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29th Colloquium of African Geology

The CGS delegation at CAG29. Top, from left: Mr Melvin Sethobya, Ms Debbie Claassen, Mr Shane Doggart, Mr Willem Meintjes, Dr Thomas Muedi, MsYasmeen Fortune and Mr Hakundwi Mandende. Middle, from left, Dr Haajierah Mosavel, Ms Mahlako Mathabatha, Ms Noluvuyo Dudumashe, Dr Chiedza Musekiwa, Ms Marcelene Voigt, Dr Taufeeq Dhansay, Mr Conrad Groenewald. Bottom, from left: Dr Thakane Ntholi and Ms Mahlatse Mononela.

The Colloquium of African Geology (CAG) is a major biennial meeting organised under the auspices of the Geological Society of Africa (GSAf). Earth scientists from around the globe have the opportunity, at the colloquium, to present their research on topics of African geology to an international forum of their peers. The event also offers geoscientists the opportunity to initiate, develop and implement projects to promote interaction between academia, industry and society. CAG29 was held in Windhoek, Namibia, from 26–29 September 2023. The inspiring theme for the conference was “The earth sciences and Africa’s development: current realities, future projections”. Senior and early-career earth scientists from government, various geological surveys, mineral exploration and mining companies and civil society, as well as politicians and media representatives attended the event. Over three hundred presentations, posters, plenary and keynote lectures and panel discussions were given by local and international experts over four days. Field trips and short courses were held before and after the scientific programme of oral and poster sessions. The scientific programme ended with a tour of the geological museum.

Tour of the Geological Museum at the Geological Survey of Namibia held on 29 September 2023.

The CGS was represented by eleven of its scientists. The following abstracts were submitted to the conference.

Presented by:	Abstract title:
Robert Thomas	• Geological evolution of northern Malawi: the final piece of the Ubendian jigsaw.
Debbie Claassen	• An integrated approach to Quaternary palaeoshoreline correlation along the southwest coast of South Africa — implications for neotectonics.
Yasmeen Fortune	• Structural tectonic evolution of the Buffels River shear zone, Namaqua Sector, Namaqualand-Natal Metamorphic Province, South Africa.
Chiedza Musekiwa	• Multispectral and hyperspectral remote sensing for geology mapping: Namaqualand region, South Africa.
Conrad Groenewald	• The long-lived ductile to brittle evolution of the Marshall Rocks — Pofadder Shear Zone during the final stages of the 1.2–0.96 Ma Namaqua Orogeny, Namaqua Metamorphic Province, Namibia and South Africa.
Shane Doggart	• Geochemical and isotopic zonation of the Orange River Pegmatite Belt in southwestern Africa — links to magmatic-hydrothermal events during the late Stenian–Tonian Rodinian assembly of the Namaqua Metamorphic Province. • How geoscience mapping and research in the Orange River Pegmatite Belt provide valuable insights into critical metal mineralisation within the pegmatites of the Namaqua-Natal Metamorphic Province. • The oldest rocks in Namibia: Archaean crustal fragments in the 1.9 Ga Richtersveld magmatic arc, northwestern Namaqua-Natal Metamorphic Province.
Marcelene Voigt	• Pb-Cu-Zn mineral potential of the Namaqualand Province, South Africa.
Hakundwi Mandende	• Integrated multidisciplinary geoscience mapping of polymetallic Sn-W-Be-REE-F mineralisation in the Namaqua-Natal Metamorphic Province, Northern Cape (South Africa).
Melvin Sethobya	• Hydrogeophysical investigations and mapping of ingress channels along the Blesbokspruit in the East Rand basin of the Witwatersrand, South Africa.
Noluvuyo Dudumashe	• Remote sensing application on mineralisation associated with Cu-Pb-Zn deposits in Pofadder, Northern Cape, South Africa.

Presented by:	Abstract title:
Thomas Muedi	• Assessment of the basalt fibre composite materials potential in South Africa.
Haajierah Mosavel	• Uranium detection in the Beaufort West area, South Africa using remote sensing techniques. • A three-dimensional geological model of the Main Karoo Basin of southern South Africa.

