to the AU Executive Council;
- 4- Supervise, follow up and evaluate the implementation of decisions taken by AU organs;
- 5- Coordinate and harmonize the AU projects and programmes;
- 6- Submit reports and recommendations to the AU Executive Council on the implementation of the provisions of the Constitutive Act;
- 7- Ensure the implementation of the provisions of the constitutive act.

Africa Union Commission Africa Mining Vision Technical Working Group (AUC-AMV-TWG)

The AUC-AMV-TWG is composed of Senior Governmental Officials from the AU Member States, Heads or Directors of the African GSOs. It also include representatives from RECs, the OAGS and other geological associations, such as the Geological Society of Africa (GSAf). They will:

- 1- Oversee the activities of the GMIS Coordination Committee;
- 2- Review the proposals for projects and activities from the GMIS Coordination Committee, and
- 3- Make recommendations to the STC for final decision or understanding and control.

GMIS Coordination Committee

The Coordination Committee will consist of 11 representatives from organizations, initiatives and projects related to the implementation of the GMIS Strategy. These are:

- 1- Africa Union Commission (AUC), represented by the Division of Trade, Industry and Mining;
- 2- Africa Mineral Development Center (AMDC);
- 3- Africa Mineral and Geoscience Initiative (AMGI);
- 4- EuroGeo-Surveys represented by the **PanAfGeo** project;
- 5- OneGeology-Africa
- 6- Organization of African Geological Surveys (OAGS);
- 7- Geological Society of Africa (GSAf);
- 8- UNESCO represented by the African Network of Earth Science Institutions (ANESI);
- 9- Association of African Women in Geosciences (AAWG);
- 10- North, West and Central Sub regional Economic Communities (RECs); and
- 11- South and East Sub regional Economic Communities (RECs).

The Coordination Committee will make sure that the implementation of projects and activities are in line with the objectives of the AMV, the CMV, the GMIS Strategy and other relevant documents. It will:

- 1- review the relevant information provided by the GMIS Secretariat and prepare recommendations to the AUC-TWG;
- 2- map out initiatives and institutions, and their current roles in relation to geology and mineral information systems under the AMV;

- 3- identify priority issues and interventions for the benefit of African GMIS;
- 4- review, validate and follow up proposals for projects and activities related to the elaboration and implementation of the GMIS Strategy;
- 5- draft and update AMV- compliant principles for GMIS, taking into consideration the best practices on Africa and other continents on the production, management and dissemination of GMIS;
- 6- identify and propose alternatives to finance geological and mineral information activities in Africa;
- 7- review the options for addressing GMIS from the CMV Guidebook, the Action Plan for Implementing the AMV, and other documents, taking into account the principles above;
- 8- review and validate the GMIS Strategy, including principles.

GMIS Secretariat

The GMIS Secretariat is a permanent body hosted by the AMDC. Its purpose is to facilitate the implementation of the Strategy and its plan of work by providing sound financial and administrative management of the activities that the Strategy coordinates and implements. It will have full executive oversight of continental, regional and national implementation of the GMIS Strategy and will facilitate joint coordination of GMIS activities in Africa. It will also facilitate a technical dialog and a mechanism for regular exchanges between all the partners involved in implementation of the Strategy to support the growth of institutional understanding essential to address changing political priorities in GMIS in the longer term. Key functions of the Secretariat include:

- 1- assessment of different documents related to the implementation of the AMV, CMV and GMIS Strategy;
- 2- map and review existing institutions, initiatives and capacities related to GMIS in Africa;
- 3- identify existing approaches that potential partners are using;
- 4- identify outstanding capacities and gaps that exist in the area of GMIS;
- 5- work out how the AMDC and its main partners (AUC, UNECA, UNDP and AfDB) might strategically engage with other partners, on these issues;
- 6- large-scale consultation with GMIS partners and initiatives to present, debate and obtain support, as well as building partnerships for the development and implementation of the GMIS Strategy;
- 7- establish dialog and collaborative work with national, regional and international organizations developing similar and complementary GMI activities to strengthen this activity in Africa.

- 8- propose projects and activities related to the development and implementation of the GMIS Strategy.
- 9- organize GMIS Standing Committee meetings and periodic validation meetings by the AUC-TWG and the AMDC Technical Committee (AUC, AfDB, UNDP, UNECA) to:
 - a. review information and prepare recommendations and guidelines;
 - b. map out initiatives and institutions, and their current roles in relation to geology and mineral information systems under the AMV;
 - c. identify priority issues and interventions for the benefit of African GMIS;
 - d. review, validate and follow up proposals for projects and activities related to the elaboration and implementation of the GMIS Strategy;
 - e. draft and update AMV-compliant principles for GMIS , taking into consideration best practice in Africa and other continents on the production, management and dissemination of GMIS;
 - f. identify and propose alternatives to finance geological and mineral activities in Africa;
 - g. review options for addressing GMIS from the CMV Guidebook, the Action Plan for Implementing the AMV, and other documents, taking into account the principles above;
 - h. review and validate the GMIS Strategy, including principles.

7.2.- PROJECT MANAGEMENT LEVEL

At this level, different organizations and initiatives, such as the ones listed below, will apply their knowledge, skills, tools, techniques and resources to implement projects and activities to meet the necessary requirements for strengthening the production, management and dissemination of geological and mineral information in Africa, according to the AMV, CMV and the GMIS Strategy.

Africa Mineral and Geosciences Initiative (AMGI)

The AMGI intends to compile, collate, process and store existing geodata in a single repository located in Africa. The data sets would be improved, first through a fast delivery track (geo-referencing and basic processing) and secondly by a value-added track. The second track will offer more complex workflows with geodata schema definition, reprocessing of satellite imagery and 3D re-interpretation. The data sets will be made available through a web-

enabled platform. The AMGI has also a capacity building component, in partnership with other Pan-African projects and organisations such as governments, RECs, mining houses, universities and training and services providers. AMGI is fully complementary to the EGS/OAGS PanAfGeo project (see below).

