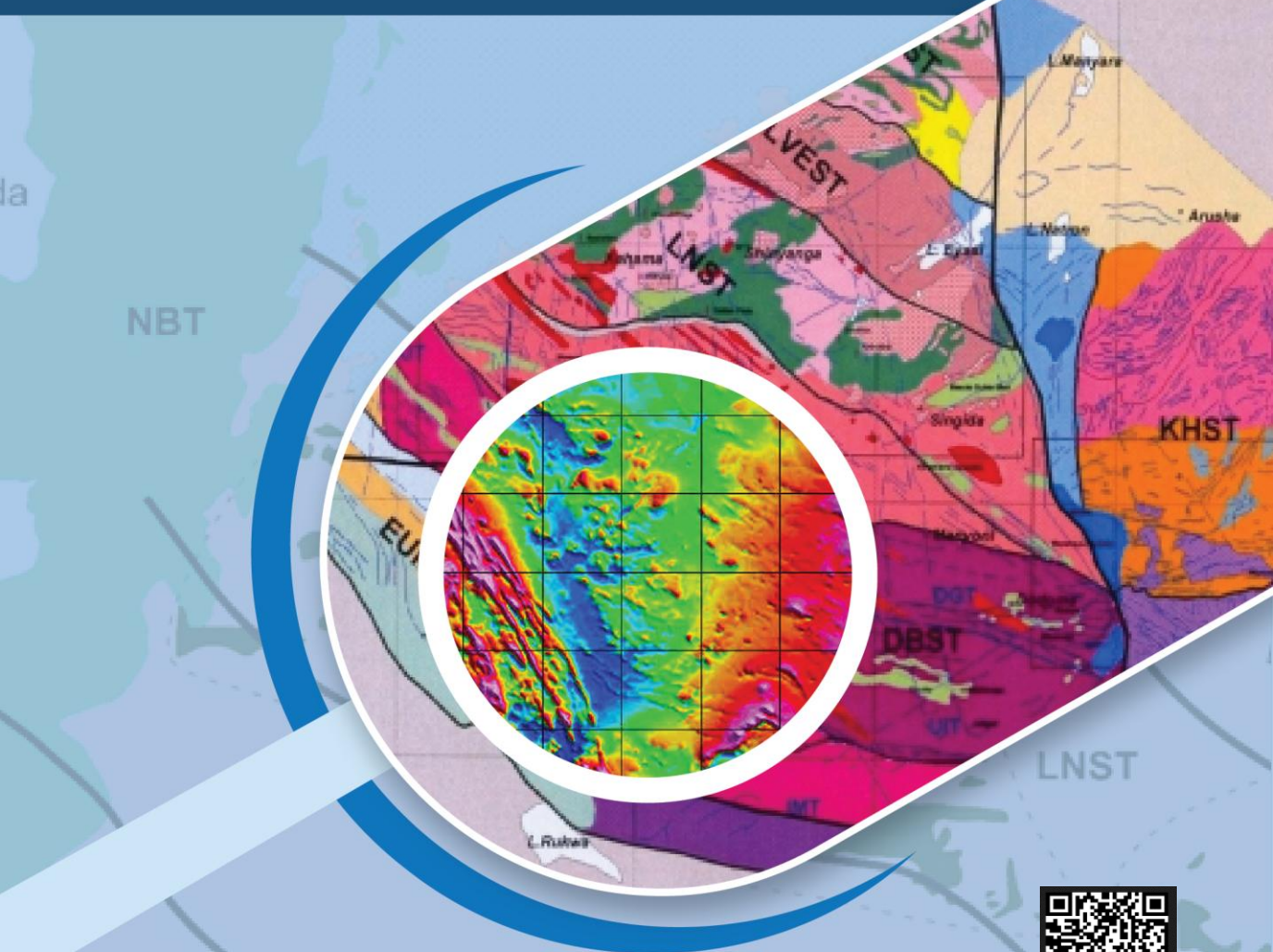




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THE UNITED REPUBLIC OF TANZANIA NATIONAL AUDIT OFFICE

PERFORMANCE AUDIT REPORT ON THE MANAGEMENT OF GEOSCIENTIFIC DATA IN THE MINING SECTOR



CONTROLLER AND AUDITOR GENERAL
MARCH 2025



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PREFACE



Pursuant to Section 28 of the Public Audit Act, Cap 418, I am mandated to conduct a Performance Audit (Value-for-Money Audit) to establish the economy, efficiency and effectiveness of any expenditure or use of resources in the Ministries, Departments and Agencies (MDAs), Local Government Authorities (LGAs) and Public Authorities and Other Bodies which involves enquiring, examining, investigating and reporting, as deemed necessary under the circumstances.

I have the honour to submit to Her Excellency, the President of the United Republic of Tanzania, Hon. Dr. Samia Suluhu Hassan, and through her to the National Assembly of the United Republic of Tanzania, the Performance Audit Report on the Management of Geoscientific Data in the Mining Sector.

The report contains findings, conclusions, and recommendations directed to the Ministry of Minerals and the Geological Survey (GST). These entities were given the opportunity to review the report and provide comments, and I sincerely acknowledge that their inputs were constructive and valuable.

My Office will carry out a follow-up audit at an appropriate time regarding action taken in implementing the recommendations given in this report.

I would like to extend my sincere gratitude and appreciation to the audited entities for their cooperation, which facilitated the timely completion of this audit. Finally, I commend the dedication and hard work of my staff in preparing this report.

A handwritten signature in blue ink, appearing to read 'Charles E. Kichere', with a large, sweeping flourish extending from the end of the signature.

Charles E. Kichere
Controller and Auditor General
The United Republic of Tanzania
March, 2025

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LIST OF ABBREVIATIONS AND ACRONYMS

ASM	:	Artisanal and Small-scale Mining
BGR	:	German Tanzania Gold Project
BHP	:	Broken Hill Proprietary Company
CGS	:	China Geological Survey
CM	:	Corrective Maintenance
FEMATA	:	Federation of Miners' Associations of Tanzania
FYDP	:	Five-Year Development Plan
GDP	:	Gross Domestic Product
GIS	:	Geographical Information System
GMIS	:	Geological and Mineral Information System
GPS	:	Global Positioning System
GST	:	Geological Survey of Tanzania
ICP-MS	:	Inductively Coupled Plasma Mass Spectrometry
ICT	:	Information, Communication and Technology
INTOSAI	:	International Organisation of Supreme Audit Institution
ISSAI	:	International Standards of Supreme Audit Institutions
JICA	:	Japan International Cooperation
KIGAM	:	Korea Institute of Geoscience and Mineral Resources
KOICA	:	Korea International Cooperation Agency
MoM	:	Ministry of Minerals
MoU	:	Memorandum of Understanding
MRH	:	Mineral Right Holder
NDF	:	Nordic Fund Development
NGOs	:	Non-Governmental Organisations
PMLs	:	Primary Mining Licences
PPM	:	Planned Preventive Maintenance
QDS	:	Quarter Degree Sheet
SAREC	:	Swedish Agency for Research Cooperation with Developing Countries
SIDA	:	Swedish International Development Cooperation
SMMRP	:	Sustainable and Management of Mineral Resources Projects
SSMs	:	Small-Scale Miners

STAMICO	:	State Mining Corporation
TCM	:	Tanzania Chamber of Mines
TCM	:	Tanzania Chamber of Mines
TEITI	:	Tanzania Extractive Industries Transparency Initiative
TGC	:	Tanzania Gemmological Centre
TZS	:	Tanzanian Shillings
UNDP	:	United Nations Development Project
XRD	:	X-Ray Diffraction
XRF	:	X-Ray Fluorescence

EXECUTIVE SUMMARY

Background Information

Geoscientific data are strategic tools for addressing future demands for mineral and energy resources. They provide critical information for industry, government, and community decision-makers, supporting natural resource management, policy formulation, environmental protection, public health and safety, and land-use planning.

In this regard, the Geological Survey of Tanzania highlights that geoscientific data, such as geological maps and geophysical and geochemical information, have limited coverage. In that case, high-resolution airborne geophysical surveys cover less than 20%, and high-density geochemical surveys cover less than 25% of the country's 322 Quarter-Degree Sheets.

The main objective of the audit was to evaluate whether the Ministry of Minerals and the Geological Survey of Tanzania effectively manages geoscientific data to ensure that it is accessible to both the public and the Government.

Main Audit Findings

The Five-Year Development Plan III (FYDP III) 2021/22-2025/26 set targets to enhance geoscientific data, including 20% coverage of high-resolution airborne geophysical surveys, 25% of geochemical surveys, 85% digitisation of geological maps and geoscientific information, and the publication of 20 research papers by 2025. By June 2024, geological surveys reached 97% coverage, while 35.09% remained unpublished. Geochemical surveys achieved 84% for low density and 23% for high density, while geophysical surveys had 100% low-resolution coverage and only 16% high-resolution coverage. It should be noted that, high-density and high-resolution data are essential for accurately evaluating mineral deposits and resources.

Despite these efforts, the Geological Survey of Tanzania (GST) has struggled to collect mineral data from Mineral Right Holders (MRH) as required by Rule 5(1) of the Mining (National Mineral Resources Data Bank) Rules, 2021. Report submissions remained significantly low, with only 7% submitted in 2021/22, 12% in 2022/23, and 11% in 2023/24, despite a significant annual

x

increase in MRH. This indicated a gap in managing geoscientific data, hindering progress toward achieving FYDP III targets. These challenges were attributed to various underlying factors, as detailed below:

(a) Inadequate Acquisition, Analysis and Interpretation of Geoscientific Data

The audit revealed that, GST lacked comprehensive geoscientific data due to the absence of explanatory notes and reports for high-density geochemical and high-resolution geophysical data. Out of seven high-density geochemical quarter-degree sheets (QDS) reviewed, only one had explanatory notes or reports, while 10 out of 51 high-resolution QDS reviewed were similarly missing these essential documents. This lack of comprehensive data hindered GST's ability to accurately assess the mineral resources in the identified QDS thus, affecting the effectiveness of the surveys.

Moreover, the audit identified several causes for this data gap, including the inability to procure planned geological equipment for analysis in the financial years 2020/21 and 2022/23. Specifically, the planned procurement of geological equipment, such as seismic equipment, field consumables, and ICT-related tools, was not implemented. Similarly, in the financial year 2023/24, planned procurements of geological equipment, such as Tough Books, GPS units, and magnetometers, were not conducted. Furthermore, capacity-building initiatives for GST staff in the key technical areas, including GIS, geophysical data acquisition, and resource estimation, were not carried out as planned.

(b) Ineffective Banking of Geoscientific Data to the Public and Government

The audit found that geoscientific data at GST are stored on servers like regular files, which were difficult to retrieve when needed. GST Officials confirmed that there was no system in place to search for data efficiently based on specific criteria. Although GST planned to procure equipment and software for a national mineral resources data bank system in the financial year 2023/24, it was not implemented, resulting in the use of manual storage and retrieval of data.

On the other hand, the audit highlighted that improper organisation of stored data caused confusion among GST officials, as witnessed in a case where two clients paid for data from QDS 45 and QDS 46, which was later found that the requested low-resolution data was unavailable.

(c) Reports for Geoscientific Data Submitted by Mineral Right Holders were not Adequately Reviewed and Verified

The audit found that Mineral Rights Holders are required to submit both geoscientific data and reports to GST. In the financial year 2022/23, GST reviewed all 243 reports submitted, while in the financial year 2023/24, only 73% of the 553 reports were reviewed. However, in the financial years 2020/21 and 2021/22, 308 and 288 reports respectively, were submitted but not reviewed. The purpose of the reviews was to assess the completeness of the reports and ensure they included all the required information.

Similarly, the audit revealed that GST did not verify the geoscientific data submitted by Mineral Rights Holders due to the lack of software for analysing and processing the data. This limitation hindered GST's ability to provide timely advice to the government. For instance, in response to a request from the Mining Commission regarding 156 licenses, GST could not provide detailed information and requested further research. The audit also noted that, GST only conducted a verification on the Saza Makongorosi Projects previously owned by M/s Winshear Gold Corp in April 2024. This was done after being specifically requested by the Ministry of Minerals.

(d) Inadequate Monitoring of the Performance of GST on the Management of Geoscientific Data by the Ministry of Minerals

The audit revealed that GST's activities were only monitored in the financial year 2020/21 out of the four financial years from 2020/21 to 2023/24. This lack of monitoring was due to inadequate planning, as the monitoring plan did not include GST's role in managing geoscientific data or the necessary performance indicators for the assessment. On the other hand, the non-disbursement of the planned budget for all the financial years under review further hindered monitoring efforts.

As a result, the Ministry of Minerals (MoM) did not effectively monitor GST's performance in managing geoscientific data, this implied that valuable

feedback and recommendations for improvement were not provided. In this regard, the implementation of these recommendations could have contributed to a better management of geoscientific data and the achievement of targets outlined in the 2009 Mineral Policy, which aims to ensure GST effectively processes, interprets, archives, and analyses geoscientific information.

Audit Conclusion

The Audit Team acknowledges and commends the progress made by the Ministry of Minerals and the Geological Survey of Tanzania (GST) in managing geoscientific data. It should be noted that, GST has made significant efforts to acquire, analyse and interpret geoscientific data while establishing a data management system. Also, GST is in the process of procuring the necessary software and equipment for data storage, as well as for the analysis and interpretation of geoscientific data, including digitising records.

Despite these efforts, the audit identified gaps in GST's data management practices, which require further improvement to fully realise the value of geoscientific data in the mining sector. In the same vein, the availability of geoscientific data to both the public and the government remains limited, which hinders informed decision-making and the efficient facilitation of mining operations. This shortfall reveals a significant gap in GST's ability to make essential data accessible to stakeholders and government agencies.

Moreover, GST has not managed to cover all parts of the country with the necessary geological mapping, geophysical, and geochemical surveys. Thus, lack of comprehensive data limits the identification of mineral resources, hindering investment opportunities and sector growth. The low coverage is compounded by the Ministry of Minerals' ineffective oversight of GST's performance, as there is no specific monitoring plan for GST.

Audit Recommendations

Recommendations to the Geological Survey of Tanzania

To improve acquisition, analysis and interpretation of geoscientific data, GST is urged to:

-
- (i) Develop and implement a comprehensive plan to expand geological mapping, geophysical, and geochemical surveys across all 322 QDS in the country;
 - (ii) Establish standardised submission and review procedures of geoscientific data received from mineral rights holders;
 - (iii) Formulate effective procedure for enforcing Mineral Right holders to submit geoscientific data to GST; and
 - (iv) Develop and implement a comprehensive capacity-building strategy to enhance its ability to acquire, analyse, and interpret geoscientific data submitted by MRH effectively.

To improve banking, storage and dissemination of geoscientific data, GST is urged to:

- (i) Develop standardised data entry and verification protocols and implement procedures to ensure stored geoscientific data are accurate and complete; and
- (ii) Devise an efficient data management system with clear indexing, categorisation, and search capabilities to enhance usability and efficiency.

Recommendations to the Ministry of Minerals

To improve monitoring and evaluation of GST's performance, the Ministry of Minerals is urged to:

- (i) Establish and implement monitoring plans, specific performance metrics as well as reporting mechanisms for monitoring the performance of GST on the management of geoscientific data activities; and
- (ii) Ensure that the planned evaluations and follow-ups are effectively implemented to drive improvements in the management of geoscientific data.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Audit

Geoscientific data are strategic tools for addressing the challenges of the future demands for mineral and energy resources. They provide vital information to industry, government, and community decision-makers to support natural resources management by formulating and implementing public policies in resource development, environmental protection, public health and safety, land use and infrastructure planning¹. According to the Geological Survey of Tanzania, geoscientific data and information include geological maps and geophysical and geochemical data².

On the other hand, the Africa Mining Vision for African Minerals Governance Framework of 2018, highlights that, Geoscientific Data are crucial not just in the Mineral Sector but also for various economic sectors, including infrastructure and agriculture. These data are fundamental tools for assessing Earth's resources and understanding Earth's geological past and the history of life. Systematically gathered geoscientific data can boost mineral exploration, attract private investment, support environmental sustainability, and improve land-use planning³.

Moreover, standardised geoscientific data enable better negotiation of mining contracts and informed land-use decisions. Strengthening African geological surveys is essential for better data production, management, and dissemination. This, in turn, facilitates informed decision-making and maximising investment benefits in exploration and minerals development. Hence, geoscientific data requires careful management to ensure that, it is secure, reliable and readily accessible in the mining sector⁴.

¹ International Mining for Development Centre Mining for Development: Guide to Australian Practice viewed at <https://im4dc.org/wp-content/uploads/2014/01/Management-of-public-geoscience-data-English-version.pdf> accessed on 15th June 2024

²According to GST as published on their website as viewed at <https://www.gst.go.tz/pages/geoscientific-data-and-information> on 17th August 2024

³Africa Mining Vision: African Minerals Governance Framework, 2018, p 22

⁴<https://im4dc.org/wp-content/uploads/2014/01/Management-of-public-geoscience-data-English-version.pdf> accessed on 15th June 2024

According to the Five-Year Development Plan (FYDP) III (2021/22-2025/26), the Government planned to have 20% of the country covered by high-resolution airborne geophysical surveys by 2025. Furthermore, the Government established and launched the team to prepare Vision 2030 with the theme “Minerals are Life and Wealth” at the event held on 12 June 2024 in Dodoma. The preparation of this document aimed to carry out a detailed study to improve this area and finally enable Tanzanians not to dig for minerals based on trial and error⁵. In this regard, a performance audit on this area helps to evaluate the accuracy, accessibility, and effectiveness of data management systems, ensuring that, they align with national policies and contribute to the attainment of sustainable development goals, such as clean energy, water security, and resilient infrastructure.

Morover, Section 27A (2) of the Mining Act Cap. 123, capitalises that, the Geological Survey of Tanzania (GST) has been vested with responsibility for all matters related to geological activities in the country. The responsibility includes but is not limited to the provision of geoscientific advice, information, and data to the Government; Acquisition of geo-scientific data and information; Maintaining, processing, archiving and disseminating national geo-scientific data and information; Collection, arrangement and maintenance of geo-scientific books; records, publications, rock or mineral or fossil or core samples for research, learning and future reference; and Supporting large and small-scale miners on Geo-scientific services.

In order to ensure the implementation of assigned roles, GST has set a mission to provide high-quality and cost-effective geoscientific data and information to the Government and other stakeholders. This is essential to ensure that government officials make well-informed and strategic decisions to enhance the knowledge and sustainable use of earth resources, thereby contributing to national socio-economic growth.

1.2 The Motivation for the Audit

The audit was motivated by the following factors as detailed as follows:

⁵<https://www.tumemadini.go.tz/waziri-mavunde-azindua-timu-ya-kuandaa-andiko-la-vision-2030/>

1.2.1 Inadequate Coverage of High-Resolution Geophysical Survey

According to FYDP III (2021/22-2025/26), the Government planned to strengthen the Mining Commission, Geological Survey of Tanzania (GST), and Tanzania Geological Centre (TGC) to have 20% of the country covered by high-resolution airborne geophysical surveys by 2025. This could enhance the availability of coal quantity data and per cent of purity to enable power generation for domestic use and the availability of statistics of strategic minerals for informed decision-making for investment in the mining sector⁶.