Erythrosuchus africanus (230 million years). This magnificent jaw and skull was found by geologist Thomas Loffler in the bed of the Omingonde River. *Erythrosuchus* is a thecodont, from a group of reptiles of the Triassic Period that gave rise to crocodiles and dinosaurs.

CGS exhibition booth at CAG29. Left to right: Mr Shane Doggart, Dr Haajierah Mosavel, CGS CEO Mr Mosa Mabuza, Dr Chiedza Musekiwa, and Mr Conrad Groenewald.

The hosting of the colloquium in Namibia coincided with the handover of products resulting from the CGS and the Geological Survey of Namibia's collaborative effort in mapping southern Namibia. The Namibia programme started in 2013 and is planned to finish at the end of the current financial year. The respective geological surveys considered the colloquium an ideal opportunity to showcase the southern Namibia geoscience mapping programme as a "Special Session" under the theme of geoscience diplomacy.

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World Conference on Climate Change and Sustainability: Rome, Italy

The World Conference on Climate Change and Sustainability (Climate Week 2023) is an annual event where scientists, business experts, government professionals, and stakeholders across various sectors discuss diverse facets of climate change and their relationship to sustainability and global warming. During this week, several stakeholders are provided with a platform to have in-depth discussions on climate and sustainability in a stimulating environment that produces innovative ideas and clear pathways towards their implementation.

The conference took place from 16–18 October 2023 in Rome, Italy. Two delegates from the CGS, namely, Dr Viswanath Vadapalli and Ms Sisanda Gcasamba, attended the conference held under the theme "Advancing Nature and Positive Solutions for Net Zero and Sustainable Future". The conference offered eleven sessions, including three keynote presentations and one poster session. In all the sessions, the focus of the presentations was climate change. Scientists and

government officials across the world showcased world-leading research and innovative techniques for the management of the major causes of climate change as well as developments in policy and regulation.

The CGS showcased its research work on the assessment of the feasibility of alkaline waste beneficiation, particularly construction and demolition waste (C&DW) in mineral carbonation as an attempt to reduce CO_2 emissions from the construction industry. This research work is a collaboration between the Japan Science and Technology Agency (JST), the Japan International Co-operation Agency (JICA); Tohoku University, Japan; the Department of Science and Innovation (DSI); and various institutions of higher learning.

During the conference, Dr Viswanath Vadapalli gave an oral presentation on a literature review titled "Mineral carbonation using construction and demolition waste to reduce carbon dioxide emissions with a focus on South Africa". In the presentation, an overview of the CO_2 emissions from the construction industry was provided together with a step-by-step approach for the carbonation process of C&DW. Based on the literature review and preliminary experimental results from the mineral carbonation of South Africa's C&DW, there is a potential to capture 116 955.85 tonnage of CO_2 (3.08%) from the available waste. While this research is still in its infancy, based on similar research done in other parts of the world, the CGS and its partners on the project are on the right track although more research, particularly on the economic viability of the technology is required. Overall, the presentation received positive feedback which will be considered over the course of the project.

Apart from the presentation by Dr Vadapalli, Ms Gcasamba chaired a poster session featuring presentations mostly from students representing various universities and research institutions across the world. During this session, the impact of industry and various anthropogenic sources such as aerosols and microplastics on global

Ms Sisanda Gcasamba and Dr Viswanath Vadapalli at Climate Week.

Dr Viswanath Vadapalli delivering a presentation on CO_2 capture and sequestration.

Ms Sisanda Gcasamba moderating a poster session.

climate change was discussed and mitigation measures were proposed.

The key message from the discussions held during the conference is that climate change is the greatest challenge of our time: a cross-cutting, multidimensional threat that requires a multilevel government response and participation from all affected stakeholders. Coming back from Climate Week 2023 it is clear that the following are key to our response to climate change:

- Multilevel government participation
- Establishment of an interface between policy and research
- Prioritisation of small-scale greenhouse gas emitters (this is the work that the CGS is currently doing)
- A move from carbon emission estimations to reporting on measured emissions.

