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The development of the back-end solution (phase 2-7) for the internal processing of geoscientific data and information received by the Council for Geoscience



Figure 1: Key milestone timeline depicting the journey the CGS has followed in the development of the Geoscience Regulation portal solution.

There are large volumes of geoscience data and information generated in South Africa every year. Moreover, there are vast amounts of historical data that has been collected throughout the genesis of studying South Africa's geology and developing the mining industry. This is underpinned by the vast and well-preserved geology of South Africa in the form of cratons, metamorphic complexes, greenstone belts, large impact craters as well as orogenic belts. Knowledge gathered from

geological investigations through time have contributed towards shaping past, present and future key industries such as mining, construction, agriculture, and trade in South Africa.

Geological datasets are often under threat due to losses of geological records caused by the abandonment of prospecting sites, mine and mining company closures, and disseminated and unknown data. This translates to a loss in South Africa's geoscientific

value. The preservation and proper collation of geoscience data and information are critical not only for maintaining the integrity of geoscientific samples, but in also protecting the rich geological heritage of the country. The collection and curation of geoscience data also enables ease of access to data to all stakeholders. The re-use and re-analysis of past datasets using modern technologies may unearth new discoveries and geological information which was previously unidentified.

In considering the significant investment and value borne by the collected geological datasets, the Council for Geoscience (CGS), as inscribed in the Geoscience Act 100 of 1993, as amended, is to serve as the national custodian and curator of all onshore and offshore geoscience data and information in South Africa. The promulgated Geoscience Act Regulations (2022) provides for the mechanisms of receiving such data as well as outline the minimum requirements and format in which geoscientific data and information must be submitted to the CGS.

Over the past year, the CGS undertook to establish an innovative and simplistic mechanism for the implementation of the Regulations. This entailed (1) the development of a front-end portal for the lodgement of geoscientific datasets launched in July 2023 and (2) the development of a back-end portal for the internal processing of submissions received. The development of the latter was officially completed in March 2024. The CGS in partnership with ERSI South Africa has developed a back-end solution for the archiving, internal processing, and management of geoscience data and information received from stakeholders. This solution allows for a simplistic and efficient manner of checking whether the critical metadata and supporting information are provided as required by law. The back-end portal is a web-based solution which will be accessed by CGS's internal users using the CGS intranet and login credentials. The solution also supports web browsers such as Google Chrome, Firefox, and Microsoft Edge.

The project scope of work and functionalities entails the development

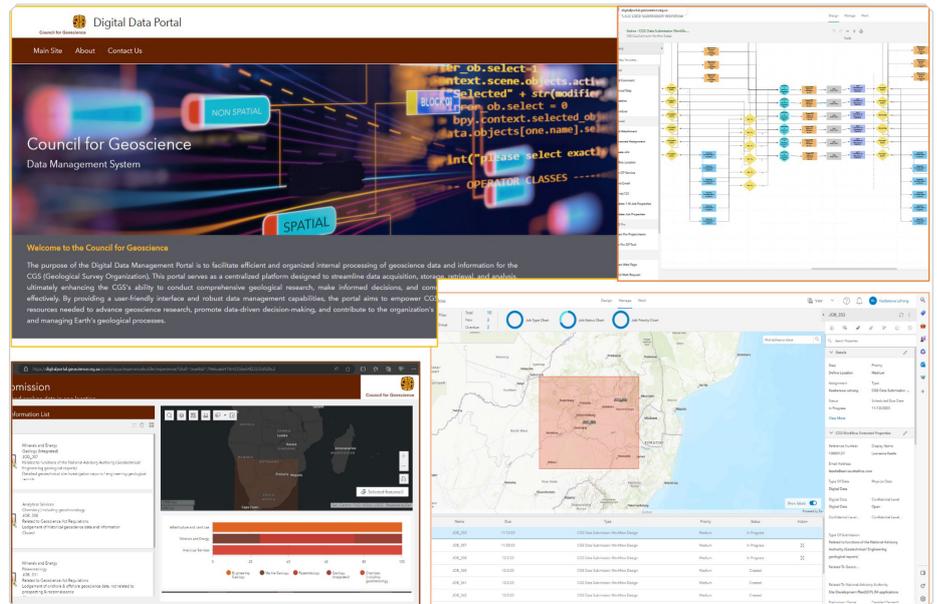


Figure 2: Snippets derived from the back-end portal for the internal processing of geoscientific data and information received from stakeholders.