However, based on the Press Release by the GST on Tanzania's Minerals Potentials during the country's showcase session, held on 5 February 2024, it was indicated that, the high-resolution airborne geophysical surveys have only been covered by 16% of the country. This session was purposely conducted to present the country's status of geoscientific surveys and indicate the government's need for further interventions in carrying out geoscientific surveys to uncover mineral potential in surveyed areas.

Moreover, in the information published on the Ministry of Mineral's website on 22 November 2023, the Minister for Mining, while speaking on Vision 2030, indicated the need to improve the conduct of Geophysical Survey data in the country. The Minister emphasised that, accurate geological information on rocks is the key to Tanzania's wealth and insisted GST to collaborate with other institutions to create a database of accurate geological information⁷.

1.2.2 Limited Accessibility to Geological and Mineral Resources Information in the Country

According to the Controller and Auditor General Performance Audit Report on the Provision of Support to Small-Scale Miners of 2024, STAMICO in collaboration with the Geological Survey of Tanzania (GST), did not give small-scale miners (SSMs) adequate access to geological and mineral resources information. This suggests that, geoscientific data is not being managed effectively to serve the needs of the respective sector beneficiaries.

⁶The Tanzania FYDP III - 2021/22-2025/26), p 93

⁷[Ministry of Minerals - Republic of Tanzania \(madini.go.tz\)](https://www.madini.go.tz) accessed on 16th June 2024.

Therefore, limited geological data and other geoscientific data led to Artisanal and Small-scale Mining (ASM) operations being carried out on a trial-and-error basis. This led to many miners, who have applied, paid fees and been issued Primary Mining Licences (PMLs), to abandon their mining areas after realising that they are barren. In this regard, most of the abandoned mining pits cause environmental degradation. On the other hand, stakeholders cited the lack of access to geological information as a critical constraint to gaining access to finance from financial institutions⁸.

1.2.3 Attainment of Target 12.2 of SDG Goal 12 by 2030 and Five-Year Development Plan III

According to target 12.2 of SDG goal 12 which aims to achieve the sustainable management and efficient use of natural resources by 2030. It is noted that, effective geoscientific data management ensures that mineral resources are extracted and used efficiently, reducing waste and promoting sustainability.

Similarly, the government, through the Five-Year Development Plan III (FYDP III) 2021/22-2025/26, planned to cover 20% of the country by high resolution airborne geophysical surveys, 25% of the country by geochemical surveys, 85% of geological maps and geo-scientific information digitalised and to publish 20 geoscientific research papers and journals by 2025.

These interventions were expected to stimulate mineral exploration, attract private investment, support environmental sustainability, and improve land-use planning. Moreover, FYDP III seeks to promote natural resources-based industrialisation through key interventions that include empowering small-scale miners by licensing areas with basic geological information, strengthening the Mining Commission, Geological Survey of Tanzania (GST), Tanzania Gemmological Centre (TGC), and the Tanzania Extractive Industries Transparency Initiative (TEITI), and identifying rare minerals.

⁸<https://www.iied.org/sites/default/files/pdfs/migrate/16532IIED.pdf>/Accessed on 15th June 2024.

These interventions are linked to the audit as Geoscientific data that underpins national policies on energy, mining, urban planning, and climate change. In this regard, a performance audit can evaluate whether data management aligns with policy objectives and long-term national goals. Hence, conducting this audit and implementing the recommendations issued after the audit is expected to contribute to attaining both the Sustainable Development Goals (SDGs) by 2030 and the Five-Year Development Plan III (FYDP) by 2025/26.

1.3 The Design of the Audit

1.3.1 The Main and Specific Audit Objectives

The main objective of the audit was to assess whether the Ministry of Minerals and the Geological Survey of Tanzania effectively manages geoscientific data in the Mining Sector to ensure its availability and accessibility to the public and the government.

Four specific audit objectives were designed to address the main audit objective. These objectives aimed at assessing whether:

- a) GST has ensured the availability of geoscientific data to the public and government to facilitate mining operations and decision-making;
- b) GST has effectively acquired, analysed, and interpreted geoscientific data to understand potential mineral resources available in the country;
- c) GST has effectively ensured the banking and dissemination of geoscientific data to enhance its availability and accessibility to the public use and government for mining operations and decision-making; and
- d) The Ministry of Minerals monitors and evaluates GST's performance in managing geoscientific data to ensure the effective implementation of roles assigned to GST.

Detailed audit questions and sub-questions used to address the audit objective are attached in **Appendix Two**.

1.3.2 The Scope of the Audit

The main audited entities were the Ministry of Minerals (MoM) and the Geological Survey of Tanzania (GST). In this regard, the Ministry of Minerals is responsible for formulating and overseeing the implementation of policies in the mining sector. It is also responsible for monitoring and evaluating GST's performance in the Management of Geoscientific Data in the Mining Sector to ensure effective implementation of its objectives and targets.

The rationale for selecting GST was that it is responsible for maintaining, processing, storing, and disseminating geoscientific data in the country. Also, it is responsible for advising the Government on all issues relating to geoscientific data.

Generally, the audit focused on assessing whether geoscientific data were effectively acquired, analysed, interpreted, banked, and disseminated to understand potential mineral resources available in the country.

Specifically, the audit assessed the overall coverage of the acquisition of geoscientific data in the country, including geological, geophysical, and geochemical surveys. It examined the extent of analysis and interpretation of acquired geoscientific data by investigating available chemical analysis equipment and categorising analysed samples.

Moreover, the audit also assessed the adequacy of geoscientific data banking by analysing the details of stored geoscientific data and storage practices. Similarly, it assessed the adequacy of reviewing, verifying, and authenticating the geoscientific data submitted by the mineral rights holders before banking them.

In addition, the audit assessed the effectiveness of monitoring and evaluation activities by the Ministry of Minerals and the Mining Commission to establish whether GST activities are adequately monitored. Therefore, the audit assessed the role of the Ministry of Minerals in developing and implementing its monitoring and evaluation plans.

Furthermore, the audit covered four financial years, starting from 2020/21 to 2023/24. The rationale for the coverage of this timeframe was to assess the performance trend of the Ministry of Mineral and GST on the management of geoscientific data in the mining sector. On the other hand, This time frame was selected due to the fact that, it was the period when the government implemented its Five-Year Development Plan III of 2021/22 - 2025/26 for three years, which is expected to be completed in the financial year 2025/26. Also, it was during this period GST set targets that aimed at improving the management of geoscientific data by implementing its Strategic Plan of 2020/21 to 2024/25, which is approaching its end.

1.3.3 Audit Criteria

To assess the effectiveness of the Ministry of Minerals through GST in managing geoscientific data, assessment criteria were drawn from various sources such as the sector legislation, guidelines, the FYDP III, and the Strategic Plans of both the Ministry of Minerals and GST. The following are the assessment criteria for each specific audit objective as follows:

(a) Acquisition, Analysis and Interpretation of Geoscientific Data

Sections 27A(2) and 27B of the Mining Act Cap. 123 requires GST to undertake geological mapping to ascertain the rocks or minerals within or under it, acquire geoscientific data and information, and maintain, process, archive, and disseminate national geoscientific data and information.

Moreover, the National Five-Year Development Plan 2021/22 - 2025/26 set a goal of strengthening the Mining Commission, Geological Survey of Tanzania (GST), with the target of ensuring that by 2025/26, 20% of the country is covered with high-resolution airborne geophysical surveys, 98% by geological mapping and 25% by geochemical surveys.

On the other hand, GST Strategic Plan of 2020/21 - 2024/25 indicated that by June 2025, GST planned to conduct regional geological mapping for 10 unmapped Quarter Degree Sheets (QDS) at a scale of 1:100,000; Regional geochemical surveys for 10 QDS at a scale of 1:100,000; Geological field checks for existing 10 QDS at a scale of 1:125,000 are conducted and

updated to a scale of 1:100,000; and five geophysical ground follow-up surveys for the identified anomalous areas.

(b) Banking of Geoscientific Data

Sections 27A (2) and 27B of the Mining Act Cap. 123 requires GST to collect, arrange, and maintain geoscientific books, records, publications, and rock, mineral, fossil, or core samples for research learning and future reference. GST is also required to promote investment in the mining industry by disseminating geodata, information and maps.

In the same vein, Rules 8 and 11(1) of the Mining (National Mineral Resources Data Bank) Rules of 2021 require GST to keep records of all mineral data, databases, and reports from mineral rights holders at the National Mineral Resources Data Bank. Also, GST is required to verify the mineral data, databases, and reports or information submitted before keeping or storing them. In order to enhance data security, Rule 11 (2) provides that access to the National Mineral Resources Data Bank shall be restricted to the authorised person.

(c) Monitoring and Evaluation of the Performance of GST on the Management of Geoscientific Data

Based on Section 19(a), (b) and (c) of the Mining Act [Cap. 123, it is required that, the Ministry of Minerals has to prepare policies, strategies, and legislation for mineral exploration, monitor the implementation of government policies on minerals, monitor the operations of all bodies or establishments with responsibility for minerals and report to the Cabinet. This has also been provided under the Ministry of Minerals Organisational Structure (approved by the President on 10 June 2018) under Paragraph 3.1 (iii). The following are the requirements for MoM's monitoring function.

Monitoring Plan According to Paragraph 4.7.1 of the Ministry of Minerals' Strategic Plan 2019/20 - 2023/24, MoM is required to prepare detailed monitoring plans that include indicators, baseline values, target values, frequency of data collection, means of verification,

frequency of reporting and responsible persons for data collection, analysis and reporting.

Similarly, the monitoring plan requires the MoM to report annually all monitoring activities carried out in the respective financial year and report them to the MoM's management and cabinet.

Planned
Reviews

According to Paragraph 7.7.2.1, the MoM is required to conduct various review meetings to track progress on milestones, activities, and targets critical for achieving organisational objectives. MoM is therefore required to conduct weekly management meetings, monthly Division/Unit meetings and annual worker's council meetings.

Key
Performance
Indicators

Under each objective rationale, strategies, targets, and key performance indicators (KPIs) have been provided. Also, Paragraph 3.4 of the Ministry of Minerals Strategic Plan has laid down specific KPIs. Among the KPIs under Objective C of MoM's SP on improvement of mineral resources management and development, MoM identified several KPIs such as percentage of mineral sector contribution to GDP, level of satisfaction with mineral sector management, and level of compliance with the legal framework governing the mineral sector.

These KPIs were designed to measure the effectiveness and impact of MoM's Strategic objectives over the five years from 2019/20 to 2023/24.

1.4 Sampling Techniques and Methods of Data Collection and Analysis

Various techniques for sampling and methods of data collection and analysis were used by the audit team as follows:

1.4.1 Sampling Techniques

The audit employed probability sampling techniques, specifically with simple random sampling, to select Quarter Degree Sheets (QDS) to be reviewed. Sampling was conducted in four levels.

The first level identified the total number of QDS required to be covered, which was 322.

The second level was to identify the types of surveys conducted: geological mapping, geochemical survey, and geophysical survey. In the third level, the audit team categorised survey coverage based on scale, density, and resolution for geological mapping, geochemical, and geophysical surveys, respectively.

For geological mapping, the scales considered were 1:250,000, 1:125,000, and 1:100,000. For geochemical surveys, the considered densities were high and low. For geophysical surveys, the considered resolutions were low and high. Lastly, the audit team considered the status of publication of the surveyed QDS by classifying them into two categories: published and not published.

The fourth level, the number of quarter-degree sheets (QDS) to be covered, was obtained using Cochran’s sample size formula as follows:

$$\text{Cochran's formula for sample size, } n = \frac{NZ^2(P)(1-P)}{Ne^2+z^2(p)(1-p)}$$

Where N = Population Size of each category

e = Margin of error (0.2)

p = Standard of deviation (0.5)

Z = Z - score (1.28)

The sample size was calculated using Cochran’s formula with a confidence level of 80%, and the result was 66 Quarter Degree Sheets. **Table 1.1** presents details of the selected number of quarter-degree sheets per survey.

Table 1.1: Sampling for Selection of Surveyed QDS Reviewed

Type of Survey Conducted	Category of Survey Coverage	Publication Status	No. of QDS Surveyed	No. of QDS Reports Selected
Geological	Scale of 1:250,000	<input checked="" type="checkbox"/>	1	1

Type of Survey Conducted	Category of Survey Coverage	Publication Status	No. of QDS Surveyed	No. of QDS Reports Selected
	Scale of 1:125,000	<input checked="" type="checkbox"/>	130	9
		<input type="checkbox"/>	113	9
	Scale of 1:100,000	<input checked="" type="checkbox"/>	67	9
Geochemical	Low Density	<input checked="" type="checkbox"/>	270	10
	High Density	<input checked="" type="checkbox"/>	74	9
Geophysical	Low Resolution	<input checked="" type="checkbox"/>	322	10
	High Resolution	<input checked="" type="checkbox"/>	51	9

Source: Auditors' Analysis of the Geoscientific Progress Map, 2024

Key:

- = Published
- = Not Published

Based on **Table 1.1**, the audit team randomly selected 66 QDS reports to be reviewed based on the established sample size for each survey type conducted, survey category, and publication status. However, one QDS covered on a scale of 1:250,000 was selected purposively without using Cochran's formula since it was the only QDS. **Appendix Three** provides a list of 66 sampled QDS that were reviewed during the audit.

In order to make verification, the audit team purposively selected Dodoma and Geita Regions since these were the only locations where GST had laboratories to test samples for geoscientific data.

1.4.2 Methods for Data Collection

Both qualitative and quantitative data were collected to provide strong and convincing evidence regarding the Ministry of Mineral and GST's performance in managing geoscientific data in the country. The Audit Team used different methods to collect information from entities and other stakeholders.

These methods include document review, interviews and physical verification, as detailed below;

(a) Documents Review

The Audit Team reviewed various documents from the Ministry of Minerals and Geological Survey of Tanzania to obtain comprehensive, relevant, and reliable information on the Ministry of Minerals, the Mining Commission and GST's performance regarding the management of geoscientific data in the Mining Sector.

The documents from the audited entities reviewed covered the period of the audit, i.e., from the financial year 2020/21 to December 2024. These included planning reports, QDS explanatory reports, performance and progress reports, and monitoring and evaluation reports. The list of documents reviewed during the audit is provided in **Appendix Four** of this report.

(b) Interviews

Interviews were conducted with officials from the Ministry of Minerals and GST to obtain information based on the audit objectives regarding the management of geoscientific data in the mining sector. Also, interviews were used to validate information extracted from the reviewed documents. A List of Officials interviewed and the justification for being interviewed are shown in **Appendix Five** of this report.

(c) Physical Verifications

Physical verifications was conducted specifically on the equipment and tools used for Geological Mapping, Geophysical Surveys, and Geochemical analysis to arrive at a conclusion regarding the Ministry of Mineral and GST's performance in managing geoscientific data in the mining sector.

In this case, GST's two laboratories, located at GST headquarters in the regions of Dodoma and Geita, respectively, were visited to physically verify the existence and capacity of the equipment used for geochemical analysis. Verifications were also conducted through visual inspection, whereby tools used for geological mapping and geophysical data processing were checked. Photos of tools and equipment were also taken.

1.4.3 Data Analysis

The collected information was analysed using both qualitative and quantitative methods to obtain facts and sufficient information regarding MoM's and GST's overall performance in managing geoscientific data in the mining sector.

(a) Quantitative Analysis

Quantitative data collected through document reviews such as the number of QDS, the number of submitted MRH' mining data and reports, and the number of geological, annual budget and their disbursement, geochemical and geophysical surveys were quantified and tabulated using Excel spreadsheets. Data were analysed by organising, summarising, and compiling them using different statistical methods for data computation. The analysed data were thereafter presented in either tables or graphs.

(b) Qualitative Analysis

Qualitative data obtained through interviews and document reviews were subjected to content analysis based on the audit questions. The extracted concepts or facts were either tabulated or presented to explain or establish the relationship between variables originating from the audit questions.

Depending on the number of interviews and documents reviewed, information was transformed into quantitative data by going through interview notes and documents to determine how many included a positive or negative statement about a particular issue or how many have made similar statements. Calculations were made by expressing the percentage of reviewed documents or interviews that included a particular type of statement.

Data was entered on a spreadsheet to explain and answer the 'why' questions. Simple pie-chart graphs were used to describe and compare the proportions under each main theme identified.

1.5 Data Validation Process

The Ministry of Minerals and Geological Survey of Tanzania were given the opportunity to go through the draft report to verify the facts, clarify the information and figures presented in the report. This was done to ensure the validity, accuracy and reliability of the presented information to improve the content of the report. The comments and responses of the Ministry of Minerals and Geological Survey of Tanzania are presented in **Appendix One** of this report.

On the other hand, experts in the field of Geoscientific Data, specifically in the management of geoscientific data, verified the presented information and data to validate the information obtained and presented in the report.

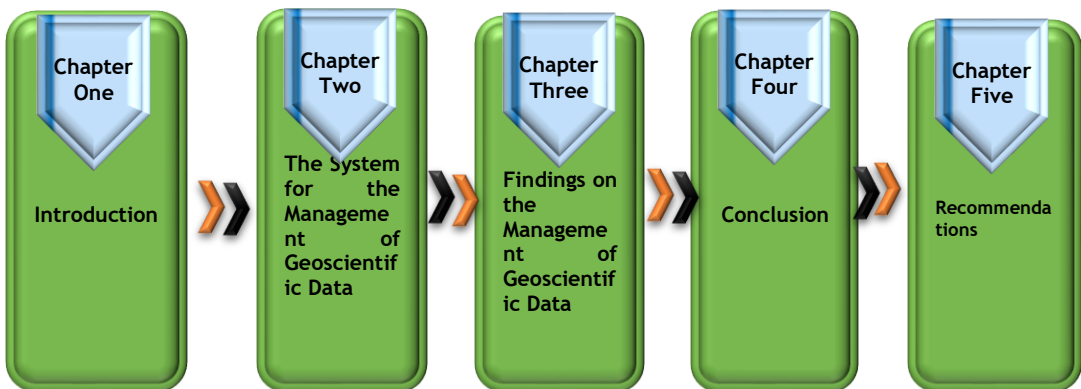
1.6 Standard Used for the Audit

The audit was conducted in accordance with the International Standards of Supreme Audit Institutions (ISSAIs) on Performance Auditing issued by the International Organisation of Supreme Audit Institutions (INTOSAI). These standards require that the audit is planned and performed to obtain sufficient and appropriate evidence to establish a reasonable basis for the findings and draw conclusions based on audit objectives.

1.7 The Structure of the Audit Report

The main chapters of this report are presented in **Figure 1.1** as follows:

Figure 1.1: The Structure of the Report



CHAPTER TWO

THE SYSTEM FOR THE MANAGEMENT OF GEOSCIENTIFIC DATA IN THE MINING SECTOR

2.1 Introduction

This chapter describes the system for the management of geoscientific data in the mining sector. It includes policies, laws and guidelines for governing geoscientific data management in the Mining Sector. Also, it outlines the roles and responsibilities of the key actors, the process for management of geoscientific data in the Mining Sector, funding arrangements and human resources for the management of Geoscientific data in the country.