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CGS delegates attend the Next Generation Tailings — Opportunity or Risk? conference

The Southern African Institute of Mining and Metallurgy (SAIMM) hosted its third conference around the topic of mine tailings, titled “Next Generation Tailings – Opportunity Or Risk?” at Emperor’s Palace, Johannesburg, South Africa, from 24 to 25 October 2023. The conference was attended by 160 delegates from government, universities, industry, science councils and consulting agencies. As a continuation of the previous year's conference discussions, the conference commenced with a panel discussion focussed on the roll out of the Global Industry Standard on Tailings Management (GISTM) within the Southern African mining industry.

The GISTM, which was developed in response to a series of tailings dam failures worldwide, provides an international framework for best practices and guidelines for safe and responsible tailings management in the mining industry. South Africa is updating its legislation and regulations on tailings management, particularly by drafting a

South African National Standard (SANS) 10286, based on the ISO management principles and provides a good base for tailings management. The session was followed by a wide variety of topics relating to tailings storage facility design and operations with regard to the modelling of tailings dams and legacy tailings dams. Specific emphasis was placed on slope stability, water seepage, stress analysis and engineering processes in the life cycle of a tailings storage facility. The second day of the conference focussed on three main themes: (1) the environmental impacts of tailings, (2) tailings as a resource and (3) the management and application of technology at tailings storage facilities.

Of note is that the industry recognises the potential for the valorisation of mining residues and this provides an opportunity for mining residues to be considered as materials which can be transformed or repurposed to create value. This could potentially lead to more research and development opportunities aimed at finding innovative and sustainable ways to recover valuable and critical metals and minerals with a view to reducing the volumes of tailings storage facilities and decreasing the environmental and social impacts associated with managing these wastes.

Dr Frederic Doucet and Ms Sameera Mohamed at the conference.

The session titled “Tailings as a resource” featured two oral presentations by CGS scientists of the Water and Environment unit (Dr Doucet and Ms Mohamed). Two additional presentations co-authored by Dr Doucet were also featured. Dr Doucet presented his perspective on the use of mine tailings in fly ash-based geopolymers in the South African context, highlighting the potential environmental, economic, and material benefits of the use of mine tailings for the production of geopolymers, as well as the associated challenges. Ms Mohamed delivered a presentation titled “Synthesis of silica nanoparticles from mine residues from the South African Bushveld Igneous Complex”. This research forms part of her PhD studies under the co-supervision of Dr Doucet (CGS) and Prof. van der Merwe (University of Pretoria). Both presentations received valuable feedback, which will contribute to the improvement of these ongoing projects. The two additional presentations co-authored by Dr Doucet were presented by postgraduate students from the University of Pretoria. These were titled “Production of silica and alumina nanoparticles from South African coal fly ash” and “Thermochemical treatment as a promising process for the valorisation of diamond mine residues”.

The conference provided an excellent platform for discussing issues and possible solutions related to tailings management and valorisation. It also created opportunities for possible collaborations in the future.

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WP-E geohazard and environmental management of mines training, conducted by PanAfGeo in Kigali, Rwanda

Pan-African Support to the EuroGeoSurveys and Organisation of African Geological Surveys (EGS-OAGS) Partnership (PanAfGeo), is a project that supports the training of geoscientific staff from African Geological Surveys through the development of an innovative training programme including the acquisition and development of important professional skills to complement scientists’ technical capabilities and qualifications. The training programme is implemented by world-class geoscientific experts both from African and European Geological Surveys.

Delegates attending WP-E geohazard and environmental management of mines training in Kigali, Rwanda.