Geoscientific knowledge and skills in African Geological Surveys (PanAfGeo)

The project PanAfGeo is about collaboration between European and African geological surveys through the EuroGeo-Surveys (EGS) and the Organization of African Geological Surveys (OAGS). It is planned as a two phase three-year project (Phase I & II) and covers four main topics:

- i. human resources capacity building and training of OAGS members and their partners;
- ii. development of OAGS members geosciences information infrastructure and management;
- iii. procurement of information technology to support the SDI and GIS technical facilities, and
- iv. interaction and mutual benefit with the other initiatives and infrastructures i.e. AMGI, ANESI, AMDC, AMGC.

The ultimate objective of PanAfGeo is to increase African-owned geological knowledge and skills so that the African Geological Surveys Organisations are key infrastructures for the development of the minerals sector and OAGS a key advisory body to the AUC.

OneGeology Africa

OneGeology is a global initiative that aims to be the provider of geosciences data globally, ensure exchange of know-how and skills so all can participate, and to use its profile to increase awareness of geosciences and their relevance among professionals and general public. Currently OneGeology is focused on serving geoscience data from individual countries to create a multi-thematic global geoscience data resource based on new international OGC standards. Standardising participants' data will enable all countries involved in the project to share authoritative information online, and on demand, to support exploration for resources (water, minerals and energy) and to help identify other relevant geological related information.

The project will support the GMIS Strategy by:

- i. providing an interactive platform with a standardized geoscience data service providing first-hand geological information;
- ii. North-South and South-South capacity building and knowledge transfer, shortening the learning curve for participants;
- iii. networking and bringing geoscientists together;
- iv. addressing common geoscience data issues in a more efficient way (i.e. legal, IPR, standardisation, IT development, education/expertise upgrading etc.);
- v. a “buddy” service for data, serving users that cannot do it themselves;
- vi. involvement in 3D geoscience data standard development and;
- vii. indirect leverage to Members’ research, survey and service contribution through its global presence.

Other initiatives

As the GMIS Strategy is a permanent and evolving instrument, it will take into consideration all the proposed GMIS initiatives that may contribute to AMV objectives, such as South-South cooperation and public private partnerships (PPP).

7.3.- IMPLEMENTATION / OPERATIONAL LEVEL

At the implementation/operational level, different institutions and initiatives will work at continental, regional and national levels to build capacities and increase the African competence to produce, manage and disseminate geological and mineral information.

1. Continental/Regional levels

Continental/Regional Databases and Geoprocessing Centers

It is proposed that data and information of relevant continental and regional interest collected under the GMIS Strategy be stored and processed by recognized Geoprocessing Centers of Excellence, which will host the continental/regional database, manage the available information and replicate it at national level to allow the exchange and upgrading of information from African GSOs.

The Geoprocessing Centers should also provide training to national GSOs using

their geo-processing facilities and internal network, which should be equipped with a modern central server and desktop computers furnished with up-to-date applications for modern geoscience data management. The training should include: application of GIS and remote sensing for mineral exploration and mapping; geophysical and geochemical data processing; geostatistics for geological applications; mineral targeting; and web mapping.

Geosciences Information Network for Africa (GIRAF)

The GIRAF will act as an advisory body for infrastructure and capacity building on a continental basis to implement the GMIS Strategy. The GIRAF was established by the International Union of Geosciences Commission for the Management and Application of Geoscience Information (IUGS-CGI) at the 21st Colloquium of African Geology (CAG21) in Maputo, Mozambique, in 2006. Currently GIRAF is hosted by the AMGC.

The GIRAF aims to facilitate the provision, dissemination and use of geoscience information and geodata in Africa through a sound-management of geological information, which will support sustainable development in the fields of mineral planning and mining, artisanal mining, securing and protection of water resources, and soil protection; (b) build a pan-African geoscience information knowledge network of GSOs, universities and companies, exchanging and information and good practice, and (c) support the implementation of the GMIS Strategy and strengthen the human capacity of the African GSOs. The GIRAF provides a forum to address these issues and has built a platform for knowledge-sharing, and networking of African geoscience information experts.

Regional Economic Communities (RECs)

Africa's RECs are considered to be the most important organizations for the implementation of the AMV at regional level. These eight organisations will be instrumental in the effective implementation, financing, monitoring and evaluation of the GMIS Strategy and its activities:

1. Arab Maghreb Union (**AMU/UMA**) – Northern Africa
2. Economic Community of West African States (**ECOWAS**) – Western Africa
3. East African Community (**EAC**) – Eastern Africa
4. Intergovernmental Authority on Development (**IAGD**) – Eastern Africa
5. Southern Africa Development Community (**SADC**) – Southern Africa
6. Common Market for Eastern and Southern Africa (**COMESA**) – Southeastern Africa

7. Economic Community of Central African States (**ECCAS**) - Central Africa
8. Community of Sahel-Saharan States (**CENSAD**) – Northern Africa.

In relation to the GMIS Strategy, Africa's RECs will act as key building blocks for regional geological and geospatial integration working together with their respective national GSOs, civil society and the AU Commission. The cooperation between RECs and their respective national GSOs is essential to help them in their development effort to conduct geological surveys in their respective areas and encourage human capacity building to fill key requirements. RECs are important in integrating projects from the continental to national levels, by acting as bridging bodies responsible for the countries in their regions and for programs such as the Africa Mining Vision to be implemented at a country level. Therefore, strengthening the Earth Science sections of the RECs is paramount if Africa is to implement the AMV and use its mineral resources for an integrated sustainable development.

2. National Level

At national level, the implementation of the GMIS Strategy will be carried out by the national GSOs, with the advisory support of the OAGS, and by the universities and research centres with support from the Geological Society of Africa (GSAf) and UNESCO (through its projects ANESI and IGP).

National Geological Survey Organizations (GSOs)

African national GSOs are vitally important to the economy of each nation, as well as to the protection of its environment and of its population. They provide objective scientific research, geological data, maps, and reports, used by state agencies, consultants, industry, developers, and the public as critical inputs to local and regional economic development plans, resulting in an economic advantage to the country and its society. They are the key beneficiaries of many African GMIS initiatives and projects. Sustainable strengthening of the geological administrations in Africa supports improved knowledge of geology-related resource potentials prior to their exploration and exploitation. Such strengthening will contribute to the development of local value chains, poverty reduction, and growth in employment.