2.2 The Governing Policies, Legislation, Strategies and Plans

2.2.1 Policies and Legislation Governing the Management of Geoscientific Data in the Mining Sector

Figure 2.1 provides elaboration about the governing policies and Legislation. These include the Mineral Policy, 2009, the Mining Act Cap. 123; Mining (Mineral Rights) Regulations of 2018; and the Mining (National Mineral Resources Data Bank) Rules of 2021.

Figure 2.1: The Governing Policy and Legislation



Source: Auditors' Analysis of the Governing Policies and Legislations, 2024

2.2.2 National Development Vision, 2025

Tanzania's Development Vision 2025 envisages the mining sector to contribute at least 10% of the country's Gross Domestic Product (GDP) by 2025. In this case, GST aspired to accelerate the sector's progress by providing reliable geoscientific data and information to attract investment

in the mineral sector, increasing government revenue through royalties and taxes. This could be achieved through the facilitation and strengthening of geoscientific surveys⁹.

2.2.3 The Strategies and Plans Governing the Management of Geoscientific Data in the Mining Sector

National Five-Year Development Plan III 2021/22 - 2025/26

Through the FYDP III, the Government planned to strengthen the Geological Survey of Tanzania (GST), Mining Commission, and Tanzania Gemmological Centre (TGC) by June 2025, to achieve the target of ensuring 20% of the country is covered by high-resolution airborne geophysical surveys; 10 Quarter Degree Sheet (QDS) (equip to 3% to make 98%); 25% of country covered by geochemical surveys; 85% of geological maps and geo-scientific information digitalised; and to publish 20 geoscientific research papers and journal. This is expected to facilitate the availability of statistics on strategic minerals for informed decision-making for investment in the mining sector.

GST Strategic Plan 2020/21 - 2024/25

The GST's Strategic Plan 2020/21 - 2024/25 under Strategic Objective C, Strategy C, in Paragraph 3.4.2, provides that GST aimed at enhancing geoscientific data management through Information, Communication and Technology (ICT) by June 2025. The Plan also provides targets, which include digitising 125 geological maps, scanning 2,500 geoscientific maps/reports, uploading metadata for 2,500 booklets, verifying 500 mineral databases, and disseminating 1,000 publications. The plan also involves processing data from 200 Mineral Right Holders, analysing ten (10) exploration databases, and establishing compliance regulations.

Similarly, the GST Strategic Plan provides for targets to conduct Regional geological mapping for ten (10) unmapped QDS at a scale of 1:100,000, Regional geochemical surveys for 10 QDS at a scale of 1:100,000, and ensuring Geological field checks for existing 10 QDS at a scale of 1:125,000 are conducted and updated to a scale of 1:100,000, and five (5) geophysical ground follow-up surveys for the identified anomalous areas.

⁹GST Strategic Plan 2020/21 - 2024/25

2.3 The Roles and Responsibilities of the Key Actors for the Management of Geoscientific Data in the Mining Sector

2.3.1 The Roles of the Key Stakeholders

Managing geoscientific data in the mining sector involves collaboration among multiple stakeholders. These stakeholders ensure the effective management of geoscientific data essential for the sustainable development of the Tanzaniamining sector. These key stakeholders and their roles are as detailed as follows:

(i) The Ministry of Minerals

According to Section 19 (a), (b) and (c) of the Mining Act, Cap. 123, and Paragraph 3.1 of the Ministerial Function Organisational Structure (approved by the President on 10 June 2018), the Ministry of Minerals and Minerals Division under the Ministry of Minerals is responsible for preparing policies, strategies, and legislative frameworks to explore and exploit mineral resources, focusing on establishing national priorities that consider the national economy. It also monitors the implementation of government policies on minerals, oversees the operations of all bodies or establishments responsible for minerals, and prepares periodic reports.

(ii) The Geological Survey of Tanzania

The Geological Survey of Tanzania (GST) is a key entity in the mining sector when it comes to geoscientific data management. Under Section 27A (2) of the Mining Act, Cap. 123, the GST is responsible for all matters related to geological activities and, in particular, shall undertake the geological mapping of Tanzania and provide data concerning the geology and mineral resources of Tanzania. Generally, it assists members of the public in seeking information concerning geological matters. It is responsible for the geological analysis and interpretation of geoscientific data through the Directorates of Geological Services and Laboratory Services.

On the other hand, the Directorate of National Geoscientific and Minerals Database is responsible for storing, maintaining, and updating geoscientific

databases, making them accessible to stakeholders like the government, mining companies, and academic institutions¹⁰.

2.3.2 The Roles of Other Stakeholders

Geoscientific data management involves other stakeholders, which include government agencies, Mining companies, and local communities. These are the Mining Commission, State Mining Corporation, Tanzania Chamber of Mines, Mining Companies, Academic and Research Institutions, Non-Government Organisations, and Local Communities. Other stakeholders' roles in managing geoscientific data in the country are shown in **Figure 2.2**.

¹⁰Section 27A (2) of the Mining Act [CAP. 123 R.E. 2019]

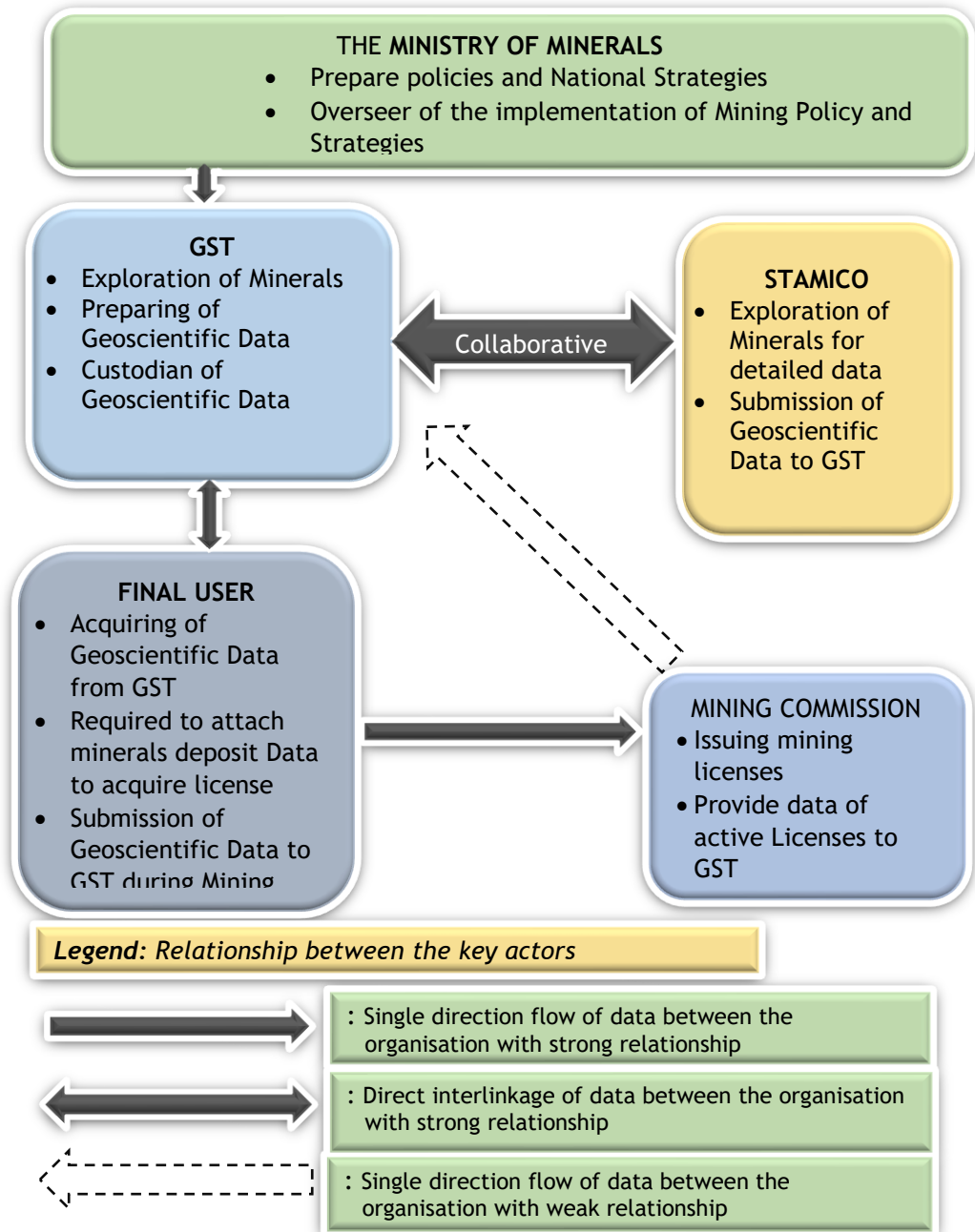
Figure 2.2: The Roles of Other Stakeholders in the Management of Geoscientific Data



Source: Auditors' Analysis of the Roles of Stakeholders in the Management of Geoscientific Data in the Mining Sector, 2024

Summarised information on the relationship of the key stakeholders responsible for the management of Geoscientific data in Tanzania (Ministry of Mineral, GST, STAMICO and Mining Commission) is shown in **Figure 2.3**.

Figure 2.3: The Relationship between Key Actors in the Management of Geoscientific Data in the Mining Sector



Source: Auditors' Analysis of Relationship of Stakeholders on Management of Geoscientific Data in the Mining Sector, 2024

2.4 The Processes for the Management of Geoscientific Data

The processes for managing Geoscientific data fall into two categories. The first category comprises the processes from data acquisition to dissemination to final users. The key players include the Ministry of Minerals (MoM) through the Geological Survey of Tanzania (GST) in collaboration with STAMICO.

The second category involves acquiring geoscientific data from mineral rights holders who own either Prospecting or Mining licences. The mineral rights holders are required to submit geoscientific data to GST. The details of these two categories are as follows.

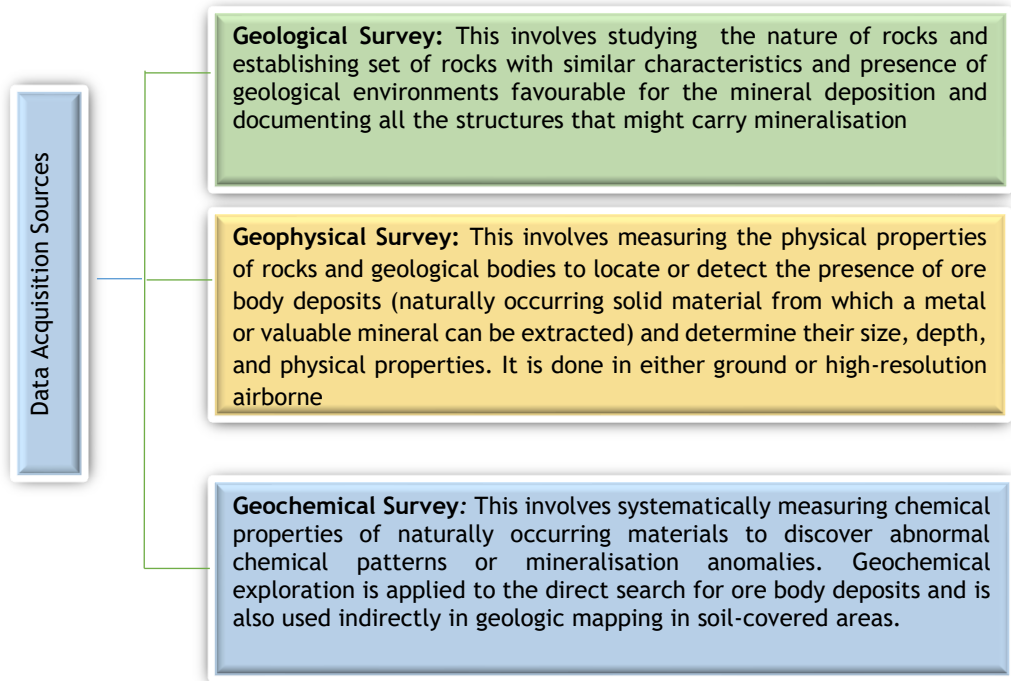
(i) The Management of Geoscientific Data by GST

GST management of geoscientific data follows six stages, as explained as follows:

(a) Data Acquisition by GST

The first stage is data acquisition by GST, which entails the collection of raw data from the surface/ground/underground or acquisition from previous holders/ Research Institutions. The collected data can be in the form of general geological, geochemical and geophysical surveys. This is done under the Geological Services directorate at GST. In this regard, data acquisition involves gathering information through geoscientific surveys in three ways, as detailed in **Figure 2.4**.

Figure 2.4: The Summarised Data Acquisition



Source: Auditors' Analysis on Information on Data Acquisition Processes, 2024

(b) Data Processing and Analysis

In this second stage, GST, through the Geological Services and Laboratory Services Directorates, conducts geophysical or geochemical data analysis. This stage is crucial as it transforms raw data from various sources into meaningful forms (images, maps, and subsurface models). It is done with the help of Data processing Software or chemical analysis instruments.

(c) Data Interpretation

In this third stage, GST, through the Directorate of Geological Services, does this through the Applied Geology Section and conducts geophysical interpretations (quantitatively or qualitatively) of processed data to provide an understanding of the meaning of processed geoscience data. Generally, interpretation integrates all available geologic and geophysical information to unlock the full potential of subsurface resources.

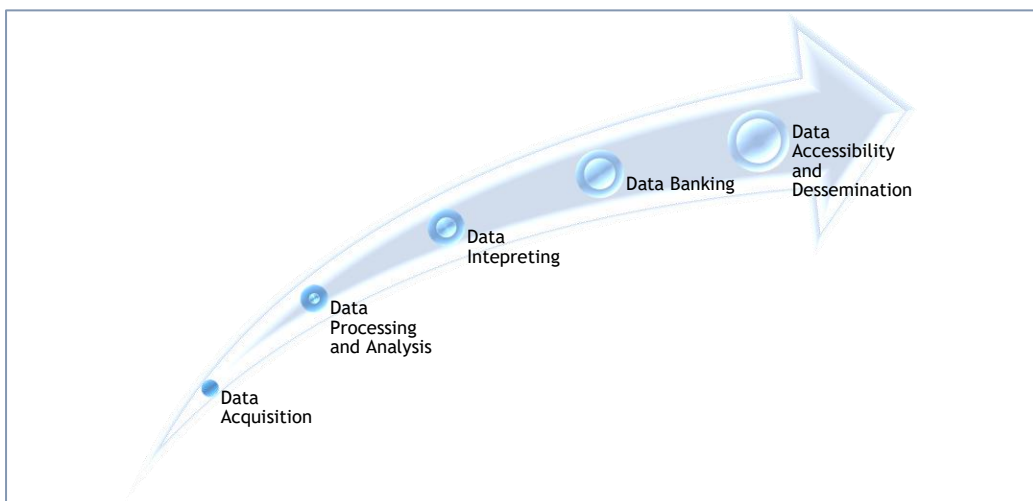
(d) Data Banking and Upgrading/Updating of Geoscientific Data Base

In this fourth stage, GST, through the Directorate of Geoscience Database, stores and archives the analysed and interpreted geochemical and geophysical data where physical collections (such as cores, rocks, maps, mineral museums, and cuttings) and digital files and documents are kept in the centralised system in an arranged manner that users can easily access and remain under the custody of GST. The archived data is stored to be retrieved and returned to the service for updating/upgrading, or editing.

(e) Data Accessibility

At this stage, GST, through the Directorate of Geoscience database, ensures data accessibility by establishing a platform that assists users in finding, retrieving, understanding, and using the data. Data accessibility consists of a centralised distribution system of geoscience information where all geoscientific data are gathered and distributed. The summarised processes of Management of Geoscientific data in the Mining Sector by GST are presented in **Figure 2.5**.

Figure 2.5: The Summarized Processes of Management of Geoscientific Data in the Mining Sector by GST



Source: Auditors' Analysis of the Information on the Management of Geoscientific Data in the Mining Sector, 2024

(ii) The Management of Geoscientific Data by Mineral Rights Holders

Mining companies manage geoscientific data in six stages, as explained as follows.

Acquiring Preliminary Exploration Data from Different Sources, Including GST: Before receiving an exploration license, the investor generates, collects, acquires and interprets data from different sources, including GST, to acquire preliminary geoscientific data. This geological data obtained from GST and different sources are used as input during exploration.

Application for a Prospecting License: Use compiled data to select the best areas for mineral rights application to the Mining Commission for acquiring prospecting licences before commencing any mineral exploration. After receiving an exploration license, the mineral rights holders apply to GST and pay fees for preliminary geoscientific data. This geological data obtained from GST is used as input during exploration.

Detailed exploration: The Mineral Right Holder, after obtaining preliminary geoscientific data, starts the exploration. Their exploration involves a Geophysical Survey and Geochemical Survey, as explained above in Section 2.4(i)(a). The major aim of exploration is to assess the quantity of minerals expected to be mined and resources to be employed. After the completion of the exploration, depending on the results, they can decide whether to commence mineral development.

Submission of Exploration Data for Verification and Storage to GST: After detailed exploration is completed, the Mining Right Holder is required under Section 27F of the Mining Act, Cap. 123 and Rule 6 of Mining (National Mineral Resources Data Bank) Rules of 2021 to submit data to GST Quarterly Reports for storage. Before storing the submitted data, GST is required to review and assess whether the submission has included all required information and conduct verification. After completing the assessment of the submitted data and verifying it based on the site, the data are stored at GST.

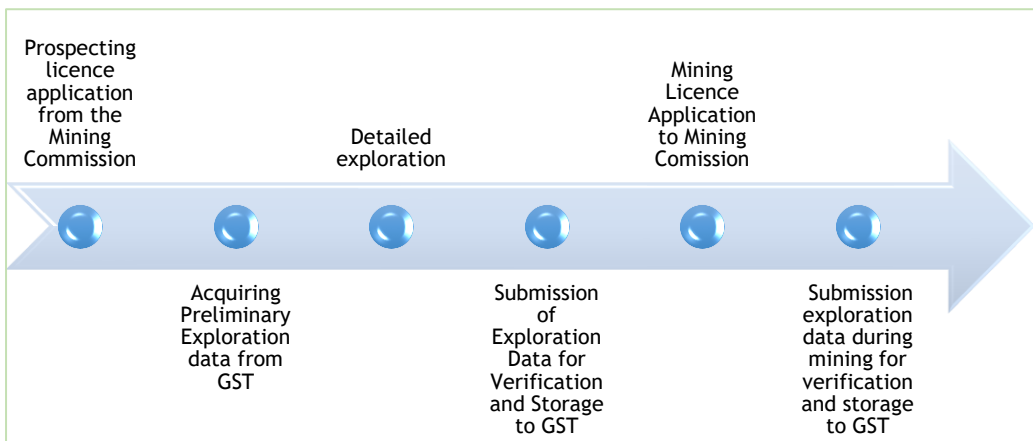
Mining License Application to Mining Commission: After the completion of the exploration activities. It is directed that, Before

starting mining activities, the Mineral Right Holder apply for a mining license from the Mining Commission if the exploration data is favourable. Thereafter, mining activities start and continue with exploration using the exploration license.