Mr Jefferson Chea (Liberia), Mr Serge Magisha (Rwanda), Ms Duska Rakavec, Ms Joyce Shongwe (South Africa), Ms Urnice Petiho (Cameroon), Ms Sisanda Gcasamba (South Africa), Ms Nqobile Mankayi (South Africa), Mr Yacob Ghebreweldi (Eritrea), Mr Francesco Traversa, and Mr Giuseppe Delmonaco, representing PanAfGeo at the Rutongo mine.

Ms Nqobile Mankayi measuring the in situ uniaxial compressive strength of competent rock mass using a Schmidt hammer during a field excursion to the Gatumba Quarry.

CGS delegates at the PanAfGeo Training in Rwanda. From the left: Ms Sisanda Gcasamba, Dr Diop Suleyman, Ms Nqobile Mankayi and Ms Joyce Shongwe.

Ms Joyce Shongwe taking measurements of the joint roughness coefficient using a profilometer (Burton comb) during a field excursion to the Gatumba Quarry.

Training on the WP-E geohazard and environmental management of mines was conducted from 19-25 November 2023. The training was jointly organised by PanAfGeo and the Rwanda Mines Petroleum and Gas Board (RMB).

The training brought together professionals from a total of 20 countries (14 African and 6 European). The aim of the course was to convene scientists from various African geological surveys for theoretical and practical sessions on the assessment, monitoring, and prevention or mitigation of geohazards (natural and anthropogenic). The training offered a total of seventeen sessions with a broad discussion on mining-related geohazards, post-mining land use and management, and valorisation of mineral waste. Two fieldwork excursions and practical exercises were also conducted. Trainers were specialists from the Geological Surveys of Italy, Lithuania, Poland, Slovenia, Gabon and South Africa.

During the opening session, the Deputy CEO of RMB, Mr Ivan Twagirashema highlighted the crisis of geohazards in

Rwanda, expressed the hope for training to bring the African countries together in finding solutions and ways of preventing/mitigating the results of such hazards.

Delegates were taken on a five stop field trip (Kigali – Rambura), although only four stops (up until Jomba) were completed due to time constrains. The first stop was made at Gatumba Quarry where field exercises on geomechanical methods for the classification of rock masses to assess the stability of exposed slopes were demonstrated. Each delegate was given a helmet and a survey data sheet to record data during the exercise. A structural compass was used to measure the orientation of discontinuities and slope, a Schmidt hammer was used to assess the in situ uniaxial compressive strength of competent rock mass, and a profilometer (Burton comb) assessed the joint roughness coefficient. During the field assessment four sets of joints were identified, and measurements were recorded. Assessment of other relevant parameters which characterise discontinuities such as spacing, persistence, opening, presence and type of filling, weathering and the presence of water/humidity was done.

The second stop was at Muhororo where a landslide had occurred in February 2023, damaging a road. The site has since been cleared and a gravity retaining wall built.

The third stop was at Hindiro where a large landslide had occurred in 2020. It was evident after the event through research that this event was not sudden, but it had started around 2006 until a complete failure occurred in 2020. During the site visit it was outlined that the complexity of such phenomena needs multidisciplinary scientific research and various methods to fully understand the origin, trigger and evolution of the event. This also amplified the importance of constant monitoring for early landslide detection and mitigation.

The fourth stop was at Jomba where a road had collapsed, and gabions had since been placed in the immediate area of the bridge to prevent further damage to the existing infrastructure. The landslide is thought to have been triggered by constant rainfall which had eventually led to the flooding of this river, causing erosion of the riverbank.

Delegates also visited Rutongo Mine which is part of Trinity Metals. Three independent mines (Rutongo, Nyakabingo, and Musha) had formed a coalition and became Trinity Metals. After induction and safety briefings, the delegates were divided into two groups. One group went into the underground workings and the other was taken to the processing plant onsite. The mine is exploiting cassiterite (SnO_2) hosted within mineralised quartz veins. Using gravity separation, the ore is transported to the processing plant that consists of shaking tables, jigs and classifiers, for initial processing. There is no evident environmental pollution onsite as the mine does not use chemicals — only water is used for processing. Groundwater is channeled out of the mine through trenches from the horizontal shaft.