In relation to the GMIS Strategy, the national GSOs will be involved at various stages of the project implementation including the identification of trainees, contribution to the preparation of adapted training schemes to address gaps in knowledge and skills in their teams, detailed assessment of needs (e.g. IT equipment), etc.

The Organization of African Geological Surveys (OAGS)

The Organization of African Geological Surveys (OAGS) represents all the National GSOs of the African continent. Its mandate is to foster and sustain government-supported geosciences endeavours and excellence on the African continent, in the quest for socio-economic development and poverty alleviation, with special reference to mineral resource assessment, sustainable land use and development, hazard mitigation and environmental protection.

The aims of the OAGS include:

- i. Collaborating in the creation of regional and continent-wide promotional maps, documents and publications that inform decision-makers in government and industry on matters relating to the applied geosciences;
- ii. Enhancing the capacity of Geological Surveys in Africa;
- iii. Sharing knowledge and expertise in geosciences, technologies, management and opportunities;
- iv. Advancing the training of African geoscientists;
- v. Jointly addressing African geoscience issues of common interest and promoting the contribution of geosciences to African affairs;
- vi. Assisting African decision makers to obtain technical advice from the members of the OAGS;
- vii. Providing a geoscience network between the Geological Surveys; ensuring the financial sustainability of the organization;
- viii. supporting the programs and objectives of the African Mining Partnership (AMP) and the African Union (AU).

Universities and Research Centers

Universities and research centres have important functions in terms of training new earth scientists that will fill vacancies in GSOs, diverse government departments, minerals exploration and mining companies, and other organisations.

Universities and research centres are also important repositories of earth sciences data, information, knowledge and expertise. As such, in addition to government departments, earth sciences departments in universities should also be integrated into wider government-related earth sciences programmes and projects.

Geological Society of Africa (GSAf)

The purpose of the GSAf is to encourage geoscientific collaboration and cooperation amongst universities, centers of excellence and other partners involved in the implementation of the GMIS Strategy. Most of its activities are Africa-wide and involve collaboration, association, holding of meetings, workshops and conferences to enhance earth science research, education and cooperation.

The main objectives of the GSAf in connection with the GMIS Strategy are to:

1. Promote understanding of the earth sciences and improve standards of earth science education and research in Africa;
2. Provide a forum for discussion and dissemination of information across national boundaries between scientists, associations and institutions engaged in African geology and earth resources;
3. Promote the development and sustainable management of the continent's earth resources, to advance its socio-economic development; and
4. Improve natural hazards assessment and disaster mitigation.

African Network of Earth Science Institutions (ANESI)

The ANESI is an initiative of UNESCO and associated organizations. Its purpose is to strengthen the training and research capacity of earth sciences institutions and experts from African universities and research centers. ANESI has a particular focus on capacity building with young scientists and PhD students; it promotes exchanges and partnership between earth science institutions, encourages partnership with industry, and aims to increase the ability of Africans to be fully involved in international projects operating in the continent, such as the International Geosciences Program (IGCP) supported by UNESCO and the International Union of Geosciences (IUGS).

The objectives of the ANESI include:

1. Promoting the emergence of new generations of African earth scientists able to assess the huge potential of African geological resources and to effectively advise governments
2. Facilitating exchange, collaboration and partnership in research and education among member institutions
3. Foster a systems approach to earth sciences in research and education
4. Promoting earth sciences at school level
5. Ensure gender equity in access to earth science research and education.

The Researcher Exchange Programme is one of the ANESI's core capacity building activities, with the objective to increase the mobility of scientists.

It is anticipated that ANESI could contribute to the implementation of the GMIS Strategy with two important activities:

- 1- **ANESI Mobility Grants** for student, researchers and lecturers allow them to move to another African university to follow short courses, conduct research or assist universities in need of lecturers' for specific courses; through a dedicated award, ANESI also encourages postgraduate female students to register for a PhD or to start a career in the earth sciences, and supports institutions willing to strengthen their collaboration with the industry.
- 2- **Assessments on the impacts of mining activities** on ecosystems and the health of communities; the objective of this work is to produce science-based evidence to influence policies on issues of mining. UNESCO, through IGCP, is supporting teams of multidisciplinary scientists working on various aspects of mining impacts on ecosystems and health in many sub-Saharan African countries. ANESI is working to develop a training and research model that guarantee a sustainable supply of skills for Artisanal and Small-Scale Mining (ASM).

7.4.- OTHER PARTNERS

These institutions are considered important for the implementation of the AMV through the GMIS Strategy:

African Association of Women in Geosciences (AAWG)

African Development Program (AfDP)

African Mineral Science Initiative (AMSI)

Commission for the Geological Map of the World (CGMW)

European Union (EU)

International Conference on the Great Lake Regions (ICGLR)

OneGeology

United Nations Development Program (UNDP)

United Nations Economic Commission for Africa (UNECA)

United Nations Educational, Scientific, and Cultural Organization (UNESCO)

United Nations Environmental Program (UNEP)

United Nations Industrial Development Program (UNIDO)

World Bank (WB).

The African Association of Women in Geosciences (AAWG)

The AAWG is an NGO affiliated to the International Union of Geological Sciences (IUGS). The AAWG's core objective is to encourage and mobilise support for education, training and research to assist African women in their acquisition of specialised skills for leadership in the geosciences sector. It highlights, and seek solutions to, problems faced specifically by women and grassroots communities in Africa in the area of geosciences. Gender equality issues are particularly relevant in Africa and for the implementation of the GMIS Strategy.

AAWG aims include:

The promotion and advancement of scientific and technological knowledge in the field of geosciences;

Dissemination of information on scientific and technical research and discoveries, and promote public understanding of the role of geosciences in Africa's development;

Establish and maintain relations between African scientists and the international scientific community;

Provide a forum for discussion and cooperation in geosciences and other related professions in Africa

Assist African governments in the quest for capacity building in geosciences and its applications.