Submission of Exploration Data during Mining for Verification and Storage to GST: During mining, the Mineral Right Holder is required by Section 27F of the Mining Act, Cap. 123 to submit mining and exploration data to the Mining Commission. They are also required to submit exploration data to GST for storage purposes. Hence, GST verifies the submitted data before it is stored.

The Summarised process of geoscientific data management by the Mineral Right Holder is presented in **Figure 2.6**.

Figure 2.6: The Process for the Management of Geoscientific Data in the Mining Sector by Minerals Rights Holders



Source: Auditors’ Analysis of the Information on the Management of Geoscientific Data in the Mining Sector, 2024

2.5 The Resources Arrangements for Managing Geoscientific Data at the Ministry of Mineral

2.5.1 Funding of Activities for Managing Geoscientific Data at the Ministry of Mineral

The Minerals Division at the Ministry of Minerals prepares an annual budget to facilitate activities related to geoscientific data management. **Table 2.1**

shows the budget for the Division of Minerals for the four (4) financial years under the audit.

Table 2.1: The Budget for the Mineral Division at the Ministry of Minerals

Financial Year	Amount Budgeted (TZS '000,000)	Amount Disbursed (TZS '000,000)	%age Disbursed (%)
2020/21	89,993	62,174	69
2021/22	41,203	40,391	98
2022/23	71,318	59,450	83
2023/24	31,245	26,615	85

Source: MoM MTEF for the Financial years 2020/21 to 2023/24

Table 2.1 shows that the Ministry of Minerals received funds to facilitate activities related to geoscientific data management. The disbursed funds ranged from 69% to 98%. In the financial year 2020/21, the government allocated 69% of the budgeted funds. While in the financial year 2021/22, the funds increased to 98%. However, for the last two financial years of 2022/23 and 2023/24, the disbursed funds were 83% and 85%, respectively.

2.5.2 Human Resources for Managing Geoscientific Data for the Division of Minerals at the Ministry of Mineral

To ensure effective geoscientific data management in the country, the Mineral Division at the Ministry of Minerals requires sufficient human resources. However, the current staffing levels are detailed in **Table 2.2**.

Table 2.2: The Staff Requirement at the Ministry of Mineral

Name of Required Professional	Required Number	Available Number	Additional Staff Required
Engineer I	5	3	2
Geologist I	10	4	6
Geologist II	9	7	2
Engineer II	2	2	0
Technician I	1	1	0
Technician II	18	0	18
Principle Engineer I	3	3	0
Principle Geologist I	1	1	0
Total	49	21	28

Source: Auditors' Analysis of Personnel Enrolment of Staff at MoM, 2024

Table 2.2 shows that 49 staff members were required to discharge their functions within the Division of Minerals. However, 21 out of 49, equivalent to 43%, were available to manage geoscientific data. This indicates that, the Division has a human resource gap of 28 required personnel, which is equivalent to 57%.

2.5.3 The Funding of Activities for Managing Geoscientific Data at GST

GST prepares an annual budget, and the government disburses the funds to facilitate the implementation of geoscientific data as per approved budgets. A budget, and the actual disbursement from the government to GST for the four financial years under the audit is shown in **Table 2.3**.

Table 2. 3: The Budget for Implementing Activities Related to Geoscientific Data at GST

Financial Year	Budget (TZS '000,000)	Actual Disbursement (TZS '000,000)	Disbursement (In %)
2020/21	6,408	5,399	84
2021/22	7,789	5,897	76
2022/23	7,901	6,751	85
2023/24	8,856	4,645	52

Source: GST MTEF for the Financial Years 2020/21 to 2023/24

Table 2.3 indicates that, the government has not disbursed all budgeted funds to GST for the past four years under the audit. The maximum amount of received funds was in the financial year 2022/23, where GST received 85% of the budgeted funds, whilst in the financial year 2020/21, it received 84%. The minimum disbursed amount was 53% in the year 2023/24.

2.5.4 Human Resources for the Minerals Division at GST

It should be noted that, GST requires sufficient human resources to ensure effective geoscientific data management in the country. The analysis showed that GST required a total of 165 staff to discharge their functions. However, only 93 out of 165, equivalent to 56%, were available to manage geoscientific data at GST. These were critical, specifically in the directorates of the Geoscience database, Geological Services, and Laboratory services. This implies that GST has a human resource gap of 72 staff within the directorates responsible for managing geoscientific data. Details of staff establishment are provided in **Appendix Six** of this report.

CHAPTER THREE

AUDIT FINDINGS

3.1 Introduction

This chapter presents the audit findings related to the effectiveness of the Ministry of Minerals, through the Geological Survey of Tanzania, in managing geoscientific data in the mining sector. The findings reveal inadequacies in the practices for managing geoscientific data. Meanwhile, it indicates areas that require improvement to enhance availability and accessibility and ensure utilisation by both the public and the government.

3.2 GST Did not Adequately Make Geoscientific Data Available for Mining Operations in the Country

The government, through Five-Year Development Plan III (FYDP III) 2021/22-2025/26, planned to cover 20% of the country with high-resolution airborne geophysical surveys, 25% of the country with geochemical surveys, 85% of geological maps and geo-scientific information digitalised and to publish 20 geoscientific research papers and journals by 2025. These interventions are aimed at stimulating mineral exploration, attracting private investment, and improving land-use planning.

However, the analysis related to the availability of the geoscientific data in the country indicated that, GST did not make geoscientific data available as detailed as follows:

3.2.1 Inadequate Coverage of Geoscientific Surveys in the Country for Developing the Mining Sector

In a review of the geoscientific progress mapping for the year 2024 and the Investor's Guide of Tanzania Mining Sector of 2024 from the Ministry of Minerals, the audit team noted that, GST covered 97% of the geological mapping for all 322 quarter-degree sheets. However, GST did not adequately conduct Geophysical and Geochemical Surveys to facilitate the availability of geoscientific data for the mining sector. Contrary to Section 27A, (2) (c), and 27B of the Mining Act Cap. 123] and Paragraph 3.4.1 of the GST Strategic Plan 2020/21-2024/25. The section and the paragraph

required the Geological Survey of Tanzania (GST) to execute all matters related to geological activities, including the acquisition of geo-scientific data and information. A detailed elaboration is described as follows:

(i) Adequate Coverage of Geological Mapping for All Quarter Degree Sheets, but One-third of them were not Published

The review of Progress Maps reports of 2024 revealed that GST managed to cover 311 out of 322 Quarter Degree Sheets (QDS) available in the country, which is equivalent to 97%. In this respect, QDS provides or assists in providing standardised, manageable, and efficient ways to represent large areas with detailed information while ensuring compatibility with the navigation system. This also assists in dividing the area of the country in regular shape. The details of the number of QDS covered in terms of scale and publication status are presented in **Table 3.1**.

Table 3.1: The Coverage of Geological Mapping

Scale used	Publication Status	No. of QDS Surveyed	Percentage Covered out of 311 QDS
Scale of 1:250,000	Published	1	0.32
Scale of 1:125,000	Published	130	41.81
	Not Published	113	36.33
Scale of 1:100,000	Published	67	21.54
Total		311	100

Source: Auditors' Analysis of the Geoscientific Progress Map, 2024

Table 3.1 shows that 36% of 311 covered QDS were not published, which undermines the purpose of collecting them. This indicates that even though they were acquired, they could not be used by the public and investors to make decisions on the exploration as they strive to identify viable mining sites for their mining operations and the development of the mining sector. This ultimately limits informed decision-making and resource management.

The main reason for not publishing the covered QDS was associated with the incompleteness of information in the covered QDS. Moreover, in a review of unpublished QDS explanatory notes, it was found that, they missed key information such as geological map detail, analysis, and interpretation, such

as laboratory analysis and economic analysis, as presented in **Section 3.3.1** in **Table 3.7**.

This affects stakeholders, including the government, in decision-making on land use. On the other hand, it affects researchers who cannot get detailed information from unpublished QDS for research purposes. Meanwhile, investors also experience a similar effect when they cannot assess risks and opportunities available in the respective areas when making investment decisions.

(ii) 23% of High-Density Geochemical Surveys were Covered

In the review of the Investors Guide Tanzania Mining Sector 2024 of the Ministry of Minerals regarding GST's achievement. It was found that up to the year 2024, the coverage of geochemical surveys was 84% for low-density and 23% for high-density. Since these activities were carried out prior to and across the period under the audit, it is ascertained that, this information can be used in conducting low-density geochemical surveys, which is a preliminary stage in geochemical surveys before high-density geochemical surveys.

However, it has to be noted that, the coverage for high-density geochemical surveys stood at 23% of all 322 QDS in the country by 2024. A high-density geochemical survey is key as it gives more details about the distribution and concentration of elements within a given area (geochemical anomalies). These data are essential for identifying mineral deposits, understanding soil and rock compositions, and land use planning. The details for the number of QDS covered are presented in **Table 3.2**.

Table 3.2: The Coverage of Geochemical Surveys

Categories of Geochemical Conducted	Publication Status	Total Number of QDSs	No. of QDS Surveyed	Percentage Covered out of 322 QDS
Low Density	Published	322	270	84
High Density	Published	322	74	23

Source: Auditors' Analysis of Data in the Geoscientific Progress Map, 2024

Table 3.2 indicates that, GST managed to cover 84% and 23% of all 322 QDS for low-density and high-density geochemical surveys, respectively. This implies that, the country had high-density geochemical surveys by 23%. Interviewed officials from GST elaborated that, GST depended on funds from development partners to cover high-density geochemical surveys as they are expensive. Also, a review of high-density Geochemical Progress Maps for 74 QDS indicated that 39, more than 50% of covered QDS, were financed by development partners, as shown in **Table 3.4**.

Moreover, a review of GST’s Geochemical Maps and Data Reports of 2024 found that, most of the geochemical surveys were carried out by organisations, exploration, and mining companies such as UNDP, Williamson Diamonds Limited (WDL), Western Rift Exploration, and Broken Hill Proprietary Company (BHP). This was also confirmed on the official GST website¹¹. Others are the Geological Survey of Finland, the Council for Geoscience (South Africa), the China Geological Survey, the Korea Institute of Geoscience and Mineral Resources (KIGAM) and GST itself. Also, organisations under joint programmes with the Government of Tanzania through GST, such as BGR, JICA, and SIDA SAREC, also conducted geochemical surveys.

This was justified by Paraph 2.3 of the Project/Programme Concept Paper of 2023, which aimed at requesting the Korea International Cooperation Agency (KOICA) to finance the programme whose one of the objectives was to generate suitable geoscientific data and create a reliable database for sustainable extractions of critical mineral resources in Tanzania¹². The paper indicated that the higher coverage of high-density geochemical surveys would enable and facilitate the conduct of exploration for new discoveries of mineral deposits for potential mining investment. This limits the Government in decision-making regarding land use planning as well as stakeholders in deciding on investments in mining based on the available geochemical data.

¹¹<https://www.gst.go.tz/pages/geochemical-surveys> (accessed on 21st November 2024)

¹²Unearthing Green Energy Mineral Resources Geoscience Information to Enable Sustainable Economic Growth, Strategic Development Programs, Improved Social Services and Poverty Reduction

(iii) 16% of High-Resolution Geophysical Surveys were Covered

In the review of the Investor’s Guide of Tanzania Mining Sector of 2024 by the Ministry of Mineral revealed that, there is 16% coverage of high-resolution geophysical surveys in the country. The analysis indicated that, up to the year 2024, the coverage of low-resolution and high-resolution geophysical surveys was 100% and 16%, respectively, and all were published.

Despite the noted achievement of having 100% coverage for low resolution, GST had limited information on the geological structure and stratigraphy of the country. This was due to the fact that, low-resolution geophysical surveys (which have been covered 100%) were basically for the identification of potential mineralisation zones over large areas, which can then be investigated in more detail. In this regard, high-resolution geophysical surveys, which covered only 16%, provide detailed data necessary to locate or detect the presence of mineral deposits and determine their size, shape and depth. This emanates from the fact that, in high-level geophysical surveys, points were spaced closely together to capture detailed information about the subsurface.

The details for the number of QDS covered in geophysical surveys are presented in **Table 3.3**.

Table 3.3: The Coverage of Geophysical Surveys

Categories of Geochemical Conducted	Total Number of QDS	No. of QDS Surveyed	Percentage Covered out of 322 QDS
Low Resolution	322	322	100
High Resolution	322	51	16

Source: Auditors’ Analysis of Data in the Geoscientific Progress Map, 2024

Table 3.3 indicates that, GST managed to cover 100% and 16% of all 322 QDS for low-resolution and high-resolution geophysical surveys, respectively. Therefore, high-resolution geophysical surveys are essential for understanding the context of mineral deposits.

During interview with officials from GST, it was revealed that the GST relied on donor funds due to high cost of conducting high-resolution geophysical surveys. Meanwhile, it was noted that, 16% of the current high-resolution

airborne geophysical data were acquired from a few selected blocks through various projects that involved GST and development partners¹³. These development partners included the Nordic Development Fund (NDF) in 2003, the World Bank (through the SMMRP project) in 2013, and the Korea Institute of Geosciences and Mineral Resources (through the AMGI project) in 2018. This affects the Government's decision-making on land use and stakeholders' decisions on investments in mining.

Moreover, in a review of Paragraph 1 of the Concept Note for Conducting High-Resolution Airborne Geophysical Survey on West Block-Tanzania of 2024, it was indicated that, high-resolution airborne geophysical data are very useful in mineral and groundwater exploration, oil and gas exploration, planning on land use, construction, environmental and disaster management. This implies that, having a low coverage of high-resolution airborne geophysical surveys of 16% impairs the implementation of the aforementioned activities. On the other hand, it was noted that, conducting high-resolution geophysical surveys would ultimately attract investment in mineral exploration. This results in new discoveries of mineral deposits that can supplement the current mineral resources for sustainable mining operations.

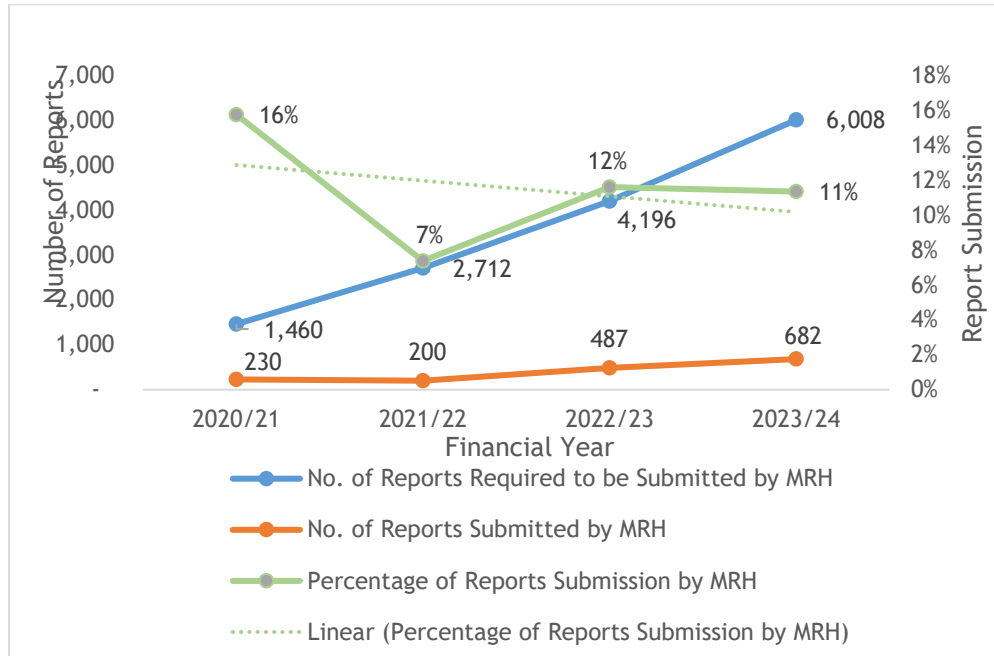
3.2.2 GST did not Ensure Adequate Submission of Geoscientific Data from the Mineral Rights Holders to Enhance its Availability to Investors and Decision-makers

The review of MRH Database and Data Submission Register at GST, as well as Annual Performance Reports for the financial years 2020/21 to 2023/24, noted that there was inadequate submission of MRH geoscientific data. The analysis showed that, during the entire four-year period from the financial year 2020/21 to 2023/24, there was no year in which all MRH submitted reports to GST as required. This was contrary to Rules 5(1) and 7(1) of the Mining (National Mineral Resources Data Bank) Rules of 2021 and Section 27F of the Mining Act, Cap. 123, which requires MRH to submit mineral data to GST. The number of geoscientific reports from MRH with active licenses that were required to be submitted compared to the number of submitted

¹³Concept note for conducting high resolution airborne geophysical survey on West Block-Tanzania, 2024

geoscientific reports to GST from 2020/21 to 2023/24 are presented in Figure 3.1.

Figure 3.1: The Number of Mineral Right Holders with Active Licence Vs Submitted Geoscientific Reports



Source: Auditors’ Analysis of Mineral Right Holders with Active Licences¹⁴ From Mining Commission Vs their Corresponding Reports Submitted to GST, 2024

Figure 3.1 indicates that, MRH did not submit all geoscientific reports to GST. It is further indicated that, for the financial year 2020/21, the number of reports from MRH was 230 out of 1,460; 200 out of 2712 in the financial year 2021/22; 487 out of 4,196 in the financial year 2022/23; and 682 out of 6,008 in the financial year 2023/24. Also, the figure indicates that the number of MRH who are required to submit reports to GST was increasing while the number of submitted geoscientific reports fluctuated with an increase in the financial year 2022/23, and there was a slight decline in the financial year 2023/24.

¹⁴This includes Prospecting Licences and Mining Licences only because the law does not put strict compliance to Small Mining Licenses to submit geoscientific data and reports

Similarly, it was found that, the Data Submission Register at GST does not categorise information submitted by MRH by mentioning if it is reported, geological maps and plans, geophysical and geochemical raw data, processed and interpreted data or maps, technical reports, core samples, or mineral exploration data.

Moreover, interviews with officials from GST indicated that GST recorded information received from MRH without distinguishing whether it was geoscientific data or reports on the implementation of their mining operations. The audit team noted that, GST just recorded the license number of MRH and the duration of information received. Interviews with officials from GST further revealed that this resulted in a challenge to maintaining the statistics of reports submitted by MRH on implementation mining operations and geoscientific data received from MRH.

Furthermore, the audit analysed the number of reports submitted by MRH regardless of the categories of information submitted and compared the number with the number of MRH with active licenses from the Mining Commission for each financial year under review. This found that MRH were not adequately submitting geoscientific data and reports to GST as required.