During the training the following steps were identified as important when dealing with geohazards:

- Identify – Learning and exchanging information and knowledge
- Monitor – Creating networks
- Mitigate – Initiating research and inventories of geohazards
- Avoid – Learning best practices for the environmental management of mines.

The field data collection and analysis were followed by a desk analysis. The rock mass rating results showed that the Gatumba Quarry is unstable and subject to potential slope failure. It was suggested that the site will need shotcrete and bolts for reinforcement of the slope face in case of excavation.

Unlike South Africa, most of the geo-environmental problems experienced in Rwanda are limited to ground instability, thus most discussions were about the best practices for managing ground instability in the region. Other impacts such as water, air, and soil pollution presented were based on case studies from Europe. Ms Duska Rokavec and Ms Petra Gostincar presented some of the best practices for mine closure in Slovenia. The importance of postmining land use was emphasised in achieving sustainable mine closure. Mine closure should not be seen as the last step in mining, but, rather, plans for mine closure should be incorporated into the overall mine plans in order to avoid issues related to the abandonment of mines and the cumulative/residual impacts of mine closure.

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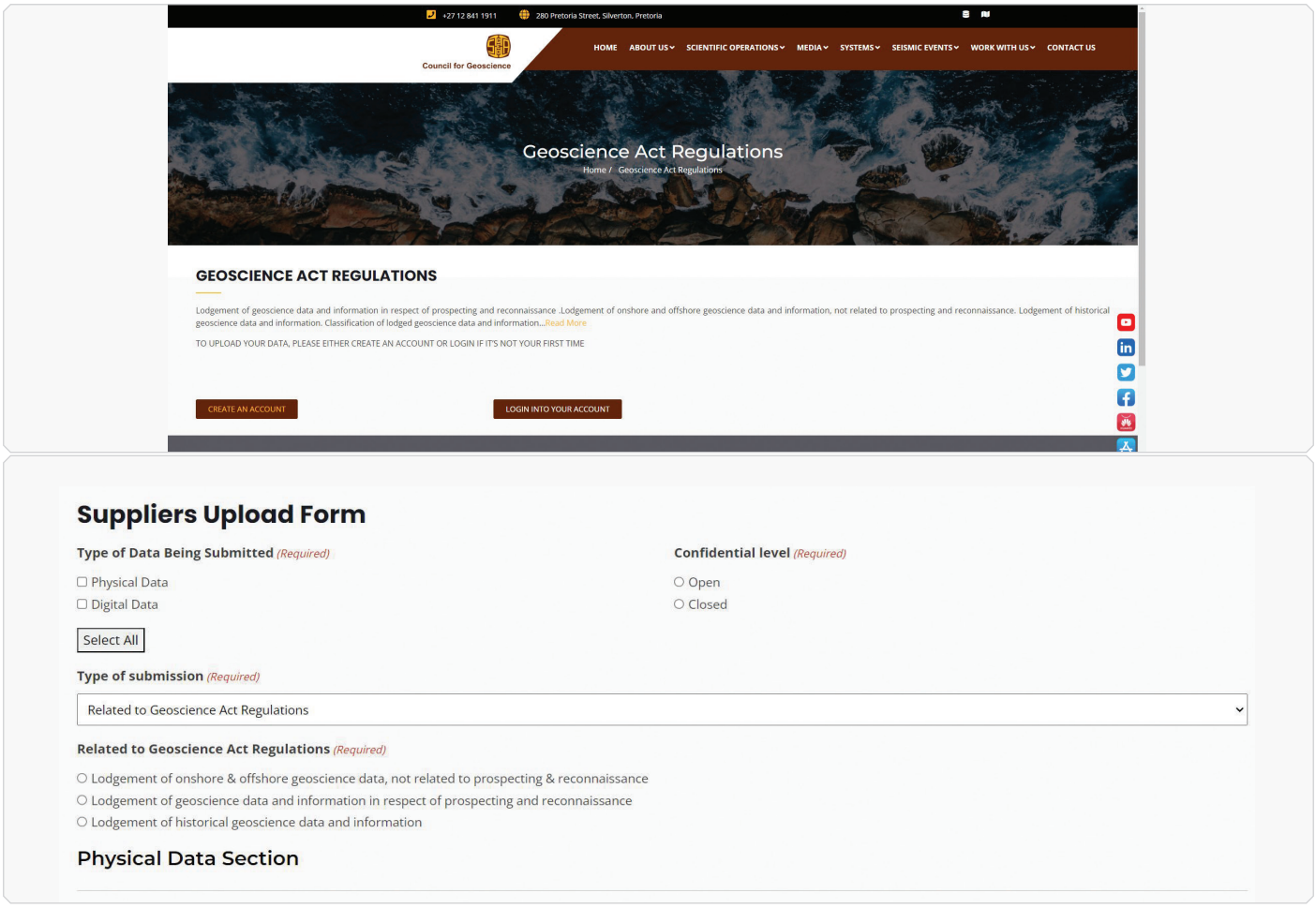
The front-end portal (Phase 1) on the CGS website for the lodgment of data and information from external stakeholders