The International Conference on the Great Lakes Region (ICGLR)

Establishment of the ICGLR was based on the recognition that political instability and conflicts in these countries have a considerable regional dimension and thus require a concerted effort in order to promote sustainable peace and development. It will:

- Promote one joint initiative of eleven countries of the Great Lakes Region in dealing with issues of peace, stability and development;
- create an institutional and legal framework addressing issues pertinent to the Region
- Establish a Peer Review Mechanism specific to the Region;
- Define common standards and approaches to relevant issues in the Great Lakes Region;
- Provide a comprehensive regional approach to peace building reconstruction and development.

The Commission for the Geological Map of the World (CGMW)

The Commission for the Geological Map of the World (CGMW) was established in 1913 at the 12th International Geological Congress (IGC) in Toronto. It is a non-profit-making scientific and educational association governed by French law. The CGMW has been affiliated to the International Union of Geological Sciences (IUGS) since 1966 and is recognized by UNESCO as a Non-Governmental Organization (NGO). Geological Surveys Organizations of countries and territories throughout the world are statutory members of the CGMW. Its mapping activity is financed by membership fees of the Surveys, IUGS and UNESCO grants, and sponsorship and/or support from Geological Surveys and from industrial partners on specific projects. CGMW General Assemblies are held every two years to assess the aims of future programs and the progress of current projects.

The last 2010 CGMW map of Africa provide the most up-to-date and seamless view of the continent, and meets AMDC's GMIS requirements. A 2016 version of the Geological map of Africa was prepared and made available to the conference participants at the 2016 IGC35 meeting held in Cape Town, South Africa.

The Tectonic Map of Africa also provides a comprehensive mapping of Africa's Continent/Ocean boundary (albeit data with no legal force), imaging the offshore national territory of countries with a coastline. This is a vital tool in planning for the role of the GMIS Strategy in Africa's Blue Economy. At larger scale, CGMW maps bridge geological information gaps between Africa and surrounding continents (eg Arabian plate, Antarctica and South America).

8.- COMMUNICATION STRATEGY

The GMIS Strategy also emphasises the importance of developing appropriate communications strategies and approaches to enable informed participation and foster ownership by all partners throughout the GMIS Strategy process. The aim of this work is to achieve effective partner and stakeholder engagement, and contribute to greater awareness and understanding of the important role of geological and mineral information systems. In particular, the communication strategy should also contribute to:

- 1) The promotion of informed participation and ownership at all stages of the design and implementation of the GMIS Strategy;
- 2) Setting realistic expectations about the GMIS contribution to the implementation of the GMIS Strategy;
- 3) Promoting wider understanding of the importance that the GMIS Strategy process embodies;
- 4) Increasing acceptance and ownership of the GMIS Strategy process; and
- 5) Raising awareness of how and where to access information, knowledge, and resources in order to improve analysis and decision-making by stakeholders.

Communication channels will include:

- A comprehensive package of communication messages, tool and narratives on the developmental and transformative role that GMIS Strategy is expected to play;
- Use of GMIS's "think-tank" capacity to collect feedback and recommendations to allow periodical technical updating and validating the GMIS activities by stimulating discussions in conferences, workshops and meetings. This includes the presentation of the GMIS Strategy background document in different technical meetings.

9.- FINAL CONSIDERATIONS

The ultimate purpose of the GMIS Strategy is to contribute to the implementation of the AMDC's mission, to implement the AMV.

The GMIS Strategy aims to promote collaboration; establish trust; empower; and mobilize supporters. It is open to new ideas and improvements; and encourages deliberation and consultations.

The GMIS Strategy is also proposed to set direction; create alignment; and build commitment. It requires articulating the AMV vision, mission, purpose and values. It also involves having goals, outcomes, and objectives, as well as proposing activities and formulating tactics and methods.

GMIS alignment is about developing a shared understanding of the situation and assessing whether the same values, goals and mind-sets are shared. It entails coordinating thoughts, actions and objectives and finding common ground in others' ideas, activities and values. It includes identifying areas of shared responsibility and the means to achieving them.

Commitment is about ensuring that a group stays together, works together and cooperates. It requires building cohesion, trust, and mutual respect among partners engaged in shared work. It also involves building ties that hold a group or partners together; building a sense of togetherness and building ownership.

Dialogue is the method that has been used throughout to build the AMDC's GMIS Strategy, with the goal of having optimal outcomes for all partners involved in its implementation; and with the commitment of improving geological and geospatial information and its use in mining and broad development processes in Africa.



Annex 1

Geological and Mineral Information System (GMIS) Principles

Preamble

Noting that the Africa Mining Vision (AMV) is to have “transparent, equitable and optimal exploitation of mineral resources to underpin broad-based sustainable growth and socio-economic development”.

Acknowledging that the AMV represents a shift from geological information for mine development to geological information that supports mining as a driver of broad-based sustainable growth and socio-economic development.

Noting that geological information is the basis, and is significant across the whole Mineral Value Chain, facilitating resource value evaluation supporting decision-making in contract negotiation through information on quality and quantity of mineral wealth in the subsoil.

Noting that geological knowledge and information are necessary conditions for African countries to exercise governance over their mineral wealth.

Highlighting that the purpose of the GMIS Principles is to provide guidance on how national, regional, continental and international institutions engaged in geological activities can effectively support the Africa Mining Vision.

Highlighting that geological information cannot be separated from issues of governance, policy and licensing, linkages and beneficiation, artisanal and small-scale mining (ASM), and capacity development; the AMV envisages a holistic approach.

Committing the principles to be applied at the national level by GSOs, universities and other government agencies with geological functions as well as Regional Economic Communities (RECs), international institutions and initiatives engaged in supporting geology in Africa.

Noting that all organisations with geological information and functions, along with the interactions between these organisations, form a “geology and mineral information system”.

Noting that geological information is used for a wide range of purposes including resource assessments, planning and risk mitigation.

Emphasising that broad categories of geological information include remote sensing, geophysics, field observations, laboratory analyses, geological interpretation and verification.