Figure 3: Some of the members of the project team composed of the CGS and ERSI South Africa technical resources. **From left:** Ms. Unathi Nondula, Ms. Keabetswe Lehong, Mr. Lawrence Keefe, Ms. Ida Krugel, Ms. Nthabiseng Mashele, Mr. Sibongiseni Hlatshwayo and Mr. Khuliso Nedzingahe.

of a new system that enables CGS end-users easy and quick access to the submitted data and information, making it retrievable, interactive, and usable on various platforms. This data and information are to be accessed and stored in a centralized repository with the required backup facility (CGS Servers). This is a back-end plugin for the live Geoscience Act Regulations Portal and is enabled for the pulling

of metadata, spatial and non-spatial data, and information into the CGS internal processing and archiving. The data will be redirected to the relevant business units based on the applicable geoscientific category. What remains of great importance to the organisation is the continued security and confidentiality of the data and thus strict measures have been put in place in the application to avoid any breaches.

Some of the key features of the solution includes the delineation of the study site over the ArcGIS Pro application, survey forms for validation, and evaluation forms for the Geoscientific Reviewer and Geoscientific Specialist. The platform also allows for the development of reports for each stage of processing, with the final approval or rejection letter to the data submitter readied for final sign-off by the relevant manager.

The solution also has a dashboard incorporated which provides for easy tracking and management of submissions for easy monitoring and search for identified data submissions. The development of the solution holds great promise in putting the CGS in par with other geological surveys of the world in contributing towards the safe keeping and credibility of the geological record of South Africa.

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CGS Jets off to Iceland and UK for a CCUS Study Tour

The Council for Geoscience (CGS) conducted a study tour to Iceland and the United Kingdom (UK) to explore various Carbon Capture, Utilisation, and Storage (CCUS) technologies. This study tour formed part of the many activities of the CCUS programme that is funded by the World Bank. Dr T. Khumalo, the Executive in the Office of the CEO, led the CGS team, accompanied by several key stakeholders, including Govan Mbeki Municipality, Exxaro, Sasol, and ArcelorMittal. These stakeholders have a high carbon footprint and are impacted by South Africa's Just Transition aspirations. They would benefit significantly from CCUS technologies, which are a direct carbon reduction intervention. The inclusion of these stakeholders will help to gain industry, local government, and community buy-in and support for the country's CCUS endeavors. The CGS team consisted of Dr. T. Dhansay, Mr. N. Nxokwana, Mr. M. Ngcobo, Ms. P. Mulyangane, Ms. Z Sibewu, and Ms. V Nengovhela. The study tour took place from 19-23 February 2024, with the primary objective of gaining insight into the modalities associated with developing and implementing CCUS technologies in South Africa.

Tour of the Carbfix plant

The tour started at the Carbfix carbon sequestration and geothermal plant located outside Reykjavik in Iceland. It is situated on the Hengill volcano and uses the water beneath it to power six



Figure 1: a) A group photo of the CGS and Carbfix delegation at Carbfix, Iceland, (b) CGS and Carbfix delegation having discussions, (c) Eye-catching outside view of the design of the injection plant at Carbfix, and (d) Mr N. Nxokwana inspecting the inside system of the injection plant.

turbines that generate electricity and heat for the capital city. Some CO₂, however, is released during the process, and to counteract this, the CO₂ is captured and mixed with water. The CO₂ is then injected into porous basalts at a depth of 300-350m, where it turns into stable carbonate minerals. This provides safe and permanent carbon storage. The project is continuously monitored and evaluated through high-resolution seismic and geophysical surveys and regular geological exploration. Mineralogical and petrographic investigations confirm the immobility of

carbon dioxide, which is mineralized as various carbonate minerals in rock pore spaces.