The CGS, as inscribed in the Geoscience Act 100 of 1993 (amended), is mandated to serve as the national custodian and curator of all onshore and offshore geoscience data and information in South Africa. In terms of Section 25 of the Act,



The front-end portal of the Geoscience Act Regulations website landing page for the upload and lodging of digital and physical data and information.

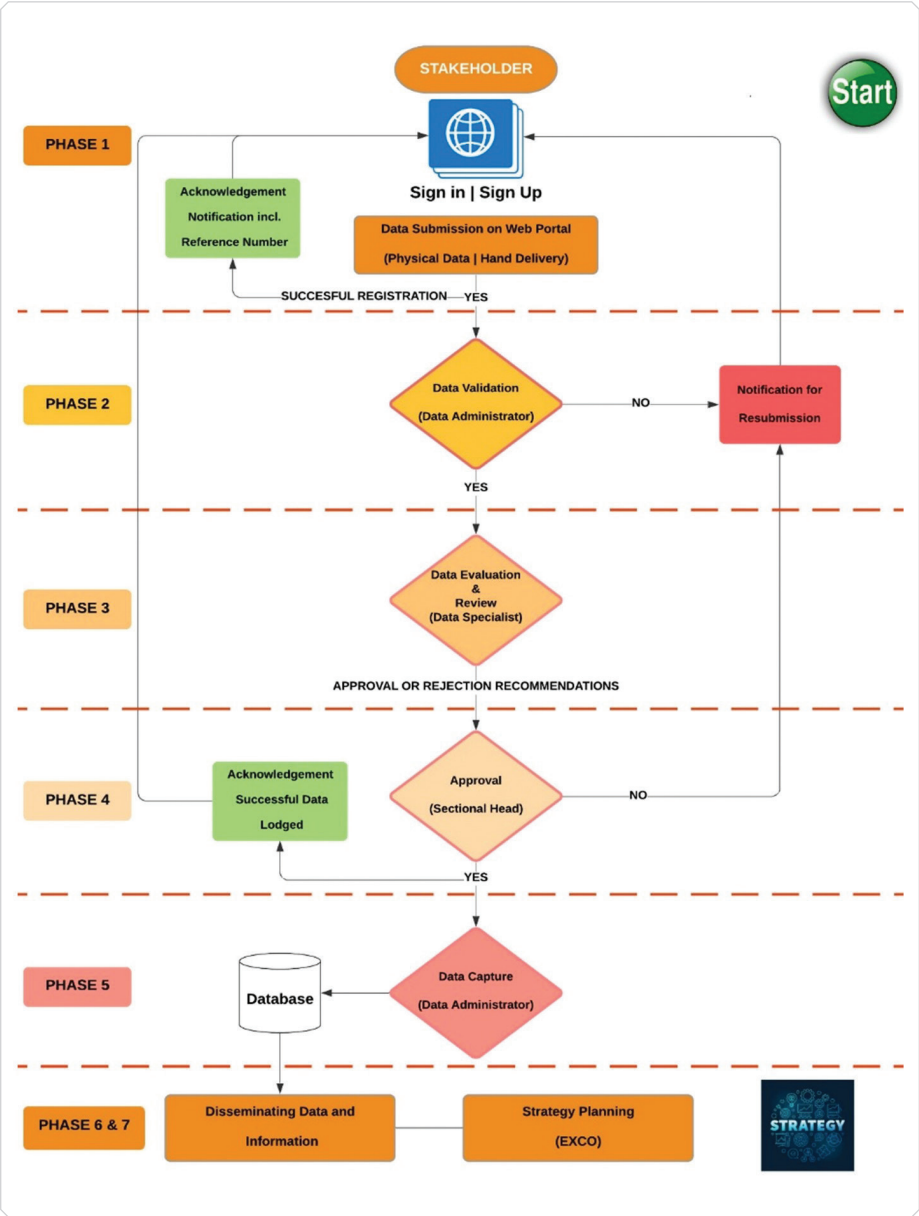
the CGS is required to publish regulations which outline the procedures to prescribe how the provisions of the Act will be applied. The Department of Mineral Resources and Energy drafted and gazetted the Geoscience Act Regulations on 10 March 2021 in preparation for the consultation process. This process involved public and private companies, government entities, academic institutions, and the general public. Following stakeholder consultations and incorporating the information received, the final Geoscience Act Regulations were promulgated on 30 March 2022.