Underscoring the importance of geological metadata for the meaningful interpretation and understanding of geological information.

Noting that the scale at which information is presented has a strong bearing on the applications for which geological information can be used, along with issues of confidentiality and data access (see Annex 2).

Recalling that under the AMV there are a series of documents that address implementation of the AMV in the geology and mineral information systems cluster, the following documents form the basis for these recommendations: the Action Plan for the Implementation of the AMV; the International Study Group Report; the AMDC Business Plan; the Report of the Expert Group and Consultative Meeting (EGCM) on Geology and Mineral Information Systems; the Consultative and Validation Workshop for the African Minerals Geoscience Initiative (AMGI); AMGI Consultative Group Recommendations; the AMDC Statute; A Country Mining Vision Guidebook: Domesticating the Africa Mining Vision; and the Geological and Mineral Information System (GMIS) Strategy.

Definitions

Exclusive Economic Zone: an area beyond and adjacent to the territorial sea, extending up to 200 nautical miles from the baselines, where a coastal country has sovereign rights as set forth in Article 56 of the U.N. Convention on Law of the Sea, such as those relating to natural resources in the water column, on the seabed, and in the subsoil.

Geographic Information System: A system of spatially referenced information, including computer programs that acquire, store, manipulate, analyse, and display such data.

Geological Survey Organisation: An institution that undertakes the systematic mapping of the earth within a country’s territory, territorial sea, Exclusive

Economic Zone (EEZ) and extended continental shelf, prepares inventories of geological resources and hazards, and publically shares these information for the benefit of the country.

Geology: Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them.

Information: A record or communication, quantitative or qualitative, regarding a subject.

Initiatives: Refers to the different activities, projects and programmes related to GMIS proposed and carried out by national, regional and international organizations.

International initiative: A set of activities undertaken in partnership between two or more sovereign states.

Knowledge: Information and skills acquired through experience or education, regarding a subject.

Metadata: data and information that defines and describes other data.

Mineral: A naturally occurring, inorganic solid material with a definite chemical composition and an ordered internal structure.

Natural resource: materials, substances, phenomena or characteristics occurring in nature which can be exploited for economic gain.

Territory: an area of land under the jurisdiction of a ruler or state.

Territorial sea: an area of the sea not exceeding 12 nautical miles from the baselines where the coastal nation exercises sovereignty, subject to the right of innocent passage and other rules of international law.

Mission and Objectives based on the Africa Mining Vision (AMV)

Mission

The mission for institutions and initiatives engaged in geology and minerals information systems activities is to:

- Improve geological and geospatial information and its use in mining and broad development processes.

Objectives

The objectives for institutions and initiatives engaged in geology and mineral information systems activities are:

1. Enhanced geological capacity in geological survey organisations, universities and other related institutions
2. Improved quality and availability of geological maps, databases and geospatial data, and eventually, complete coverage of Africa at the 1:100,000 scale
3. Standardisation of geological information and information systems at the national, regional and continental levels.

Principles

All institutions and initiatives engaged in geology and mineral information systems related activities, including GSOs, universities, other government institutions and international organisations, shall apply the principles hereunder defined:

Principle 1: Geological information is important for sustainable development and should be made available to the public, including agro-minerals, industrial minerals and materials, gems, metallic and non-metallic minerals.

Principle background: Geological information provides an indispensable element in the minerals related investment decisions as well as for broader development, and as such it is a public good.

Principle 2: The activities of geological institutions and initiatives shall be coordinated. This includes national, regional, continental and international levels of coordination.

Principle background: Such coordination is essential to achieve consistency of geological information, an improved understanding of national and regional geology, and efficiency in the geological information systems. Bilateral and multilateral cooperation in the acquisition and sharing of geological data can contribute to the improvement and integration of geological information in all countries.

Principle 3: Geological institutions and initiatives shall be resourced adequately in terms of budgets, equipment, and staff in order to undertake the systematic geological mapping of the entire territory, territorial sea, exclusive economic zone and continental shelf.

Principle background: This includes collecting, compiling, processing, storing, managing, analysing, interpreting, presenting and sharing of geological data, information and samples and undertaking other necessary functions.

Principle 4: All geological data, information and metadata, unless confidential (see Principle 5) shall be available for free.

Principle background: To maximise the benefit of geological data, information and metadata, it is important that as much geological information is made publically available as possible, particularly at the scales of between 1:100,000 to 1:250,000 (see Annex 2 for more information on scales and applications of geological data).

Principle 5: Commercially and national security sensitive data collected by geological survey organisations are to be kept confidential in accordance with national law.

Principle background: Such confidentiality is essential to ensure trust and the sharing of commercially sensitive information with the geological survey organisation. In many cases, prospecting or exploration will not result in a mine, but the records, if kept by a GSO may later stimulate further prospecting and exploration and with better technology, ultimately lead to the development of a mine.

Principle 6: Geological institutions and initiatives need to decide according to strictly professional considerations: these considerations include scientific principles and professional ethics on the methods and procedures for the collection, compilation, processing, storage, management, analysis, interpretation, presentation and sharing of geological data and information.

Principle background: The use of scientific and professional ethics in all decision making will help retain and strengthen trust in geological information as well as the institutions that generate and/or obtain this information.

Principle 7: Data for geological purposes are compiled from all types of sources, including remote sensing, field surveys, lab testing and other sources taking into account information quality, suitability, and costs.

Principle background: There are many types of geological information and the cost of these vary greatly depending on what information is being collected, compiled, processed, stored, managed, analysed, interpreted and shared. Each step in the data value chain has costs and it is important to ensure geological activities are planned with all relevant costs in mind.

Principle 8: Geological institutions and initiatives in each country should standardise geology and mineral information systems including nomenclatures, classifications, mapping scales and methods.

Principle background: The use of standardised geology and mineral information systems ensures information can be shared, compared and extrapolated for technical efficiency.

Principle 9: The laws, regulations and measures pertaining to GMIS under which the geological institutions and initiatives operate are to be made public.