Net Zero Technology Centre (NZTC)

The team met with the representatives of NZTC, a Scottish company that has a pilot plant located in Larne, Northern Ireland. NZTC specializes in carbon nexus, which connects high-carbon industries, carbon utilization markets, and sequestration spaces. In collaboration with CO₂Circular and B9 energy, they have developed the

SMART-Direct Air Capture technology. SMART-DAC is a two-step process that captures and separates CO₂ from the air. In the first step, membrane gas absorption, an alkaline solution absorbs CO₂ from the air as it passes through the membrane. In the second step, the absorbent is regenerated by membrane electrolysis, recycling the CO₂-saturated alkaline solution back into absorbent liquid and separating the concentrated CO₂, creating a continuous absorption cycle. The captured CO₂ can be used as a carbon source for sustainable chemicals, materials, or synthetic fuels. SMART-DAC technology is an ideal solution for small, medium, or large industrial sites looking to reduce their carbon emissions or for industries looking to utilize the captured CO₂.

Lessons learned.

During the study tour, the CGS team gained valuable insights into the processes, challenges, and future opportunities of the sector. The results observed by Carbfix are particularly relevant to South Africa, as they confirm the technical feasibility of this technology in a South African context. Despite the seemingly less ideal geological conditions in South Africa, mainly that South African basalts targeted for CO₂ injection are much older and therefore considered less permeable, compared to Iceland, the socioeconomic and environmental conditions in South Africa are arguably better suited for the implementation of this technology. To ensure successful implementation in South Africa, the focus will need to be on enhancing the flow and exposure of injected carbon dioxide into the targeted reservoir, a key aspect of the

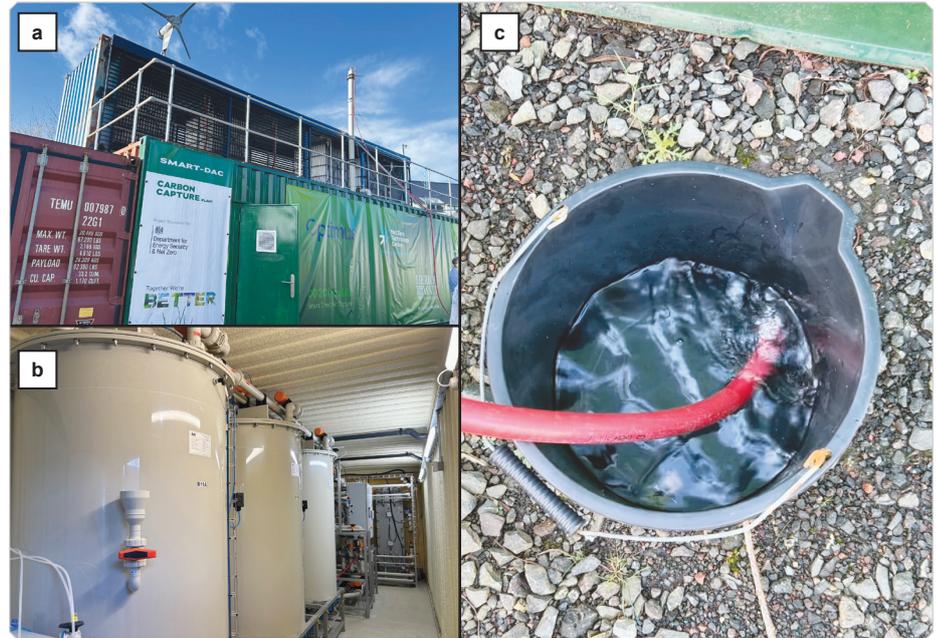


Figure 2: (a) SMART-DAC Circular carbon capture pilot plant system in Larne, Northern Ireland, (b) Circular carbon capture system pumps and tanks, (c) The resultant bubbling captured CO₂.