In Quarter 4 of the 2021/2022 and 2022/2023 fiscal years (FY), as part of the preparation for the implementation of the Geoscience Act Regulations (lodgment of information and data), the CGS developed processes for the lodgment, processing and storage of mainly geotechnical and prospecting data and information from external stakeholders.

In terms of Section 2 of the Geoscience Act Regulations, the lodgment of geoscientific data includes onshore and offshore geoscientific data and information, including historical data that is not related to prospecting and/or reconnaissance. Such information must be submitted to the CGS in terms of the Geoscience Act Regulations. Lodgments must be in the prescribed format, as indicated in Annexure B of the Regulations. Geoscientific data and information holders are encouraged to submit the data in digital format with the accompanying minimum metadata through the front-end portal, accessible on the CGS main webpage https://www.geoscience.org.za/cgs/systems/publications/geoscience-act-regulations/. The frond-end portal will allow a company's representatives to register the details of the entity on the portal. The portal will send a confirmation email to the lodger to set login credentials. Once the stakeholder has registered, they can login and fill in the supplier's upload form. The portal facilitates both physical and digital submissions. Therefore, stakeholders wishing to lodge physical material are encouraged to register and provide details regarding the physical address for physical material submissions or data collection through the portal.

The CGS Data and Information Policy guides the receipt of data and information, entailing, among other principles, the confidentiality of data and information. The receipt of data adheres to Section 2 of the Geoscience Act Regulations, governing the classification of lodged geoscience data and information, as stipulated:

(1) Any geoscience data and information received by the CGS from the Department of Mineral Resources and Energy in terms of an active prospecting right and reconnaissance permit will be treated as confidential until such time that the prospecting



Process flow from Phase 1 (lodging of geoscientific data) to Phases 2 - 7 (data validation, evaluation, review, acceptance/rejection, and dissemination).

right or reconnaissance permit has lapsed or been abandoned.

(2) All geoscience data and information not related to prospecting and reconnaissance including historical data lodged with the Council for Geoscience will be treated as confidential, unless:

a. Confirmation allowing third-party access to the geoscience data is obtained in writing by the Council for Geoscience from the owner.

b. The lodgment is accompanied by a written condition stipulating the duration of the confidentiality arrangement.

c. The lodged geoscience data and information are older than 15 years.

(3) All notifications and arrangements must be marked for the attention of the Chief Executive Officer of the Council for Geoscience.

(Geoscience Act Regulations, 2022)

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