Consequently, GST did not have adequate detailed information on Geoscientific Data upon request by the Government on areas that were surrendered after the expiry of MRH licences¹⁵. This resulted in GST's need to conduct a study to gather sufficient information to be able to provide advice as requested by the Government for the decision-making process regarding whether the areas should be set aside for investment or not.

The noted inadequacies were attributed to the non-enforcement of rules to ensure MRH submitted data and that the government could use those data for decision-making. The audit team noted that, GST did not have the mandate to take action, such as imposing penalties or revoking licenses of MRH that failed to submit the reports.

¹⁵Correspondence letter with Ref. No. BA.79/192/01/124 dated 21 September 2023 from GST to the Mining Commission

A review of Section 27F (7) of the Mining Act Cap 123 indicated that GST was mandated to prepare rules for better compliance with the submission of reports to GST. However, Rule 14(1) of the Mining (National Mineral Resources Data Bank) Rules 2021, prepared by GST, indicated that the mandate to suspend or cancel the mineral rights (license) of MRH, which fails to comply with the requirements, was mandated to the Mining Commission.

Further, interviews with officials from the Mining Commission indicated that both GST and the Mining Commission have the independence to undertake their roles based on their establishment without being influenced by any entity. A review of licences provided by the Mining Commission and interviews with officials from GST revealed that GST lacked information on active licences. This was an indication of inadequate coordination between the two entities. This, in turn, led to GST being unable to take action since it has no such mandate. Instead, GST only sent letters to remind MRH to submit the reports.

On the other hand, interviews with officials from GST indicated that a bill to amend the Mining Act was submitted to the Parliament to empower them to take action against MRH, which failed to comply with legal requirements. Officials further elaborated that other issues addressed in the submitted bill included the requirement of MRH to submit reports on the implementation of their activities and geoscientific data they obtain in their licensed areas. However, a review of the draft document proposed the amendment as it only covered the introduction of fines for those who submit false information while remaining silent to those who do not submit.

The following sections outline the key factors contributing to limited availability of geoscientific data in the country, which hinders both mining operations and government decision-making.

3.3 GST did not Effectively Acquire, Analyse, and Interpret Geoscientific Data

In a review of Annual Action Plans and Annual Performance Reports for the financial years 2020/21 to 2023/24, it was found that, GST did not effectively acquire, analyse, and interpret geoscientific data to understand the potential mineral resources available. This is mandated through Section

27A, (2) c and f, and Section 27B of the Mining Act CAP 123 R.E 2019] to execute all matters related to geological activities, including acquiring geoscientific data and information. These are as explained in the subsequent sections;

3.3.1 GST did not Acquire Comprehensive Geoscientific Data

The audit team noted that, GST's Investor Guide of Tanzania Mining Sector of 2024 indicate that 97% of the country has been geologically surveyed at scales of 1:250,000, 1:125,000, and 1:100,000, whereas geochemical surveys cover up to 23% of the country by high-density and 84% by low-density. Moreover, 16% of the country is covered by high-resolution airborne geophysical surveys, as indicated in **Section 3.2**.

However, in the review of Quarter Degree Sheets (QDS) Geoscientific reports for the years 2020/21 to 2023/24, and Geoscientific Progress Maps of 2020/21 to 2023/24, it was found that geoscientific data and reports acquired by GST were not comprehensive to inform the potential mineral resources available in the country and therefore the analysis did not consider financial years as the information provided were cumulative. Based on this, the audit had to consider all the data acquired even prior to the period under the audit. The following reasons were attributed to the following:

(i) Absence of Explanatory Notes for High-density Geochemical, Low and High-Resolution Geophysical Data

Based on the analysis of the high-density geochemical survey maps on sampled QDS, the Audit team found that, up to 3 October 2024, GST conducted high-density geochemical surveys to 74 QDS out of 322 QDS countrywide. This coverage was equivalent to 23%, as indicated in **Section 3.2.1 (ii) of this report**. However, the audit team found that seven out of nine sampled QDS for high-density geochemical surveys did not have explanatory notes showing the sampling techniques, results, catchment areas, analysis, and interpretation.

The review of Progress Maps on the sampled QDS for high-density geochemical surveys showed that these surveys were carried out by

organisations such as the United Nations Development Project (UNDP), Broken Hill Proprietary Company (BHP), Diamond Exploration Company (Tanex), Joint German Tanzania Gold Project (BGR) as well as joint survey programs such as GST and China Geological Survey (CGS) and GST and Nordic Fund Development (NDF) and Sustainable and Management of Mineral Resource Projects (SMMRP) and GST itself. However, it was noted that these surveys did not have explanatory notes that describe the analysis and interpretation of the acquired raw data, except for the high-density geochemical survey carried out by SMMRP on QDS 101 and 162.

Based on this fact, it was difficult to access maps and understand the interpretation of different mineralisation anomalies from raw data. In this regard, the raw data is required to be processed to get maps with anomalies. Similarly, it was difficult to make recommendations to establish the basis for follow-up on the mineralisation anomalies in most potential areas. Details on the coverage of high-density geochemical data from seven geochemical surveys conducted by different organisations are provided in Table 3.4.

Table 3.4: The Status of High-density Geochemical Data

Project	Year ¹⁶	Total No. of QDS Covered	QDS No. of Reviewed QDS	Status of Geochemical Data	
				Raw Data	Explanatory Note
United Nations Development Project (UNDP)	1975-1977	11	8	✓	×
GST & NDF ¹⁷	2003-2007	5	62 and 153	✓	✓
GST	1988-2003	35	95	×	×
Sustainable Management of Mineral Resource Projects (SMMRP)	2013-2014	9	101 and 162	✓	✓

¹⁶ GST had not carried out any high-density geochemical survey for the period under review

¹⁷ QDS No. 305 was replaced by QDS No. 153 after noticing that it was not Surveyed on high density geochemical survey

Project	Year ¹⁶	Total No. of QDS Covered	QDS No. of Reviewed QDS	Status of Geochemical Data	
				Raw Data	Explanatory Note
GST & CGS (China Geological Survey)	2018	6	244	√	×
Western Rift Co Ltd (BHP)	1956-60	2	29	√	×
Diamond Exploration Company (Tanex)	1992	7	79	√	×
Joint German Tanzania Gold Project (BGR)	1988-91	1	62	√	×
Total		74	9		

Source: Auditors' Analysis of Raw Data and Explanatory Notes for Respective QDS for High-Density Geochemical Survey, 2024

Key

- √ : Available
- × : Not available

Table 3.4 shows that only 2 projects, namely SMMRP (1975-1977) and GST & NDF (2003-2007) for conducting a high-density geochemical survey, had raw data and explanatory notes. On the other hand, it is indicated that neither raw data explanatory notes for QDS No. 95 were acquired, which were covered through the project carried out by GST in collaboration with NDF. However, in a review of the Brief Explanation to the Geology of QDS 95 (Mtego-wa-Noti), 2010, it was found that, samples for the geochemical survey were taken as part of the geological mapping, which indicates that the geochemical survey has been partially conducted.

Moreover, during interviews with GST officials, it was elaborated that raw data and corresponding explanatory notes for high-density geochemical surveys were not submitted because there were no rules and regulations requiring the organisations to submit them at that time. However, the audit noted that this was done through signing a Memorandum of Understanding (MoU). In the review of the Memorandum of Understanding, it was found

that the deliverables were not clearly set, and there were no clear roles and responsibilities of each part. Instead, the MoU set the areas of collaboration such as Mineral resources assessment and research on regional ore-forming systems; Strengthening the Geological Survey of Tanzania through instrumentation, software upgrading and training; Modern technology and methodology applications in regional geological, geophysical and geochemical surveys; processing geo-samples and analyses; and geo-data analysis; and sedimentary basin analysis, energy resources evaluation and hydrogeological investigations. This implies that, GST did not ensure that MoU contained the required terms and conditions as well as the deliverables.

Further review of sampled QDS details from GST’s geoscientific database indicated that, GST maintained unprocessed raw geophysical data for both low—and high-resolution geophysical surveys in its database. However, reports that were the basis for interpreting the acquired geophysical data for both low and high resolution were not prepared. The status of low-resolution geophysical data is provided in Table 3.5.

Table 3.5: The Status of Completeness of Low-Resolution Geophysical Data

QDS Index No.	Status of Availability of Raw Data	Status of Availability of Explanatory Note	Audit Remark
45	✓	×	Analysis and interpretation were not done on all selected QDS
55	✓	×	
80	✓	×	
91	✓	×	
187	✓	×	
196	✓	×	
263	✓	×	
282	✓	×	
314	✓	×	
318	✓	×	
Total	10	0	

Source: Auditors’ Analysis of Raw Data for Respective QDSs for Low-Resolution Geophysical Surveys from GST’s Database, 2024

Key

- ✓ : Available
- × : Not available

Table 3.5 shows that for the past four financial years under review, GST has not been able to process and analyse the QDS’ raw data and issue geophysical survey reports for both low- and high-resolution geophysical surveys. This implies that, the GST’s database only kept raw and processed data without explanatory notes or reports of those raw data.. In this regard, the practice used was not useful in providing insights into the available geophysical features of the surveyed QDS.

Likewise, a review of the high-resolution geophysical survey data from GST’s database revealed that high-resolution geophysical surveys conducted for selected QDS did not have corresponding explanatory notes or reports of the processed data that are yet to be analysed and interpreted. The explanatory notes could have indicated the details about data capture, which could specify the flight distance from the surface, line direction, and line spacing and show the type of survey equipment used, such as an aeroplane or helicopter. Further, these explanatory notes could have indicated the interpretation techniques used. Consequently, these data were not clear and useful to users such as miners, investors and decision-makers. The completeness of high-resolution Geophysical Data for selected QDS is indicated in **Table 3.6**.

Table 3.6: The Status of Completeness of High-Resolution Geophysical Data

QDS No.	Status of Availability of Raw Data	Status of Availability of Explanatory Note	Audit Remark
78	J	x	Analysis and interpretation were not done on all selected QDS
84	x	x	
107	x	x	
127	x	x	
142	J	x	
144	J	x	
153	J	x	
167	J	x	
312	J	x	
Total	6	0	

Source: Auditors’ Analysis of Selected QDS Information from GST's Database, 2024

Key

- J : Available
- x : Not available

Table 3.6 shows the status of acquired high-resolution data. Out of 9 sampled QDS, 6 had resolution raw geophysical data. These were QDS with index numbers 78, 142, 144, 153, 167, and 312. The audit team inquired about the raw data for 3 QDS, namely 84, 107, and 127, and noted that these QDS had neither raw data nor respective reports, as confirmed by officials from GST during interviews.

Moreover, the audit team noted that, the submission of reports was not a requirement on the signed memorandum of understanding (MoU) of which, upon its review, the deliverables and other necessary terms and conditions were not clearly set, there was no clear set of roles and responsibilities for each part. They only set areas of collaboration, which include Mineral resources assessment and research on regional ore-forming systems; Strengthening the Geological Survey of Tanzania through instrumentation, software upgrading and training; Modern technology and methodology applications in regional geological, geophysical and geochemical surveys; processing geo-samples and analyses; and geo-data analysis; and sedimentary basin analysis, energy resources evaluation and hydrogeological investigations. This indicates that GST did not ensure its MoU contained the required deliverables and other necessary terms and conditions.

Based on these facts, the absence of comprehensive geoscientific survey data and reports which were based on high-resolution geophysical surveys and high-density geochemical surveys, has hindered GST's assessment of the actual potential mineral resources that could be available in the identified QDS in the country. This, therefore, led to GST not having comprehensive and sufficient geoscientific data, as individual MRH were undertaking these surveys during prospecting or mining. Hence, due to that, GST was not in a position to adequately advise the government on geo-scientific matters and assist members of the public seeking information concerning geological matters as required in Section 27A, (2) (c) and (f), and Section 27B of the Mining Act Cap. 123.

(ii) GST's Geological Surveys Reports had Insufficient Details Required for Mining Activities

Based on the review of QDS explanatory notes, it was revealed that the QDSs reports contain three important parts as follows: The first part is Geological Structural analysis, which provides the observed structures that are the possible area of mineral deposition. The second is the results and interpretations that provide analysis and interpretation of geophysical, remote sensing, field observation, laboratory test result data, and the geological map, which contains geographical information. The third part describes the mineral occurrence and economic potentiality that provide for mineral resources present in the area, as well as the quantity and quality of the mineral resources observed.

During the review of sampled QDS reports, the audit found that the QDS content contained insufficient details required to facilitate mining activities, as presented in **Table 3.7**.

Table 3.7: The Status of Contents of QDS on Geological Reports

QDSs No.	Last Surveyed Year	Published	Geological Maps /Sketch	Structural Analysis	Analysis and Interpretation	Economic Geology
88	1965	1:125,000	×	✓	✓	✓
182	1963	1:125,000	×	✓	×	✓
32	1959-60	1:125,000	✓	✓	×	✓
152	1972	1:125,000	×	✓	×	✓
232	1962	1:125,000	✓	×	×	✓
51	1961	Not published	×	✓	×	✓
8	1967	Not published	✓	✓	×	✓
47	1937-39 and 2000	Not published	×	✓	✓	✓
120	1993	Not published	×	✓	×	✓
127	1967	Not published	×	✓	✓	✓
157	2007	Not published	×	✓	✓	✓
165	1968	Not published	×	✓	×	✓
54	1963	1:125,000	×	✓	×	✓
64	1939	1:250,000	-	-	-	-
80	1966	1:125,000	-	-	-	-

QDSs No.	Last Surveyed Year	Published	Geological Maps /Sketch	Structural Analysis	Analysis and Interpretation	Economic Geology
216	1970-71	Not published	-	-	-	-
305	1976	Not published	-	-	-	-
225	1962	1:125,000	-	-	-	-
45	1965	1:100,000	✓	✓	×	✓
53	1963	1:125,000	✓	✓	✓	✓
75	2020	1:100,000	✓	✓	✓	✓
89	1963	1:100,000	✓	×	×	✓
132	1959	1:100,000	✓	✓	×	✓
142	1963	1:100,000	✓	✓	✓	✓
148	2014	1:100,000	✓	-	-	✓
204	2022	1:100,000	✓	✓	✓	✓
278	2018	1:100,000	✓	✓	✓	✓

Source: Auditors' Analysis of Sampled QDS Selected Geological Reports, 2024

Key

- ✓ : Available
- × : Not available
- : No report provided

As indicated in **Table 3.7**, five out of 28 QDS did not report on minerals' economic significance value, while 12 out of 28 QDS missed laboratory analysis and interpretation. Further review of QDS indicated that 10 out of 28 QDS had a geological map/sketch of the surveyed area. This means that, it is difficult to identify, visualise, and locate mineral resources presented in the surveyed area. Moreover, a review of the 13th GST Ministerial Advisory Board Meeting Minutes dated 18 January 2023 indicated that, a limited budget led to working for 34 days instead of 60 days during data collection, which narrowed the scale of work as well as the details.

It was further noted that QDS 64, 80, 216, and 305 had no reports because they were conducted a long time ago between 1939 and 1976, and hence, their reports could not be traced because of improper documentation. However, the audit noted that, improper record-keeping was a critical matter regarding the missing QDS. As observed by the audit team during data collection, this was caused by improper organisation and storage of geoscientific data as well as inadequate arrangement of archived documents.

On the other hand, in an analysis performed on the geological progress map, the audit team noted that about 42.13% of published geological maps were done under a small scale of 1:250,000 and 1:125,000 as in **Table 3.1**. Meanwhile, GST indicated that they preferred a scale of 1:100,000 for publication of the geological reports and maps, as emphasised in the GST Strategic Plan (2020/21-2024/25), to strive to update QDS to this scale of 1:100,000 as explained in Section 3.2.1. This implies that, having geological maps published on a small scale portrays geological features in a general manner, which provides inadequate geological information. Consequently, it becomes difficult for investors to identify actual places and initiate mining operations.

(iii) Ineffective Updating of QDS Information

Based on GST Strategic Plan of 2020/21 to 2024/25, GST introduced an initiative to update important geological information, including uncertainty of lithological boundaries, detailed structural interpretations, and mineral occurrence data in existing 10 QDS from the scale of a 1:125,000 to 1:100,000. GST planned to update the geological information in two QDS every year, which means that for the period under the audit, namely 2020/21 to 2023/24, GST was required to update a total of eight QDS.

However, the review of GST’s Annual Performance Reports for the financial years 2020/21 to 2023/24 revealed that GST managed to conduct an update to only two QDS, namely number 125 (Mrijo) and 126 (Kibaya), during the financial year 2022/23, while there was no implementation of the planned update activities for the remaining six QDS in the subsequent financial years of 2020/21, 2021/22 and 2022/23. The details of planned update activities for the past four financial years and the actual implementation is provided in **Table 3.8**.

Table 3.8: The Percentage of Updating the Existing QDS Geological Mapping through Strategic Mineral Potential Mapping

Financial Year	Planned	Conducted
2020/21	0	2
2021/22	0	1
2022/23	2	2
2023/24	2	0

Source: Auditors’ Analysis Geological Map Progress, 2024

Table 3.8 shows that in the financial years 2020/21 and 2021/22, GST did not plan to update the geological maps of any existing QDS as required by the strategic mineral potential mapping programme. However, GST managed to update two QDS and one QDS in the financial years 2020/21 and 2021/22, respectively. A review of the Explanatory Notes for the two QDS, namely QDS 74 and 74W, which were updated in the Financial Year 2020/21, indicated that GST planned to update them in the Financial Year 2019/2020.

On the other hand, a review of Annual Action Plans for the financial years 2022/23 and 2023/24 revealed that GST Planned to update QDS based on the indication of the type of minerals (Strategic or critical minerals) and not as part of its normal annual planning. However, GST planned to update four out of eight QDS for the financial years 2022/23 and 2023/24, respectively. They planned only for four QDS in 2 financial years because, according to the strategic plan for 2020/21 to 2024/25, they planned to conduct two QDS per year. Both the GST annual action plan for the financial year 2022/23 and 200023/24 and the GST strategic plan for 2020/21 to 2024/25 just indicated the number of QDS to be updated without being specific to the name of QDS. However, the updated QDS for the financial year 2021/22 is QDS 316, and those updated in the financial year 2022/23 are QDS 125 and 126.

The audit team noted that, GST did not plan to update existing QDS due to inadequate initiatives to emphasise the updating of QDS based on strategic or critical minerals.

This implies that, ineffective updating of QDS information hinders the objective of upgrading the existing geological information regarding the mineralisation potential of the area as a result of outdated data. This consequently made it difficult for the Government, investors, and stakeholders to make informed decisions on resource exploration and extraction. Likewise, updating the QDS information aimed to harmonise geological boundaries with adjacent QDS could have caused inconsistencies in geological structures that are vital in controlling mineralisation but have not been realised either.

3.3.2 GST did not Adequately Analyse and Interpret the Submitted Geoscientific Data

Rule 8 of the Mining (National Mineral Resources Data Bank) Rules of 2021 mandates that the Chief Executive Officer of GST or any authorised person to verify the mineral data, database, reports, or information submitted before keeping or storing them.