construction and well design phase. It's worth noting that the injection process does not require clean water, and wastewater can be used instead. In the context of South Africa's Leandra pilot site, the abundant mine water from surrounding coal and gold mines can provide a reliable source of water. This project is an effective solution to tackle environmental challenges associated with mine water in the area, and financial incentives are crucial to its success. Carbfix's economic viability is supported by strong factors, including (1) the utilization of existing infrastructure at the geothermal plant, (2) carbon trading agreements with major greenhouse gas emitters in the European Union, and (3) the significant advantage of owning an IP for basaltic injection. For South Africa to successfully implement and

deploy Carbon Capture, Utilization, and Storage (CCUS) technologies, it needs to introduce a legislative and regulatory framework specifically directed towards CCUS implementation. The government should consider providing grants and subsidies to support the net-zero transition of CCUS.

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JOGMEC 15th anniversary celebrations in Gaborone, Botswana workshop, 27 - 30 November 2023

Since 2009, the Japan Organization for Metals and Energy Security (JOGMEC) Botswana Geologic Remote Sensing Centre and the Botswana Geoscience

Institute (BGI) have jointly held the JOGMEC events for the Southern African Development Community (SADC) countries. The JOGMEC

invited experts from each country to Botswana, Gaborone for the event to be held locally (the Seminar was also streamed online).

The Council for Geoscience (CGS) team was invited to participate in the event and consisted of two experts to attend the workshop and two experts to participate in the competitions. The central theme of the training was satellite image analysis and field data integration using QGIS, a geographic information software system.

The seminar consisted of technical talks on satellite image analysis, introduction of JOGMEC projects within SADC countries, a short speech by experts from SADC countries regarding achievement of activities with JOGMEC, an award ceremony, and presentation of the competition, and certification of new remote sensing instructors.

The table below shows the CGS participants.

Workshop
1. Ms Samukelisiwe Mtshali
2. Ms Nangamso Dunga
JOGMEG Competition
1. Dr Thomas Muedi
2. Ms Vhuhwavhohau Nengovhela
Online participants
1. Ms Ndivhuwo Mukosi
2. Ms Zininzi Phikiso
3. Mr Mzoli Breakfast
4. Ms Mihali Hobo
5. Ms Lebogang Nhleko
6. Ms Waheibah Daniels
7. Mr Shane Daggart
8. Mr Mawande Ncume
9. Mr Hakundwi Mandende
10. Mr Jabu Mathebula
11. Mr Ayanda Lawu



Figure 1: The CGS team in Botswana, Gaborone, in November 2023. **From Left:** Ms Samukelisiwe Mtshali (CGS), Dr Thomas Muedi (CGS), Mr Yatsuka Sho (JOGMEC), Ms Nangamso Dunga (CGS) and Ms Vhuhwavhohau Nengovhela (CGS).



Figure 2: **Left:** The CGS team is attending the dinner at the Japanese ambassador's house. **Right:** The CGS team will be attending fieldwork after the remote sensing workshop for ground truthing.



Figure 3: **Left:** Dr Thomas Muedi sharing experiences between the CGS and JOGMEC for the past 15 years. **Right:** Ms Vhuhwavhohau presented the importance of using remote sensing for detailed map making and the prospect of mapping new mineral resources in South Africa.

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The Council for Geoscience attends GEO Week 2023 & Ministerial Summit

The Council for Geoscience (CGS) participated in the 2023 Group on Earth Observations (GEO) Week and Ministerial Summit, organized by the Department of Science and Innovation. The GEO summit was held in the Cape Town International Convention Centre (CTICC 2) in Cape Town from 6 to 10 November 2023 under the theme "The Earth is talking, and it is time we listen." The summit gathered people from 152 participating organizations and 115 members of states. The event offered a platform to exchange knowledge on Earth observation data and the potential applications of data from measuring instruments and remote-sensing satellites in addressing the challenges facing humanity through presentations, seminars, and panel discussions. Four days of GEO Week 2023 was followed by a closed one-day ministerial meeting.