Principle background: Allowing the public access to this information fosters trust, transparency and accountability between geological information providers and the wider stakeholder community.

Principle 10: Geological institutions and initiatives are entitled to comment on misinterpretation and misuse of geological data by third parties.

Principle background: In some cases geological information may be misused either inadvertently or deliberately. In such cases, especially where there is a risk that the wider public, or investors, are going to be misled, it is important that geological institutions and initiatives comment on the misuse so as to retain the trust of stakeholders and the wider public.

Principle 11. International development organisations should support geological initiatives in African countries that are making meaningful efforts to implement the AMV. This consists of developing precision mining, taking care of governance and participation, policy and licensing, linkages, economic diversification and beneficiation, artisanal and small-scale mining and minerals related capacity development.

Principle background: Minerals information does not exist in isolation from social and economic systems. By addressing geology together with the issues above, it will improve the chances that minerals information will meaningfully contribute to equitable and transparent sustainable development.

Principle 12: International institutions and public and private sector-led initiatives should mobilise and strengthen African human and institutional capacity by utilising African experts, staff and students from national geological survey organisations, universities and other institutions in all their activities in order to have a maximum impact in the development process.

Principle background: African geological capacities will improve through ownership of geological activities and the delivery of these activities especially where this involves practical geological research and education.

Annex 2: Scales of geological information

Table 1: Geological and minerals information scales in the context of the Africa Mining Vision.

Main Scales of Work	Level of activity	Main use of information (Economic, social and environmental)	Main responsible for data collection and management	Source of financial support for data collection and management	Other source of financial support	Ownership of data and information	Accessibility	Responsible for data and information dissemination	Benefits
1:2,500,000 1:1,000,000 1:500,000	Continental level	Regional policy International agreements Regional integration Large scale infrastructure planning Communication	African GSOs, Regional initiatives and institutions (e.g. RECs), International initiatives and institutions	Options could include (CMV): (1) A portion of mineral fees, levies, ground rent, etc.; (2) A portion of mineral royalties;	Member States, Public Private Partnerships, international organizations, donors, NGOs, etc.	Ownership with Member States and custodian with African GSOs	Free access*	African GSOs	Indirect revenue or 'savings' through the optimisation of development planning based on geological information
1:500,000 1:250,000 1:100,000	National level (Geological Surveys)	Attract mining investments, Boardroom decision making by exploration and mining companies, Planning use of groundwater sources Prevention and limitation of impacts from geological hazards Infrastructure works Land use	African GSOs	(3) A dedicated "national mineral resources replenishment levy" on all extraction (operating mines).		Ownership with National Governments and custodianship with national GSO		National GSO	Indirect revenue through the attraction of local or international investment as well as 'savings' through the optimisation of development planning based on geological information
1:50,000 1:25,000 1:15,000	Mining Industry level	Prospecting Exploration Resource classification Environmental impact assessment Mine site restoration	Mining industry and national GSO	Exploration and mining companies including greenfield and brownfield exploration activities		Mining industry and national GSO	Disclosure and access to be based on policies, regulatory frameworks and agreement reached by all parties involved	Mining industry through national GSO, based on policies, regulatory frameworks and agreements	Direct tax revenue to mining industry from mining activity



Annex 3

Questionnaire to assess African Regions' and States' capability/potential to produce, manage and disseminate GMIS in the context of the CMV process

Note: We acknowledge the contribution of Ms. Anna Nguno, President of the OAGS, for her contribution during the preparation of this questionnaire.

Introduction

This questionnaire is part of the Geological and Mineral Information System (GMIS) Strategy, proposed by the African Mineral Development Centre (AMDC), to assess African Regions' and States' capacity/potential to produce, manage and disseminate GMIS in the context of the domestication of the Country Mining Vision process.

The questionnaire is applied in connection with Principle 1 of the Plan of Action for the Implementation of the Africa Mining Vision (AMV): "*Comprehensive knowledge of mineral endowment*", with the desired result of: "*Improved geological and mining information systems to underpin investment in exploration and mine development*".

The aim of the questionnaire is to:

- a) Identify gaps and areas of need in the African Member States' capability/potential to use GMIS in mining and broad development processes, and access expertise and information resources from a broad range of local and international partners.
- b) Identify support mechanisms to:
 - i. finance the production, management and dissemination of GMIS by African Geological Survey Organizations (GSOs), and
 - ii. facilitate training and capacity building of GSOs to produce, manage and disseminate GMIS.

- c) Support African Member States in generating and applying geological information for informed policy and decision-making across the mineral value chain.

The questionnaire is intended for use by African Member States as part of the CMV process. Questionnaire outcomes can be used to indicate current strengths, and areas requiring attention or improvement.

The questionnaire can also be used as a diagnostic tool by African Member States and Regions, either in whole or in part, for internal assessment, to stimulate strategic discussions, or year-on-year to support monitoring and evaluation of GMIS.

Assessment Questions:

NATIONAL FRAMEWORK FOR GEODATA GOVERNANCE

GSO Institutional framework

1. What kind of GSO has the country?
2. Is it autonomous or linked to a government ministry?
3. How is it financed?
4. Does the GSO have a Governing Board?

Geological data governance framework

5. Is there a well-developed and efficient mechanism for coordinating the handling and sharing of geological data and information?
6. Does the country have a national land use plan?
7. Is the land use plan complemented by other laws at relevant administrative levels, which define land use according to the suitability of the land and quality and quantity of resources?
8. Is there a skills development levy (y/n). If so, how is it structured?
9. Is the country a member of the Organisation of African Geological Surveys (OAGS)?
10. If not, are there any constraints for the country to join the OAGS?
11. Is there any value or benefits associated with OAGS membership?

Data Integrity and Security

12. Is there official government information on total mineral reserves?
13. Does the government possess detailed geological data on the quantity and quality of its mineral resources?