Based on the reviews of selected geoscientific reports from MRH, the Audit team noted that, GST did not analyse and interpret raw geoscientific data submitted by MRH. It was further noted that, GST only prepared a submission checklist of Geoscientific data acquired from MRH to check whether all necessary information was submitted. However, GST did not process and analyse the submitted data to check its accuracy and completeness and prepare analytical reports.

Based on the review of the Annual Action Plans of 2020/21 to 2023/24, the audit revealed that the analysis and interpretation activities for both acquired and submitted data from MRH were not part of the planned activities in the respective Annual Action Plans for the financial years 2020/21 to 2023/24, and no budget was allocated for carrying out those activities, which contravene the requirement of the GST Strategic Plan.

Moreover, the audit team further noted that, GST conducted verification on Saza Makongorosi Projects, previously owned by M/s Winshear Gold Corp, in April 2024. However, the review of Exploration Results and Mineral Resources of the Saza-Makongolosi Project, 2024 noted that it was done after being tasked by the Ministry of Mineral to conduct due diligence to verify the authenticity of the data submitted to the Government by M/s Winshear Gold Corp. This indicates that verification was not a GST initiative but rather the Ministry of Mineral Initiatives. In executing the assignment, GST reported that, to assess mineral resources, STAMIGOLD granted GST temporary access to the Datamine software for mineral resource estimation.

On the other hand, the review of documents based on the correspondence files of MRH at GST indicated that GST did not understand the use of codes, nomenclature, spatial reference systems, file extensions, and other

parameters related to mineral data submitted by MRH. It was further noted that, such parameters were used to protect the confidentiality of data submitted by MRH.

This emanates from the fact that, each MRH had own coding, terminology, and spatial reference systems, as evidenced in the letter with Ref. No. BA.79/192/01/51 dated 13 January 2023 from GST to one of MRH requesting industrial training on data management. The training aimed to equip GST staff to understand types of coding, nomenclatures, and spatial reference systems as different MRHs used different geological models. Difficulties in understanding these parameters, codes, terminologies, etc; hindered the analysis and interpretation of submitted geoscientific data to GST by MRH. As a result, GST could not perform the important role required.

Reasons for Ineffective Acquisition and Analysis of Geoscientific Data

The noted ineffectiveness in the acquisition and analysis of geoscientific data was mainly caused by the inadequate capacity of GST in terms of equipment/tools, funds, and human resources, as detailed as follows:

a) Inadequate Laboratory Tools to Facilitate the Geoscientific Data Analysis

In order to ensure that GST had adequate capacity to conduct geochemical and geophysical analysis, equipment was required to enhance the analysis of the survey results. However, the audit team found that, GST had not managed to establish capacity in terms of laboratory tools.

This was evidenced in a review of the laboratory tools and equipment register at GST, along with on-site verifications, which ascertained that, there were several factors contributing to insufficient results from geological mapping and geochemical surveys. These included the absence of modern laboratory tools, the presence of non-functional equipment, an inadequate number of tools, the inability of existing equipment to conduct geophysical surveys, the lack of software for geoscientific data analysis and interpretation, and delays in the procurement of geological equipment.

(i) Absence of Modern Laboratory Tools for Data Analysis and Interpretation

During interviews with officials from GST at the Laboratories of Dodoma and Geita, it was noted that, there was an absence of Modern tools to facilitate the analysis and interpretation of geoscientific data. This led to GST not having sufficient results from lab tests that correspond to geological and geochemical surveys carried out. The list of required laboratory tools that were noted to be unavailable at GST is indicated in **Table 3.9**.

Table 3.9: The List of Un-available Laboratory Tools for Analysis of Geoscientific Data

Aspect	Equipment Name	No. of Equipment Required
Sample Preparation	Heavy Duty Laboratory Oven	4
	Cupellation Furnace	2
	Fusion Furnace (Diesel/Gas)	2
	Jaw Crusher with Splitter	1
Sample Analysis	ICP-MS	2
	Flame Photometer	2
	CHNO Analyzer	2
	Thermogravimeter Analyzer	2
	Moisture Analyser	2
	Bomb Calorimeter	2
	X-ray diffractometer (XRD) Analyser/stand-alone	1
Total		22

Source: Auditors' Analysis of GST's Laboratory Equipment Register, 2024

Table 3.9 shows that 22 laboratory tools were unavailable at GST's laboratories to facilitate sample analysis of geoscientific data. These 22 laboratory tools, nine tools were for sample preparation, while 13 were for analysis.

Based on the interview conducted with GST's officials, it was commented that, instruments which were unavailable were vital for revealing the geochemical signatures that point to the presence of valuable minerals since they can conduct detailed analyses of samples, identifying the minerals present in the sample. They can detect rare earth elements with

high precision, unlike the available tools, which most of them can use to analyse the elemental composition of the sample from the surveys.

On the other hand, a review of the Ministerial Advisory Board Meeting Minutes of 23 September 2023 revealed that, GST was missing 2 additional equipment, which were ICP-MS (used to measure elements at trace levels in biological fluids) and XRD Analyser (used to analyse structural information such as chemical composition, crystal structure, crystal size, deformation, preferred orientation and layer thickness). Further inquiry revealed that GST has been planning to procure the two equipment in the past two financial years, which were 2022/23 and 2023/24, but they were not implemented.

The unavailability of modern equipment poses a risk in identifying the mineralogical information in the sample from geoscientific surveys, leading to insufficient databases and unreliable statistics.

(ii) Presence of Non-functional Tools

In the review of register for laboratory tools/equipment at GST and verifications conducted at GST’s laboratories. It was noted that, there was the presence of non-functional tools for geoscientific data analysis and interpretation. The list of equipment that was non-functional is presented in Table 3.10.

Table 3.10: The List of Non-functional Tools for Data Analysis

Equipment Name	Available	Non-operational	Operational
Eppendorf Centrifuge	1	1	0
Belt Pulveriser	1	1	0
Swing Mill (Argate)	1	1	0
Nitrogen Generator	1	1	0
UV Photo spectrometer	3	2	1
XRF	5	3	2
ICP OES	1	1	0
AUTO Sampler	1	1	0
Modular Cooling System	1	1	0
Recirculating Chiller	1	1	0
Total	16	13	3

Source: Auditors’ Analysis of GST’s Laboratory Tools Register, 2024

Table 3.10 shows that, 13 out of 16 tools for sample analysis were not operational. It is also indicated that, 1 out of 3 available UV Photo spectrometers and 2 out of 5 available XRF were operational.

Moreover, it is further indicated that, except for the two tools, namely UV Photospectrometer and XRF, GST had only one tool for the remaining tools in its laboratory. However, all these tools were not operational.

Similarly, physical verification of laboratory tools and equipment carried out at the two GST laboratories in Dodoma and Geita revealed the presence of laboratory equipment that was defective and not in operation due to inadequate maintenance. Further review of GST’s Annual Performance Reports for the financial years 2020/21 to 2023/24 noted that GST had been reporting on the challenges related to the maintenance and servicing this laboratory equipment.

Moreover, during interviews with GST officials, it was noted that the expertise in maintaining equipment used by GST activities, such as geological, geochemical, and geophysical surveys, was not locally available, and hence, the defective equipment had to be shipped to suppliers for maintenance. The procurement process perpetrated the absence of timely maintenance and repair of the equipment. GST has been planning to procure equipment for replacement but has not managed for the past three financial years.

(iii) Insufficient Number of Tools for Analysis of Geoscientific Data

A review of the laboratory tools and auditors’ verification at GST’s laboratory revealed that the number of equipment required by GST was not adequate. **Table 3.11** indicates the analysis of the tools available, required, and lacking in the GST laboratory.

Table 3.11: The List of Available and Required Tools for Data Analysis

Equipment Name	Available	Required	Deficit
Eppendorf Centrifuge	1	2	1
Drying Oven	3	6	3
Muffle Furnace	3	6	3
Fusion Furnace	3	10	7
Flask Shaker	1	3	2

Equipment Name	Available	Required	Deficit
Jaw Crusher	2	5	3
Sample Divider	1	3	2
Riffle Splitter	1	5	4
Sieve Shaker	6	10	4
Sample Divider (Glass)	1	5	4
Fume Hood	1	3	2
Micro Wave Digester	1	2	1
Distiller Machine	1	4	3
Atomic Absorption Spectrometer	3	6	3
UV Photospectrometer	3	5	2
XRF	5	8	3
CS Analyser	1	2	1
ICP OES	1	2	1
Modular Cooling System	1	2	1
Analytical Balance	3	8	5
Stirrer Machine	1	2	1
Recirculating Chiller	1	2	1
Generator	1	2	1
Total	45	103	58

Source: Auditors' Analysis of GST's Laboratory Equipment Register, 2024

Table 3.11 indicates that 45 out of 103 tools were available. However, those tools were less than the requirement by 58 tools. This insufficiency causes difficulties for GST in undertaking their roles timely.

(iv) Available Equipment does not have the Capacity to Conduct High-Resolution Geophysical Surveys at a Large Scale

The interviewed officials from GST indicated that GST has no capacity to conduct high-resolution geophysical surveys because they do not have equipment to facilitate such activities. They said the required equipment is a helicopter or drone, which GST currently does not have.

However, the available equipment can be used in small areas with coverage of not more than 10 hectares. They further elaborated that the available equipment can be used in small areas or designated for small-scale miners but not for covering QDS because it can take a very long time to complete

one QDS. The audit team noted that, the capacity of equipment available can cover small areas. This hinders GST from conducting high-resolution geophysical surveys in the country using equipment they currently own.

The Audit Team assessed the available equipment and its functionality status and found that GST had a total of 160 out of 4,594 equipment available for high resolution. The capacity of available equipment is presented in **Appendix Seven**.

(v) Absence of Software for Geoscientific Data Analysis and Interpretation

Interviews with officials from GST revealed that, GST did not analyse and interpret geoscientific data from Mineral rights holders because GST did not have mineral resource estimation software capable of performing geostatistical analysis and developing comprehensive resource models. It has to be noted that, with mineral estimation software, a geologist or analyst can calculate the volume and quality of materials within the extent of an area under investigation, and it can create reports of any geological object based on international standards.¹⁸

Moreover, interviews with officials responsible for data analysis indicated that GST was still in discussion regarding the type of software to procure since each individual MRH uses different mineral estimation software for the preparation of mineral data submitted to GST. This was confirmed in a review of documents in which one of the GST letters to MRH, dated 2 August 2022, with Ref. No. BA.79/192/01/09 showed that, GST requested for opportunities to learn about the efficiency and adequacy of the software so that they could make an assessment and select the one that would suit them best. However, up to the time of this audit, which was November 2024, they had not been able to get software compatible with all software used by MRH. Hence, at the moment, the process is still in progress.

In order to analyse the data from the respective MRH, GST requires specific software that is either similar to or compatible with the one used by MRH. On the other hand, interviews with officials from GST emphasized that, there were no established official software specifications from GST office

¹⁸ <https://www.3ds.com/products/geovia/surpac>

to be used by MRH. This led to each investor using software with different technologies from each other to undertake the mining operations in the country.

According to an interview with GST officials, it was elaborated that, GST was trying to find software compatible with the software used by MRH, but the intended software was not in place until the time of this audit in September 2024. This was due to the fact that no single software has been obtained that is compatible with all available software, such as Datamine, Surpac, and Vulcan.

Based on these facts, there were various reasons for not having software, which include;

- (i) Non-availability of single software that can be compatible with all software used by mining companies; and
- (ii) The installation of one software among the available ones can only enable analysis from mining companies using that software. This posed a great challenge to GST, particularly in securing appropriate software with the technology that can be compatible with all the available technologies used by various mining companies.

In this regard, GST's lack of software for mineral resource verification/estimation makes it difficult to conduct verification on resource estimations on various licences. Due to the fact that, GST cannot verify mineral resource estimation. This implies that, it is difficult for GST to provide geoscientific advice to the Government in order to make informed decisions. This has made it difficult for the Government to ascertain whether the area that has been legally abandoned or surrendered by MRH should be set aside for investment, small-scale miners, or left open.

The audit further noted that, GST managed to conduct verification of mineral estimation for the Saza Makongorosi Project by using software from MRH (STAMIGOLD) after being granted temporary access to the Datamine software. This mining project was formally under M/s Winshear Gold Corp, which is currently under the Government.

(vi) Delays in the Procurement of Geological Equipment

In the review of procurement plans and procurement documents, it was found that, there was a delay in procuring the geological equipment to enhance the acquisition of geological information. For instance, it was noted that in the financial year 2023/24, GST planned to procure three equipment, namely: GPS Clock server - Handheld GPS (4 pcs); Laptop Computers - Panasonic Tough Book 55 (4 pcs); and Analytical of Scientific Software - Gas Analyser (1 set).

However, the Audit found that, the procurement was not finalised despite the process beginning in the financial year 2023/24 (12 October, 2023). Further review of procurement file for the named equipment showed that the process has been in the evaluation stage since 7 January 2024. It was also found that, GST procured and installed geological equipment (Computer and ICT) for the past four financial years in the financial year 2022/23.

The procurement of other geoscientific equipment, such as installation of geological equipment, seismic equipment, geological investigation facilities, and generators, was not implemented as planned. These equipment were either not procured or the procurement process was not completed up to the completion of this audit. The reason for delays was due to the equipment not being included in the GST action plans and the non-disbursement of the planned budget. Details of these equipment are provided in **Appendix Eight**.

Moreover, the audit assessment revealed that there had been delays in procuring geoscientific equipment as GST has not been procuring geoscientific equipment in a timely manner. The delay ranges between 0.87 to 2 years for the financial years 2022/23 and 2023/24, respectively. Whereas, in the financial years 2020/21 and 2022/22, no geoscientific equipment was procured as it was not included in the GST action plans. The extent of the delay for the selected incomplete procurements of equipment up to September 2024 is indicated in **Appendix Nine** of this report.

Furthermore, for laboratory equipment, a review of the procurement plans and corresponding reports revealed that GST has been planning to procure listed laboratory equipment but has not finalised such procurement. This

was observed in the financial year 2020/21, in which GST planned to procure laboratory equipment and installation services through tender No. AE/059/2020-2021/G/09 in its respective annual plan with a total of TZS 1,250,000,000. However, the procurement was not completed up to the time of the audit in November 2024. The details of selected equipment that was intended to be procured by GST since the financial year 2020/21, but its procurement has not been finalised, is indicated in **Table 3.12**.

Table 3.12: The Status of Procurement of Other Lab Geoscientific Equipment

Financial Year	Tender No	Planned Purchase (Sampled Goods/Equipment)	Status
2020/21	AE/059/2020-2021/G/08	Supply of laboratory chemicals and equipment	Not procured
	AE/059/2020-2021/G/09	Supply of Laboratory equipment and installation	Not procured
	AE/059/2020-2021/G/10	Supply of laboratory supplies	Not procured

Source: Auditors' Analysis of GST's Procurement Plans and Reports for the Financial Years 2020/21 to 2023/24

Table 3.12 shows that GST planned to procure laboratory equipment and materials in the financial year 2020/21 to enhance geoscientific laboratory tests and analysis of mineral samples. It can be noted that, despite planning to procure laboratory equipment for sample analysis in that particular year, GST did not accomplish its plans. However, it was noted that the procurement of laboratory chemicals planned for the financial year 2020/21 was implemented in the financial year 2023/24 through contract no. TR120/2023/2024/G/96/CR/14, which was signed on 8 July 2024 and 5 August 2024 by the supplier M/S Taxgen Corporation Ltd and the Chief Executive Officer of GST, respectively, although it was not in the respective Annual Procurement Plans.

Therefore, non-completion of procurement of such equipment renders the geological survey activities stagnant as the acquired samples could not be analysed and processed to obtain geoscientific data for mineral resource investors and decision-makers. The reasons for the non-completion of this procurement were inadequate planning and disbursement of the planned budget in the respective financial year, as presented below.

(i) Inadequate Planning

Based on the review of Procurement Plans for the financial years 2020/21 to 2023/24, the audit revealed that, GST plan to procure Geological equipment was not finalised due to inadequate planning as they did not include it in their annual corresponding action plan, this practice hinders the GST's ability to conduct geological survey effectively. This potentially affects their operational efficiency and delays the completion of the surveys. The details of the planning and disbursement of funds for the procurement of geological equipment are presented in **Table 3.13**.

Table 3.13: The Status of Planning and Disbursement of Funds for Procurement of Geological Equipment

Financial Year	Tender No	Planned Purchase (Sampled Goods/Equipment)	Budget in the Action Plan
2020/21	AE/059/2020-2021/G/08	Supply of laboratory chemicals and equipment	Not included in the Action plan.
	AE/059/2020-2021/G/10	Supply of laboratory supplies	Not included in the Action plan.
2022/23	AE/059/2022-2023/G/20	Supply of Geological field consumables, gear, and equipment	Not included in the Action plan
	AE/059/2022-2023/G/21	Supply of geological investigation facilities	Not included in the Action plan.
	AE/059/2022-2023/G/54	Supply of tents and camp equipment	Not included in the Action plan.
2023/24	AE/059/2023-2024/G/94	Supply of generators	Not included in the Action plan.
	AE/059/2023-2024/G/78	Geological equipment (Tough Book, GPS, IRIS, Gas analyser, Magnetometers, etc.)	Not included in the Action plan.

Source: Procurement Plan, Annual Action Plan, and Annual Implementation Reports for the Financial Year 2021/21 and 2022/23

Table 3.13 indicates that, for a total of seven planned procurements of the geological equipment, GST did not include planned procurements in the Annual Action Plans. Meanwhile, no budget was disbursed to finalise the plan.

(ii) Insufficient Disbursement of Funds

Through the review of procurement plans, the audit revealed that GST could not finalise the procurement of laboratory materials due to insufficient or unallocated funds, for example, in Tender No. AE/O59/2020-2021/G/09 (Supply of Laboratory Equipment and Installation), GST allocated an amount of only TZS 39,566,681 out of the total required amount of TZS 80,695,267, covering just 49% of the budget. Similarly, in the Tender No. AE/O59/2022-2023/G/13 (Supply of Crucible-Making Materials), no funds were allocated, preventing the finalisation of the procurement plan. This practice led to delays in acquiring laboratory materials, potentially affecting GST's laboratory operations. The details of the planning and disbursement of funds for the procurement of laboratory materials are shown in Table 3.14.

Table 3.14: The Status of Planning and Disbursement of Funds for the Procurement of Laboratory Materials

Financial Year	Tender No	Planned Purchase (Sampled Goods/Equipment)	Budget in the Action Plan	Disbursed Budget
2021/22	AE/O59/2020-2021/G/09	Supply of Laboratory equipment and installation ¹⁹	80,695,267	39,566,681.8
2022/23	AE/O59/2022-2023/G/13	Supply of crucibles-making materials ²⁰	239,200,000	0

Source: Procurement Plan, Annual Action Plan, and Annual Implementation Reports for the Financial Year 2021/21 and 2022/23

Table 3.14 indicates that, GST has included two planned procurements in the Annual Action Plans. These were the procurement of laboratory equipment and installation and supply of crucibles-making materials. Despite these two equipment being included in the Annual Action Plans, the disbursed funds were less than 50% for the supply of laboratory equipment and installation in the financial year 2020/21; the disbursed amount was used for maintaining and servicing laboratory equipment and not acquiring

¹⁹ This was under activity code C01S06 which was to acquire, maintain and service lab equipment and software

²⁰ This was under the activity code D01S07

of new laboratory equipment. Thus, there were no fund releases for the supply of crucibles-making materials.

b) Inadequate Human Resources from the Directorates of Geological Services and Directorate of National Geoscientific and Minerals Database at GST

It was noted that, GST requires sufficient human resources to ensure effective acquisition and analysis of geoscientific data. After reviewing the staff establishment on staffing level as of 2023 at GST, the analysis showed that there was insufficient number of staff compared to the required number of staff, as detailed in **Table 3.15**.