The Earth is constantly communicating with humanity on the resources we depend on for life. The Earth communicates through various means: 1. Changes in biodiversity and plant life; 2. Soil productivity deterioration threatening food security; 3. Climate change i.e. rivers drying up and oceans rising.

One of the main topics of discussion at GEO Week was the catastrophic effects of climate change. These issues can be addressed using earth observation data on how the Earth is changing, which is more freely available now more than ever. The data is gathered by remote sensing technologies and provides information to enable monitoring of the atmosphere, oceans, and land surfaces of our planet. There is still however a challenge with the dissemination and use of the data, mainly being that a lot of people are unable to receive the data, and when they can, it is in a language that they do not understand.

GEO Week also aimed to showcase solutions, exhibit leadership, and foster collaborative action. The week began



Left photo: Ms. Sipehelele Gobeni (Executive Manager (left)), Ms. Noluvuyo Dudumashe (middle) and Dr. Chiedza Musekiwa (Minerals and Energy Unit (right)); *Right photo:* Ms. Mahlako Mathabatha (middle) (Marketing Officer: Communication & Stakeholder Relations) attended the GEO Week 2023 and Ministerial Summit held from 6 to 10 November in Cape Town.



with topical workshops and quick presentations, culminating in the GEO Ministerial Summit and ultimately the Ministerial Declaration. The event led to the adoption of the GEO Post-2025 Strategy: "Earth Intelligence for All". Some of the goals of the strategy include promoting open access to data and information, investing in activities to raise awareness of Earth observation, and increasing the participation of young people. The goal of GEO Week 2023 was to motivate for the provision of free, reliable data that can be understood by everyone to address the triple planetary crisis of pollution, biodiversity loss, and climate change. As a first step in giving young people a greater role, GEO Youth presented the first-ever GEO Youth Declaration.

The summit provided the CGS an opportunity to exhibit, engage with stakeholders, benchmark on technologies available in the market to combat climate change, and present the programmes that the CGS is undertaking in contributing towards climate change. The CGS delegation was led by Ms. Sipehelele Gobeni; Executive Manager: Geoscientific Services; and consisted of Dr. Chiedza Musekiwa, Chief Scientist; Minerals and Energy; Ms. Noluvuyo

Dudumashe, Junior Scientist, Minerals and Energy; Ms. Mahlatse Mononela; Manager: Communication & Stakeholder Relations, and Ms. Mahlako Mathabatha, Marketing Officer: Communication & Stakeholder Relations.



Right, Ms. Sipehelele Gobeni (Executive Manager of Geoscientific Services) having a radio interview with Radio 2000.

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Elevate Your GIS Skills with ArcGIS Pro Workshops!



The Knowledge Management Unit will be offering **ArcGIS Pro** workshops for all CGS employees throughout 2024. These workshops will vary in difficulty, offering something **GIS** for everyone from **beginners** to **advanced** users. They will include both **theory** and practical **exercises**, with the aim of making the sessions of each workshop as **interactive** and as **hands on as possible**.

The workshops will cover the following:

- Migrating from ArcMap to ArcGIS Pro (Import map documents)
- Introduction to ArcGIS Pro interface & navigation
- Creating and managing projects & maps
- Adding and symbolizing data layers using CGS stylesheet.
- Basic spatial analysis techniques (e.g., buffering, overlay)
- Working with attribute tables
- Layouts & map composition
- Advanced symbology and labeling techniques
- Georeferencing raster data
- Spatial analysis tools (e.g., spatial joins, proximity analysis)
- Geodatabase management & data organization (Getting started with the File Geodatabase (Convert Personal Geodatabase feature class and shapefiles to a File Geodatabase)
- Creating and Editing Features and Attributes
- Adding XY (lat & long data)
- Digitization
- Geographic Coordinates & Map Projections
- Coordinate Conversion (UTM to Lat & Long, DMS to DD & Converting DD to DMS)
- Geoprocessing Tools - (Basic – Advanced GPT uses)

Dates

An email will be circulated closer to the time with a link to a sign-up form.