GMIS Legal Framework

14. Is there any provision in the regulations for financing the GSOs from the mining revenue?
15. Are the laws, regulations and measures pertaining to GMIS, under which the geological institutions and initiatives operate, made public?
16. Does allowing public access to this information foster trust, transparency and accountability between geological information providers and the wider stakeholder community?
17. Does the legal framework make provision to ensure that geological data and information acquired by the private sector is made available to governments?
18. Are there legal or policy framework that facilitates access to geological data?
19. What are the current impediments to acquisition of geological data and information by the government?
20. How are geological data and information used by the government to create valuable assets?

PRODUCTION, MANAGEMENT AND DISSEMINATION OF GEODATA

Production and collection of geodata

21. Is there a national minerals research development strategy?
22. How frequently are geological surveys conducted? What date was the most recent one conducted?
23. To what extent does the geological department use other work already done like the open-access regional geoscience and geographic databases?

Data storage and access

24. Is there a digital geological data base?
25. How efficient and up to date are the country's data storage and access technologies?
26. Are geological data easily available? What are the barriers to access of geological data and information by companies and other interested parties?

Type of available geological data

27. Is there a geological base map (y/n)? If so, at what scale?
28. Is there a mineral occurrence map of the country (y/n)? If so, at what scale?
29. What types of minerals are documented? Are their locations documented?
30. What type and quality of geological survey is needed?

Ownership and custodianship of African geodata

31. Who is the owner and custodian of geological data of an African country involved in the AMGI (African Mineral and Geoscience Initiative) project?
32. Who owns the geodata acquired through a donor funded programme such as the World Bank, African Development Bank etc.?
33. Who owns the data if there is a value addition through cooperative projects like the AMGI?

Sourcing of the data

34. Where does African geodata currently reside (i.e. GSOs, European Public Sector Archives, Extractive Industry source data, other institutions such as geological institutes, universities, private sector contractors in donor aid funded geoscience programs)?

Availability of data

35. Are geological data, information and metadata, unless confidential, made available publicly for free, particularly at the scales 1:100,000 to 1:250,000?
36. Are there maps of the country at this scale?
37. In what form are these maps available (digital or print)?
38. How are geological data disseminated?
39. How do you estimate the benefit gained by the distribution of such data to the public?

Status of geological information

40. Is the geological information considered a public good and made available for different applications in the mineral sector and for broader development?
41. How well is the role of geology in society understood by the majority of citizens? What evidence do you have for this? Does the level of understanding about the role of geology in society need to be improved?

Confidentiality of data and information

42. Are commercially and national security sensitive data collected by GSOs kept confidential in accordance with national law?
43. Is there confidentiality to ensure trust and sharing of commercially sensitive information with the GSOs?
44. If prospecting or exploration do not result in a mine, does the GSO keep the records to stimulate further prospecting and exploration, which ultimately might lead to the development of a mine? Do the GSOs have a rock and analytical data repository?

Standardization of data and information

45. Do the geological institutions and initiatives in the country standardize geology and mineral information systems including nomenclatures, classifications, mapping scales and methods?
46. Does the use of standardized geological and mineral information systems ensure that information can be shared, compared and extrapolated for technical efficiency?
47. Which regional and international initiatives contribute the most to the strengthening of geological and mineral information systems in the country?
48. How do you maximize the benefits arising from the country's participation in regional and international initiatives aimed at expanding Africa's geological coverage and mineral inventory?

Spatial data infrastructure (SDI)

49. Are there developed and implemented regional spatial data infrastructures (SDI) for geological knowledge management and visibility of public information, including:
 - a. spatial data infrastructure-interoperability standards-data modelling-data dissemination;
 - b. database management;
 - c. geographic information systems and user-oriented products;
 - d. data quality-data right management-data licensing;
 - e. IT networks-user access management.
50. Is there effective facilitated access to public data assets to encourage the generation of added-value?
51. Is there commitment of the ministries in charge of the mineral resources sector to allocate the appropriate budget to the GSOs for information management?
52. Is there a commitment of the GSOs to allocate the adapted budget to the specific GMIS projects?

GSOs SUSTAINABILITY AND CAPACITY BUILDING

Addressing capacity issues

53. Is there capacity (human and infrastructure) to interpret, review, archive and disseminate information?
54. Does the geological institution has an adequate budget to upgrade its physical infrastructure and human capacities in order to have modern geological and mineral databases?
55. Do education and training institutions offer specialised diplomas or degrees in geology, metallurgy, mining engineering, mining economics, and statistics?

56. Is there a portion of the resource rents that is invested in human development (skills in critical areas) in the field of geosciences?
57. Are there improved terms and conditions of employment to allow recruitment of competent staff and retention of best officials in key positions in Geoscience?
58. Is there a system of incentives to retain skilled staff in the geological department?

Coordination of geological institutions and initiatives

59. Are the activities from geological institutions and initiatives coordinated at national, regional, continental levels?
60. Is the geological information consistent at national, regional and continental level?
61. Is there bilateral and multilateral cooperation in the acquisition and sharing of geological data that can contribute to the improvement and integration of geological information in Africa?
62. Is there a well-developed and efficient mechanism for coordinating the handling and sharing of geological data and information on a national, regional and continental level?

Financial capability

63. Are the geological institutions and initiatives resourced adequately in terms of budgets, equipment, and staff in order to undertake systematic geological mapping of the entire territory, territorial sea, exclusive economic zones and the continental shelf?
64. Are the geological institutions and initiatives capable of collecting, compiling, processing, storing, managing, analyzing, interpreting, presenting and sharing of geological data, information and undertaking other necessary functions?
65. If not, why are geological and mining institutions under-resourced?
66. Can additional measures be put in place to strengthen the capacity of geological and mining institutions?

Scientific and professional ethics in all decision-making

67. Do the GSOs and initiatives decide according to strictly professional considerations, including scientific principles and professional ethics on the methods and procedures for the collection, compilation, processing, storage, management, analysis, interpretation, presentation and sharing of geological data and information?
68. Does the use of scientific and professional ethics in all decision-making retain and strengthen trust in geological information as well as the institutions that generate and/or obtain this information?

69. Are there ethical procedures for the institution in discharging its responsibilities?
70. How effectively are geological and mining institutions discharging their responsibilities?
71. Which barriers, if any, are inhibiting geological and mining institutions in discharging their responsibilities?