Table 3.15: The Staff Requirement at GST

Name of required professional	Required number of staff	Available number of staff	Additional Staff Required
Geologist	78	38	40
Technicians	39	29	10
Chemist	15	8	7
Engineers	20	12	8
ICT officers	6	2	4
Librarians	4	3	1
Information Officers	3	1	2
Total	165	93	72

Source: Auditors' Analysis of GST's Staff Establishment, 2023/24

Table 3.15 shows that 93 out of 165, which is equivalent to 56% of the required staff, are available to manage geoscientific data activities at GST. This analysis is specifically conducted at the directorates of Geoscience Database, Geological Services, and Laboratory Services. This indicates that, GST has a human resource shortage of 72 personnel in the directorates responsible for managing geoscientific data. This hinders the effectiveness of the acquisition and analysis of geoscientific data.

The Audit Team carried out further assessment to establish the productivity of the current staff level based on the expected output. The audit noted that, for the financial year 2023/24, using the available staff, 2 planned activities from the Directorate of Geological Services were not

implemented. These activities were geological mapping in two unmapped QDS and strategic mineral potential mapping in two QDS.

Moreover, three planned activities from the Directorate of National Geoscientific and Minerals Database were not implemented, including Processing satellite images for 10 QDS, collection and capturing of metadata for 1,000m of core samples, and Collection of 100 specimens for Geomuseums were not implemented.

It has to be noted that, the assessment was carried out based on the main factors that give the output of GST, including (i) the number of available staff, (ii) output produced, and (iii) expected (planned) output. The details on the productivity of staff based on the number of available staff at GST are provided in **Appendix Ten** of this report.

Furthermore, in the review of the action plan from GST, it was noted that GST planned to recruit new staff for two financial years, 2022/23 and 2023/24. However, a review of the annual performance report for the two years indicated that, it was not implemented as planned, as indicated in **Table 3.16**.

Table 3.16: The Number of Planned Staff for Recruitment VS Employed Staff

Financial Year	2020/21	2021/22	2022/23	2023/24
Planned No. of staff	0	0	26	15
No. of Staff Employed	0	0	29	18

Source: Auditors' Analysis of Action Plans and Annual Performance Report, 2024

Table 3.16 indicates that for the financial year 2023/24, GST recruited 18 new staff; for the financial year 2022/23, GST recruited 29, 3 more than 26 required new staff. In the review of documents, a correspondence letter with Ref. No. AB.10/267/04/11 and AB.10/267/04/19, both dated 22 June 2023, indicated that the President's Office - Public Service Management and Good Governance had granted the permit to GST to recruit new staff.

Moreover, during interview with officials from GST, it was revealed that the required new staff were included in the Annual Action Plans for the financial years 2022/23 and 2023/24 to cover the staff shortage. However,

in the financial years 2020/21 and 2021/22, GST did not plan to recruit new staff despite the shortage of staff.

On the other hand, it was further noted that, GST had taken the initiative to request permission to recruit new staff to enhance their scheme of service, whereas, on 21 July 2022 and 6 April 2023, GST received letters of permission to recruit 7 and 12 personnel, respectively. It was further noted that on 21 July 2022, permission was granted to recruit Chemists (1), Engineers (3), Geologists (4), Procurement (1), Records Management (1) and Technician (1), whereas through a letter dated on 6 April 2023, GST was permitted to recruit engineers (2), Chemists (2) and Geologists (3) respectively.

c) Inadequate Implementation of Training Programmes to Capacitate GST Staff on the Analysis of Geoscientific Data

Through the review of GST’s staff training and development plan to capacitate its staff for the financial year 2020/21 to 2023/24, the Audit noted that, GST training plans to capacitate its staff based on geoscientific data were not adequately implemented as indicated in **Table 3.17**.

Table 3.17: The Staff’s Training on the Directorate of Laboratory, Database and Geology Related to Geoscientific Data

Financial Year	No. of Staff Planned for Training	No. of Staff Trained	Trained Staff (%)
2020/21	19	0	0
2021/22	12	0	0
2022/23	11	1	9.1
2023/24	14	4	28.6

Source: Auditors’ Analysis on GST Staff Training and Development Plan and its Implementation Reports, 2024

Table 3.17 indicates that, GST implemented the planned staff training for only 2 Financial Years, which were 2022/23 and 2023/24, by 9.1% and 28.6%, respectively. The training was from the directorate of Database, Geology services, and Laboratory services, which are directly involved in the acquisition, analysis, interpretation, and banking of geoscientific data. This

was caused by the training programme not being reflected in the GST Annual Action Plans.

Similarly, in the review of the Annual Action Plan for the four financial years from 2020/21 to 2023/24, it was noted that, the content of training in the training programme was not reflected in the Annual Action Plan of GST.

The assessment indicated that, all the planned training in the training programme for the financial years 2020/21 and 2021/22 were not reflected in the annual action plan; hence, they were not conducted. However, it was only in the financial year 2022/23 that GST managed to equip its staff with knowledge in area of GIS Interface and Spatial Data Infrastructure, Database Modelling and Management since the training was included in the Annual Action Plan. Meanwhile, in the financial year 2022/23, GST managed to equip its staff with knowledge in only one area of GIS and remote sensing, but it was not included in the annual action plan. As a result, GST staff were not equipped with all the knowledge planned to be imparted to them through these planned training programmes. The training contents and their reflection on the Annual Action Plans are shown in **Appendix Eleven** of this report.

Despite GST, including the training for Geophysical data acquisition, processing, and interpretation on ERT/IP Modelling and Resource Estimation, this training was not implemented. In a review of the annual performance Report for the Financial Year 2023/24, it was indicated that, the funds for this training were not disbursed; hence, the training was not conducted. On the other hand, it is indicated that GST included Training on Machine Operation and Troubleshooting. Whereas, 72% of the planned funds for this training were disbursed. GST indicated that the funds were used to conduct short courses to sharpen the skills of staff without specifying the skills imparted to staff. The rest of the planned trainings were not in the Annual Action Plan; hence, they were not implemented.

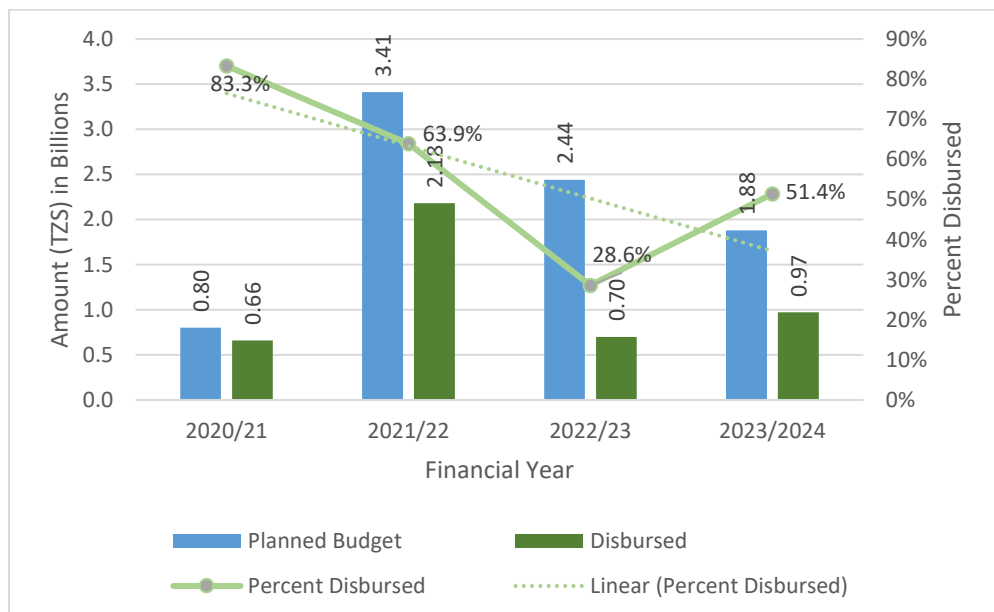
Therefore, inadequate training of its staff resulted in inadequate staff updates on their capacity in the acquisition, analysis and interpretation of geoscientific data and the use of analytical equipment in the laboratory due to new and updated or emerging technologies. Further review of Evaluation Reports of the submitted Geoscientific Data indicated that GST faced

challenges in understanding the codes, nomenclature, spatial reference systems, file extensions, and other parameters related to mineral data submitted by MRH. This was due to the fact that, there were no software specifications to be used to establish the requirements for the preparation of Geoscientific Data for MRH submission to GST. Hence, each MRH used its own software technology. This led to GST being unable to assess the correctness of the submitted data. This was evidenced in the correspondence letter with Ref. No. BA.79/192/01/09 dated 2 August 2022 from GST to M/s Twiga Mineral Corporation Limited requesting industrial training on exploration data management.

d) Inadequate Funds to Facilitate Implementation of Geoscientific Survey Activities

Through the review of Annual Action Plans and Annual Implementation reports for the Financial Year from 2020/21 to 2023/24, the Audit team noted that, there was inadequate disbursement of funds to facilitate adequate conduct of survey activities, as indicated in **Figure 3.2**.

Figure 3.2: Status of Funds Disbursement to Facilitate Surveys Activities



Source: Auditors' Analysis of Budget and Disbursement of Funds for Survey Activities, 2024

Figure 3.2 indicates that the disbursement of funds for GST to undertake geoscientific survey activities was above 65% only in one Financial Year, which is 2020/21, whereas, for other financial years, the disbursement was below 65%. This limited the adequacy of the acquisition of geoscientific data due to financial constraints.

Further analysis conducted by the audit indicated that the allocation of funds for the planned geoscientific survey activities was not constant; hence, the following activities were affected, as explained as follows:

(i) Three Planned Activities in the Financial Year 2022/23 did not Receive Fund

In a review of the GST Action Plan and Annual Progress Report for the financial year from 2020/21 to 2023/24, the audit team noted that GST did not receive funds for three planned activities in 2022/2023. These activities included conducting field follow-up for identifying potential areas, collecting 3500 rocks, soils, plants, water and mineral samples from external and internal clients, analysing and analytical report preparation, and facilitating national geoscientific and mineral data management and dissemination. This affected the overall process of acquisition of Geoscientific data to attain the set target in the respective financial year.

(ii) 18 Activities were Allocated Less than 50% of the Planned Budget

In a review of the GST Action Plan and Annual Progress Report for the financial year from 2020/21 to 2023/24, the audit noted that 18 planned activities received less than 50% of the planned budget. The audit assessment showed that a total of 18 activities, the allocated funds from the planned budget were less than 50%, and the minimum disbursement was one percent. Thus, seven activities in this category were not adequately implemented, as their disbursement was less than 20%. One of the activities was in the financial year 2021/22, which involved acquiring application software systems and licenses.

Moreover, two activities were in the financial year 2022/23: updating the mineral occurrences database, a Book of *Madini Yapatikanayo* and Minerogenic (Field Collection and verifying mineral occurrence for 16 regions of Tanzania, and procurement of geoscientific equipment. Also, four

activities were in the financial year 2023/24, which were Geological mapping in two (2) unmapped QDS and strategic Mineral Potential Mapping into two (2) QDS; Updating of mineral occurrences database on a Book of Minerogenic Map of Tanzania; Collection, verification, review, process and store geoscientific data/information and reports from Mineral Right Holders; and Scanning of 500 existing geoscientific maps and reports; capturing of 500 booklets metadata and upload in database; and collect 100 specimens for Geo-museums. The details of the aforementioned activities are provided in **Appendix Twelve**.

(iii) 19 Activities were Allocated with more than 50% of the Planned Budget

In a review of the GST Action Plan and Annual Progress Report for the financial year from 2020/21 to 2023/24, the audit noted a total of 19 planned activities received more than 50% of the planned budget.

In this regard, the minimum disbursement was 54%, and the maximum was 139% of the planned budget. The audit assessment indicated that, five activities in this category were inadequately implemented, as their disbursement was less than 70%. Also, one activity was in the financial year 2020/22, which was about upgrading the geo-scientific and mineral database of the country.

Moreover, the audit assessment noted that, three activities were in the financial year 2021/22, which were the digitisation of 30 existing and new geological maps, edit 15 maps, processing of satellite imageries for 10 QDS, computerising and scanning of 1,000 reports, collection/verification of existing/new raw-geoscientific data/information from MRH and geoscientific research companies/institutes and acquiring Laboratory equipment and instruments (Preparation of specifications, Outsourcing Budget preparation and application Spare parts). On the other hand, one activity in the financial year 2022/23 was to digitise 24 existing and new geological maps, edit 30 maps, and process satellite imagery for 10 QDS by June 2023.

This ultimately resulted in the inadequate implementation of GST-planned activities. For example, for Financial Year 2022/23, the Geological mapping

in two unmapped QDS, 203 and 204, was conducted as planned. However, based on the annual performance report of the Financial Year 2022/23, two QDS, 275 and 276, which were under the strategic mineral potential mapping, were not mapped due to financial constraints.

It was also noted that, for the financial year 2023/24, field preparation was conducted, but geological mapping in two (2) unmapped QDS and strategic Mineral Potential Mapping into two (2) QDS were not conducted due to insufficient funds. Furthermore, the audit noted that, for the past four financial years under audit, from 2020/21 to 20203/24, GST did not plan or allocate funds to facilitate the adequate conduct of geochemical and geophysical survey activities. A detailed analysis of the planned activities with their respective budget is presented in **Appendix Thirteen**.

Similarly, interviews with GST officials revealed that geochemical and geophysical surveys were not included in the annual plans because they required large amounts of funds than the allocated budget. This inadequacy prevented GST from acquiring any new geochemical and geophysical data in QDS for the four years covered in the audit. Moreover, reviews of the Annual Progress Report for the Financial years from 2020/21 to 2023/24 indicate the performance of a revenue collection from its own source, as presented in **Table 3.18**.

Table 3.18: GST Own Source Revenue Collection Performance

Financial Year	2020/21	2021/22	2022/23	2023/24
Planned Revenue Collection (TZS Million)	508.39	889.04	2,000.80	2,781.00
Actual Revenue Collection (TZS Million)	664.48	1,251.43	1,929.39	2,394.21
Percentage of Revenue Collection	130	140	96	86

Source: Auditors' Analysis on GST Annual Progress Report (Financial Year from 2020/21 to 2023/24), 2024

Table 3.18 shows the GST internal revenue collection for the financial year from 2020/21 to 2023/24. The table further indicates that the performance

percentage on own source revenue collection kept decreasing while the total target and collection kept increasing from year to year.

However, during interviews with GST officials, it was revealed that, the revenue is collected from the GST account at the Bank of Tanzania. The amount is being disbursed as part of GST annual budget disbursement.

3.4 Ineffective Banking and Accessibility of Geoscientific Data to the Public and Government

A review of the documents²¹ from GST and verification made to the server, museums, core shed, and archive indicated weaknesses in the storage of the geoscientific data. This is contrary to Section 27A (g) and (h) of the Mining Act, [CAP. 123 R.E. 2019], which required GST to maintain, process, archive and disseminate national geoscientific data. The noted inadequacies are described in the sections as follows:

3.4.1 Stored Geoscientific Data has no Complete Information on their Labels

Auditors' physical verification of geoscientific data stored as samples noted that, rock samples stored in the museum were either not labelled or labelled with incomplete information as required under ISO 15489-1:2016 Paragraph 9.3 and 9.4 which requires stored data to have, at a minimum, unique identifier which is either machine-generated or human readable. For instance, the audit team noted that, the name of the rock sample and the location where the sample was taken were not included in the labels. Officials from GST elaborated that the missing labels on rock samples were misplaced while handling the samples.

Additionally, officials from GST further elaborated that the individuals who collected those samples from the field submitted them without recording the locality and coordinates, making it impossible to identify or trace the rock name and the location where the rock samples were taken. This was contrary to Section 27F (1), (2) & (3) of the Mining Act Cap. 123, which requires the GST to establish the National Mineral Resources Data Bank for the storage of accurate mineral data.

²¹QDS Mapping Progress Maps, Reports from the Mineral Right Holders, Verification Reports

3.4.2 Not All Geoscientific Data Reports Submitted by Mineral Right Holders were Reviewed and Verified before Storage/Banking

A review of Annual Progress Reports and correspondences between GST and MRH from the financial years 2020/21 to 2023/24 indicated that, GST collected reports for geoscientific data from the Mineral Right Holders and did not review and verify them as required by Rule 8 of the Mining (National Mineral Resources Data Bank) Rules, 2021. The status of review and verification of reports for geoscientific data from the Mineral Rights Holders is indicated in Table 3.19.

Table 3.19: The Status of Review and Verification of Reports for Geoscientific Data from the Mineral Rights Holders

Financial Year	No. of Reports Submitted by MRH	No. of Reports Verified by GST	Reports Verified (%)
2020/21	308	0	0
2021/22	288	0	0
2022/23	243	243	100
2023/24	553	405	73
Total	1,392	648	173

Source: Auditors' Analysis of Annual Progress Reports (2020/21 to 2023/24) on Verification of Geoscientific Data from the Mineral Right Holders, 2024

Table 3.19 indicates that for the financial years 2020/21 and 2021/22, GST did not review and verify the reports for geoscientific data submitted by the MRH. On the other hand, it indicates that in the financial year 2022/23, GST reviewed and verified all 243, equivalent to 100% of the submitted reports, and in the financial year 2023/24, 73% of the submitted data were verified. During interviews with officials from GST, it was clarified that, this was due to the staff shortage at the Directorate of National Geoscientific and Minerals Database. The audit noted that, the directorate had six out of 13 required staff.

Moreover, a review of reports prepared by GST on the verification of data and reports submitted by MRH indicated that, GST did not verify the accuracy of the mineral data or geoscientific data submitted by the MRH; rather, it only verified the completion of the submitted reports. The officials from GST elaborated that the Mineral Data, other than reports, were submitted as soft copies to the Director of National Geoscientific and

Minerals Database in a raw form. Hence, GST received soft and hard copies of geoscientific data from MRH. Therefore, from the financial year 2020/21 to 2023/24, GST received 1,601 mineral data, 118 files of which were soft copies and 1,483 hard copies from MRH in which, all of them were not verified. Further information is indicated in Table 3.20.