22-24 May - Basic

24-26 July - Intermediate

11-13 September - Advanced

***Please note:** For specific topics or customisation requests, feel free to reach out to us directly. We're here to tailor the workshops to meet everyone's unique needs.*

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First Aid Level 1 Training at the CGS, Bellville Region

First Aid Level 1 Training was held at the Council for Geoscience (CGS), Bellville Regional Office from the 12 to 15 February 2024. Mr. Thulani Gili from IEFA (Institute of Emergency First Aiders) led the training which comprised of a theory and practical component.

IEFA was established in 1987 in response to a growing need for public education in emergency first aid procedures. IEFA's aim is to provide training and education in emergency First Aid according to the highest professional standards in the

belief that anyone who has this sound basic knowledge will be able to provide invaluable assistance to the Emergency Medical Services. More importantly, anyone with the training will be able to help reduce the mortality rate during the first critical minutes following an emergency. Knowing what to do will enable one to cope confidently and to

Mr. Azukile Mpahlwa, Thulani Gili, Dr. Haajierah Mosavel and Mr. Philile Diko "the patient"
Above image: Team applied the Emergency procedures due to a head injury that occurred.



effectively assist a person in distress. This is vital for CGS employees in case of an emergency, especially for staff doing fieldwork in remote areas as they can apply the required First Aid. The course consisted of a two full days workshop in which Mr. Gili gave formal instructions,

practical demonstrations, exercises, and assessment opportunities.

The practical exercise included the systematic approach in an emergency scene which included the following stages:

Hazards	Safety of the environment Rescuer: Wear gloves and CPR mouthpiece Check history, signs and symptoms.
Hello	Assess responsiveness. Observe breathing.
Help	If unresponsive and not breathing, call for EMS (Emergency Medical Services) and AED (Automated External Defibrillator) – 10177 / 112
Compress	Compress the chest deep and fast. 100/minute (almost 2 compressions per second) Adult, child, and infant: 30 compressions
Airway	Open airway. Head tilt – chin lift.
Breathe	Administer 2 effective breaths. Continue with 30:2 until EMS or AED arrive or signs of life are seen.
Defibrillate	When the AED arrives, switch on and attach the pads Follow the voice prompt instructions.
Trauma	Head to toe survey (send for ambulance) BLEEDING: Wear gloves, use direct pressure and elevation. Cover with a clean dressing. BROKEN BONES: Ambulance response time, do not move the fracture, stabilise joint above and below fracture. BURNS: Cool with water and cover with burn dressing.
Position & Cover	Recovery position and treat for shock. Maintain body temperature (blanket or rescue blanket) Nil per mouth (can wet lips) Reassure continually.
Monitor & Record	Monitor and record vital signs 1) Level of Consciousness (L.O.C) 2) Airway 3) Breathing 4) Skin colour 5) Skin temperature



Team 2: From left to right: Mrs. Nokuthula Booï, Ms. Lebogang Nhleko, Dr. Chiedza Musekiwa, Ms. Zinanzi Phikiso, Mr. Sashan Manikam, Mr. Edowe Domingo, Mr. Thandile Stafa, Mr. Wilhelm Van Zyl, Dr. Hayley Cawthra, Mr. Mveleli Sikade, Ms. Phakama Magele, Ms. Nompumelelo Yanta, Mr. Adrian Williams. (From the CGS). Front row: Philemon aka Mannequin and Mr. Thulani Gili (From IEFA)

Emphasis was given on CPR (Cardiopulmonary Resuscitation) which has been developed to help a casualty who has stopped breathing and / or whose heart has stopped beating. Cardiac arrest can suddenly happen as in a heart attack, or it can happen due to infective breathing or not breathing. IEFA CPR training complies with the guidelines released by the American Heart Association.

The course concluded with a formal learner assessment and certificates will be given on completion of the course and on successful examination results.

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