Planning and cost of data in the data value chain

72. Are data for geological purposes compiled from all types of sources, including remote sensing, field surveys, lab testing and other sources taking into account information quality, suitability and costs?
73. Is there a plan of activity including related costs to achieve the desired results?

Misinterpretation and misuse of geological data

74. Are the GSOs and initiatives entitled to comment on misinterpretation and misuse of geological data by third parties in order to retain the trust of stakeholders and the wider public? (Privately to government? And/or in public, eg to the media?)
75. Do the institutions and initiatives have the infrastructure and the human capacity to evaluate such type of misinformation or misuse of geological data by third parties?

Geological initiatives' support to the implementation of the AMV

76. Are there any geological initiatives in your region/countries supporting the implementation of the AMV?
77. Are the geological initiatives in African countries taking care of governance and participation, policy and licensing, linkages, economic diversification and beneficiation, artisanal and small-scale mining and minerals related capacity development?
78. Are the geological initiatives in African countries addressing geology together with the issues above in order to improve the chances that minerals information will meaningfully contribute to equitable and transparent sustainable development?
79. What are the criteria for evaluating a country's effort to implement the AMV?
80. What type of support will the country get if it tries to implement the AMV using the CMV guideline for its mineral sector?
81. Which organizations will support such type of development in a country?
82. Are the international institutions and public and private-sector led initiatives mobilizing and strengthening African human and institutional capacity by utilizing African experts, staff and students from national geological survey

- organizations, universities and other institutions in all their activities in order to have a maximum impact in the development process?
83. Do the African initiatives contribute to the improvement of African geological capacities through ownership of geological activities and the delivery of these activities especially where this involves practical geological research and education?
 84. Is there capacity building through workshops or research related projects?
 85. What type of training is being given to strengthen the mineral resources sector?
 86. Is the necessary infrastructure available at the GSOs and universities to conduct practical training as well as research in the country?
 87. If not, will there be a program to upgrade the infrastructure, as in most African countries -especially within the GSOs - there is a deficiency of specialists (for example geochemists, petrologists, economic geologists, structural geologists, sedimentologists, paleontologists, geophysicists, etc.)?
 88. Will there be cooperation between the local universities, GSOs and the international initiatives and supporting organizations to train qualified personnel in the various fields of specialization?
 89. No country has developed usage of its mineral resources revenue without a research and development unit. That is not the case in Africa. Is there a plan to establish such types of research and development centres within the GSOs in cooperation with the universities and regional excellence centres?
 90. Does your country have a national geological society to further capacity building and infrastructure development?
 91. If so, is this society affiliated to the Geological Society of Africa?

Geoscience information infrastructure and management

92. Are there strengthened geoscience information infrastructures and skilled professionals at operational level in the respective African Geological Surveys, with adaptation to the local context in terms of existing equipment and personnel as well as sustainability potential?
93. How is the improvement of the capacities of GSO professionals undertaken in the GMIS sector?
94. Are there improved capacities of GSO professionals to publish web services at national level to be harvested within the pan-African SDI by the web portal?

EFFECTIVENESS OF GEODATA

Effectiveness of Geodata to improve transparency in the mining sector

95. To what extent do available data in the national GSOs help to:

- a. Improve the development and the application of policies, regulations and fiscal regimes for mining activities?
- b. Provide better decision-making options and improving management capacity of mineral resources and mining sector activities?
- c. Better assess the potential of mining projects and support the design of optimal tenders with the real value of mineral resources?
- d. Facilitate price discovery for governments and support decision-making in contract negotiation through information on quality and quantity of ores in the subsoil?
- e. Provide governments with better options for concession of exploration and mining permits?
- f. Establish judicious taxation rates and ensuring that countries receive a fair share of the mineral related revenues?
- g. Allow a better assessment of environmental impact and sustainability of mining projects and activities?
- h. Monitor licenses of contracts and follow up mineral exploration and exploitation projects and activities;
- i. Enable African geological institutions to deal with mineral resources in a sovereign manner?
- j. Reduce the risks for investors and alleviate investor tendencies to require very favourable tax regimes?
- k. Support, improve and follow up artisanal and small-scale mining (ASM) activities and to help them to be integrated into local and regional economic development and land-use plans and strategies?
- l. Strengthen capacities of ASM operations to operate viably with minimum environment and social damage?
- m. Formalize ASM and upscale programmes to upgrade knowledge, skills and technology in the ASM sector?
- n. Develop continental policies, laws, regulations, standards and codes to promote sustainable ASM?
- o. Assess industrial minerals with low value but very high linkage potential, including:
 - i. **agro-minerals to improve agricultural development in Africa** that can be used for soil rehabilitation and fertilizers, such as carbonates, potassium and phosphorite?
 - ii. **minerals that can support African industrialisation** as inputs into the manufacturing of cement, ceramics, glass, paints, toothpaste, and many other products?
 - iii. **aggregate and other materials for construction and infrastructure development in Africa**, such as sand and gravels?

- p. Develop the African Blue Economy by supporting coastal and oceanic management; delimitation of African countries' outer continental shelf; assessment of marine mineral resources and by guiding the identification of potential areas for fishing and bio-prospecting activities?
- q. Identify underground water resources and planning for their use and management?
- r. Identify natural hazards of geological origin, their monitoring and the mitigation of their impacts, such as landslides and rock falls, collapses, slumps, erosion, sedimentation, earthquakes, natural emissions of hazardous gases, land motion and subsidence, shrinking and swelling clays among others?
- s. Highlight characteristics of the ground when planning and performing infrastructure works such as dams, ports, roads, pipelines, transmission lines, bridges, viaducts, roads, development corridors (DCs), etc?
- t. Identify opportunities for geo-heritage (for example, through museums and other special institutions, and the development of geo-tourism related to volcanoes, hot pools, spectacular rift landscapes and other geological features)?
- u. Make the correct use and occupation of urban and rural land, sustainable urban development and safe construction?
- v. Identify favourable areas for different types of agricultural activities?
- w. Support environmental impact assessment and management, as well as for waste management and disposal?