Table 3.20: The Records of Received Files (in soft copies) and Mineral Data (hard copy) for Geoscientific Data from the Mineral Rights Holders

Financial Year	Mineral Data Submitted in Soft Copies	Mineral Data Submitted in Hard Copies	Total
2020/21	14	218	232
2021/22	20	180	200
2022/23	36	451	487
2023/24	48	634	682
Total	118	1,483	1,601

Source: Auditors' Analysis of Records for Submission of Reports and Geoscientific Data (2020/21 to 2023/24) Submitted by the Mineral Right Holders, 2024

Table 3.20 indicates that for the financial years 2020/21 and 2021/22, GST received files either in soft copies or hard copies. However, not all of the received files were verified. This resulted in uncertainty about whether the stored data files were related to reports on mining operations conducted or geoscientific data collected by MRH during those mining operations. Interviews with GST officials elaborated that, GST lacked the system and software to verify the geoscientific data received by the MRH.

Moreover, the audit noted that GST's inability to adequately review and verify the reports related to geoscientific data submitted by MRH limited their ability to authenticate and check their correctness to ensure the relevancy and reliability of the stored geoscientific data. Therefore, this limited GST capacity to advise the government by providing mineral resource estimation for economic benefits as required by Regulation 4 (1) and (2) of the Mining (State Participation) Regulations, 2022. This may likely hinder the government from having a substantive basis for making informed decision-making.

Moreover, in the review of documents, a correspondence letter with reference number BA.79/192/01/124 dated 21 September 2023 from the GST to the Mining Commission indicated that, GST received a request from

the Mining Commission to review a total of 156 licenses²² and advise whether those areas should be set aside for investment by institutes, private companies, or the government. However, GST's response to the Mining Commission indicated that they did not have adequate detailed information on the requested licenses. Thus, emphasised that they require more research to get sufficient information and advice accordingly.

Furthermore, the audit noted that, GST conducted verification only for Saza Makongorosi Projects, previously owned by M/s Winshear Gold Corp, in April 2024. Review of Exploration Results and Mineral Resources of the Saza-Makongolosi Project, 2024 noted that, it was done after being tasked by the Ministry of Mineral to conduct due diligence to verify the authenticity of the data submitted to the Government by M/s Winshear Gold Corp. This indicates that, verification was not a GST initiative but rather the Ministry of Mineral Initiatives. In executing the assignment, GST reported that, to assess mineral resources, STAMIGOLD granted GST temporary access to the Datamine software for mineral resource estimation.

This implies that, GST function of advising the government was not attained since it did not have sufficient information in all areas occupied by MRH that could provide sufficient information for decision-making on geoscientific data through the quarterly reports.

3.4.3 Inadequate Organisation and Structuring of Stored Geoscientific Data for Easy Access and Retrieval

The audit noted inadequacies in the organisation of geoscientific data stored on the server and the arrangement of archived documents, as indicated as follows.

(a) *Inadequate Organisation of Geoscientific Data Stored in the Server*

The Audit Team noted that, geoscientific data stored in the server was not arranged to facilitate easy access. For instance, the files with the Geoscientific Data were stored in the same folder without differentiating the reports per financial year, quarter and the respective name of the

²²Mineral Right Holders

Mineral Right Holder as required by ISO 15489-1:2016, Para 3.5 and 9.6 which requires data to be stored in appropriate storage environment(s) and media with regards to function, nature, importance and process.

As a result, the naming of the files, the specification of the time when the reports were submitted, and the identification of the Mineral Right Holder who submitted the same were difficult to identify when accessing the Geoscientific Data.

On the other hand, the audit noted that, the inadequacy of organising the stored geoscientific data in the server led to confusion of client files by officials (i.e., they do not understand which data are available) from GST when dealing with clients. For example, a review of correspondence file BA.79/192/01 Part B on Minute Sheets with Folio No. 32 dated 7 June 2024 and Folio No. 67 dated 15 July 2024 indicated that, GST prepared a bill to the two clients for payment for the requested data for QDS 45 and QDS 46. On the other hand, after the clients paid the fees, GST informed the clients that the low-resolution data they requested for QDS 45 and QDS 46 were not available because it was misinformation, and GST refunded the clients an amount of TZS 1,400,000 each.

Therefore, inadequate data organisation was caused by the absence of guidelines on which format and how to store the geoscientific data in the database, which made it difficult to retrieve the data quickly. As a result, it becomes difficult to clearly identify specifically the information which is available and the on which is w not available.

(b) *Inadequate Arrangement of Archived Documents*

The audit visited the Archive for Storage of Geoscientific Data for verification. The archived documents were improperly managed contrary to the requirement ISO 15489-1:2016, Paragraph 3.5 and 9.4, which require data to be classified and arranged according to levels, functions, activities or processes. This is evidenced by the audit team as they observed QDS maps that were not stored on their respective shelves and according to levels but piled up over them. The officials from GST indicated a shortage of space on the shelves. The observed status of the stored documents from the Archive is indicated in **Photo 3.1**.

Photo 3.1: Photos Showing the Status of the Stored Documents from the Archive



Source: Photos taken on 24 July 2024 by Auditors from the Archive located at the GST Offices in Dodoma, 2024

Based on **Photo 3.1**, it is indicated that the documents were piled on the shelves instead of being stored inside them, exposing them to dust and unsecured conditions against destruction.

(c) *Absence of an Online System for Storage and Dissemination of Geoscientific Data*

According to ISO 15489-1:2016, Paragraph 9.6 requires data to be stored in appropriate storage environment(s) and media. The stored information should be adequate for locating and monitoring the security of the records. The audit noted that, GST previously used the Geological and Mineral Information System (GMIS) to store and disseminate Geoscientific Data. This was done through the Data Shop/Sales Portal, which is used to sell geoscientific data.

However, interview with officials from GST indicated that the system was no longer in use since the financial year 2017 due to security worries since the system was designed and hosted abroad. In a review of the documents,²³ it was found that the requirement for deploying a new system indicated that GMIS was developed to manage data collected only by GST and not from mineral rights holders. Further, it indicated that the system could not handle a huge amount of data. Also, it lacked the necessary functionalities to verify and manage data as per revised Mining Legislation requirements and faced serious security risks.

It was further observed that GST had, in the financial year 2023/24, planned to procure software for the national mineral resources data bank system at a contract price of TZS 120,984,606.45. A review of the Procurement Plans for 2023/24, contract documents, and reports revealed that GST had planned to procure equipment and software for managing geoscientific data. However, by the time of this audit, the procurement process for equipment related to the national mineral resources data bank system, under tender no. AE/059/2023-2024/G/73 had not been completed. Also, the software system and licence for the mineral data bank were procured through tender no. AE/059/2023-2024/G/71 was still pending.

Moreover, in an enquiry made during the interview, it was elaborated that, GST entered into and signed a contract with the supplier on 14 March 2024 and 14 May 2024, respectively, by the supplier M/S Invention Technologies Company Limited and the Chief Executive Officer.

The commencement was supposed to be on 9 February 2024, whilst the intended delivery date was supposed to be 9 May 2024. However, up to the time of this audit in November 2024, the supplier had not supplied the intended software. The two procurements were aimed at enhancing the management of the geoscientific database. Up to September 2024, the above equipment and software had not been procured.

Furthermore, non-accomplishment of the procurement was perpetrated by a lack of follow-up on the implementation and administration of the

²³Statement of Requirement for Provision of Services for Designing, Development, Deployment, Training & Commissioning of National Mineral Resources Data Bank System, 2022

contract, as the contract itself was defective based on the signature and delivery dates. Hence, GST did not manage to achieve the target of maintaining the mineral resources data bank through dedicated and well-established software as intended. The lack of proper management of geoscientific data has limited data availability to the public and users due to their incompleteness.

Therefore, the absence of an online system for storing and disseminating Geoscientific Data hinders its accessibility and purchase anywhere in the country/world.

3.5 Inadequate Monitoring of the Performance of GST on the Management of Geoscientific Data by the Ministry of Minerals

Reviewing the Ministry of Minerals' annual performance reports for the financial years 2020/21 to 2023/24, the audit noted that, GST activities were only monitored in the financial year 2020/21 out of the four years under review. This is contrary to sections 19(b) and (c) of the Mining Act Cap. 123, which requires the Ministry of Minerals to monitor the performance of all bodies or establishments responsible for minerals and report to the Cabinet. Also, this was contrary to Paragraph 3.1 (iii) of the Approved Functions and Organisation Structure of the Ministry of Minerals of 2018, which requires the Ministry of Minerals to monitor the operations and performance of all bodies or establishments responsible for the mining sector and prepare periodic reports.

On the other hand, the audit noted that, the monitoring reported in the 2020/21 annual report was done by working together with GST on an exploration project undertaken in QDS 279 in Liwale, Lindi. However, GST was not provided with any reports on areas for improvement.

Hence, the inadequate monitoring of GST activities relating to geoscientific data management was caused by inadequate planning, disbursement of funds for monitoring GST activities, absence of key performance indicators to measure the performance of GST and absence of follow-ups on the matter to ensure corrective measures undertaken as explained as follows.

3.5.1 Inadequate Planning for Monitoring of the Performance of GST by the Ministry of Minerals

In a review of the Annual Plan from the Ministry of Minerals for the financial year from 2020/21 to 2023/24, the audit noted that in all four financial years under review, the Ministry of Minerals planned and budgeted for monitoring GST and other bodies under the Ministry. The budget covered monitoring the performance of the Mining Commission, GST, STAMICO, TGC and TEITI, as indicated in Table 3.21.

Table 3.21: The Budget Planned for Monitoring of Bodies under the Ministry of Minerals

Financial Year	Planned Budget (TZS)
2020/21	91,750,000
2021/22	19,250,000
2022/23	16,270,000
2023/24	28,300,000

Source: Auditors' Analysis of the Annual Action Plan and Annual Performance Report for the Financial Year from 2020/21 to 2023/24

Table 3.21 indicates that in four financial years under review, a total of TZS 155,570,000 was budgeted for Monitoring five entities under the Ministry of Minerals, GST being among them.

The audit noted that, this amount of funds was required to conduct quarterly visits to each entity under the Ministry and monitor their performance in line with their action plan. However, no specific plan indicates a timeline for the visit, resources required, and performance indicators prepared specifically for GST. This is contrary to section 6.1.3 of the National Guidelines for Monitoring and Evaluation of Development Projects and Programmes, where the Ministry of Minerals is required to prepare an annual work plan for monitoring and evaluation of their entity.

However, during interviews with officials from the Ministry of Minerals, it was elaborated that, the absence of a specific section responsible for monitoring and evaluation of entities under the ministry caused inadequate planning for monitoring GST. Also, the Ministry of Minerals does not have a performance agreement with GST. As a result, the MoM did not specifically set targeted key performance indicators to be monitored by GST that could

lead to the attainment of mineral policies and five-year development plan III (2021/22 - 2025/26).

3.5.2 The Ministry of Mineral did not Effectively Conduct Planned Monitoring Activities of the GST on the Management of Geoscientific Data

Review of the Annual Action Plan for the financial years 2020/21 to 2023/24, the Ministry of Minerals planned to conduct monitoring of GST, Mining Commission, STAMICO, TGC, and TEITI for all four financial years on a quarterly basis. However, a review of the Ministry of Mineral’s annual performance report for the four financial years indicated that, the Ministry of Minerals monitored GST only in the financial year 2020/21. Also, it was noted that, monitoring was conducted only when they participated in the geological mapping of QDS 279 in Liwale districts for two months. Other activities, such as the implementation of planned procurement of tools, such as the supply of seismic equipment, data storage, and data analysis from mineral rights holders, were not monitored. In the other three financial years, from 2021/22 to 2023/24, no monitoring was conducted.

The rationale for the Ministry of Mineral not to conduct planned monitoring of GST was the non-disbursement of the planned budget for the respective financial year. The details of the disbursement of the planned budget are presented in **Table 3.22**.

Table 3.22: The Planned and Disbursed Fund for Monitoring of GST at MoM

Financial Year	Activity Code	Planned Budget (TZS)	Disbursed Amount (TZS)
2020/21	C01S05	91,750,000	0
2021/22		19,250,000	0
2022/23		16,270,000	0
2023/24		28,300,000	0
Total		155,570,000	0

Source: Auditors’ Analysis of the Annual Action Plan and Annual Performance Report for the Financial Year from 2020/21 to 2023/24

Table 3.22 shows that the budget was not disbursed to facilitate the monitoring of GST activities by the Ministry of Minerals despite being

budgeted. This was due to the fact that, Monitoring and Evaluation was under the Directorate of Policy and Planning of the Ministry of Minerals. However, at the time of this audit, the Ministry had established a full-fledged Monitoring and Evaluation Unit with a sub-vote 1008, and hence, there is the likelihood that funds will be allocated to facilitate monitoring activities.

Moreover, in the case of monitoring activity conducted in the financial year 2020/21, the budget was from activity code C01S, which covered the aspect of Mineral sector revenue collection supervision and monitoring, and not activity code C01S05, which covered the aspects of monitoring of GST performance and other entity under the Ministry of Minerals which are Mining Commission, STAMICO, TGC and TEITI as planned.

As a result, MoM did not adequately monitor GST's performance in managing geoscience data. Hence, improvements that would have been a result of comments from monitoring by the Ministry of Mineral were not adequately provided to GST. The implementation of issued comments could be important in the management of Geoscientific Data, hence the attainment of the set targets in the mineral policy implementations. Such targets are to ensure GST processes, interprets, archives, and disseminates quality geoscientific information, maps, and data as set in the Mineral Policy of 2009.

3.5.3 The Absence of the Key Performance Indicators to Measure the Performance of GST

A review of paragraph 4.7.1 of the Ministry of Mineral's Strategic Plan (2019/20-2023/24) of 2019 indicated that, the Ministry insists on the preparation of monitoring plans with indicators, baseline values, targets values, data collection, and method analysis, means of verification, reporting frequency and responsible person. While the Ministry managed to prepare these plans to measure the performance of its planned activities. The audit revealed that, the plans lacked specific performance indicators for evaluating GST performance. This is not in line with the requirements of Paragraphs 3.1 and 3.3.2 of the Ministry of Minerals Organisation Structure of 2018, which require the performance of GST to be monitored.

Therefore, without key performance indicators for GST, it would be difficult for the Ministry to effectively track and evaluate the performance of GST operations, which consequently hinders the identification of areas for further improvement and suggestions.

3.5.4 The Absence of Follow-ups on the Matter to Ensure the Corrective Measures undertaken

A review of the Annual Performance Reports from the Ministry of Minerals indicated that, the Ministry of Minerals prepared the performance reports, which include activities performed by the ministry and those performed by institutions such as GST and the Mining Commission. It was also noted that, the Ministry only incorporated the activities reported by those institutions into their reports without measuring their performance, providing feedback on what to improve, or taking corrective action against those institutions under the Ministry.

Interviews with officials from the Ministry of Minerals (MoM) indicated that the GST is under its own establishment, where every directorate at GST reports to the Ministerial Advisory Board as part of monitoring. As a result, the Ministry did not measure, give feedback and follow up on the issues identified in the performance of GST. This eventually hindered the provision and implementation of corrective measures.

CHAPTER FOUR

AUDIT CONCLUSION

4.1 Introduction

This chapter draws the audit conclusions based on the findings described in Chapter Three. The basis for drawing the audit conclusions is on the overall and specific objectives of the audit, as presented in Chapter One of this Performance Audit Report.

4.2 General Conclusion

The Audit Team acknowledges the progress made by the Ministry of Minerals and GST in areas of managing geoscientific data. The audit recognises GST's efforts to acquire, analyse, interpret, and disseminate geoscientific data and establish a geoscientific data management database. This includes initial steps taken toward digitising and storing geoscientific records. Also, GST is in the process of procuring a databank software and equipment for storing geoscientific data as well as software for geoscientific data analysis and interpretation. While these efforts demonstrate a commitment to advancing geoscientific data management in the country, further improvements are necessary to achieve optimal performance and fully capitalise on the value of this critical information in the mining sector. This is due to the audit revealing shortcomings in the management of geoscientific data by both the Geological Survey of Tanzania (GST) and the Ministry of Minerals.

Generally, GST does not effectively ensure the availability of geoscientific data to the public and the government. The limited access to up-to-date and comprehensive geoscientific information hinders informed decision-making and the efficient facilitation of mining operations. This shortfall indicates a gap in GST's mandate to make vital data accessible, impacting both public stakeholders and government agencies.

The GST has not managed to cover all parts of the country with necessary geological mapping, geophysical, and geochemical surveys. This shortfall results in incomplete geoscientific data, which hinders the development of the mining sector. Also, GST does not acquire and analyse sufficient geoscientific data from Mineral Rights Holders. In this regard, the lack of

comprehensive surveys and mapping in the key regions limits the identification of potential mineral resources, constraining investment opportunities and impeding the sector's growth. Without broader and more thorough coverage, Tanzania's ability to fully capitalise on its mineral potential remains compromised.

These shortcoming impacts public and governmental stakeholders such as the State Mining Corporation, Tanzania Extractive Industries Transparency Initiatives, and Tanzania Geological Society, thus undermining the value of this critical information.

On the other hand, these issues have been compounded by the Ministry of Minerals' insufficient oversight of GST's performance. The lack of robust monitoring mechanisms has allowed inefficiencies within GST to effectively implement its assigned roles. Moreover, the Ministry of Minerals does not adequately monitor the performance of GST with respect to the management of geoscientific data. This is because the Ministry of Minerals does not have a specific monitoring tool for GST. On the other hand, the Ministry does not allocate funds for monitoring activities.

4.3 Specific Conclusions

4.3.1 GST does not Adequately Acquire, Analyse, and Interpret Geoscientific Data

The audit concludes that, GST does not effectively acquire, analyse, or interpret geoscientific data to assess the country's potential mineral resources. This is due to the fact that, the geoscientific data acquired by GST are neither comprehensive nor sufficiently relevant to support the mining sector's activities effectively. This inadequacy results in gaps in critical information required for the exploration, resource estimation, assessment, and decision-making. Moreover, the lack of relevant and detailed processed data has limited the sector's capacity to identify, evaluate, and develop mineral resources' economic potential, thus ultimately undermining the potential for growth and investment in the mining industry.

On the other hand, GST does not adequately analyse and interpret submitted geoscientific data, resulting in a lack of usability for relevant

users. Also, GST's capacity is inadequate to effectively acquire, analyse, and interpret geoscientific data, which hinders its timely availability. In this regard, GST does not have the system and software for the analysis and interpretation of geoscientific data. This limitation impacts the mining sector's ability to access crucial information when needed for exploration and development activities. This impedes the effective application and harnessing of geoscientific data in decision-making and mineral resource development.

In this case, inadequate data acquisition efforts and insufficient analysis and interpretation have resulted in an inadequate understanding of available mineral resources, especially those reported by mineral rights holders. This deficiency ultimately limits strategic planning and exploration efforts. Thus, undermining the country's ability to fully leverage its mineral potential.

4.3.2 GST does not Adequately Bank Geoscientific Data

The audit concluded that, GST does not adequately bank and disseminate geoscientific data, resulting in limited availability and accessibility for public and governmental use. The lack of an organised, efficient system for storing and sharing this data has created barriers to its effective use in mining operations and broader decision-making processes. This is due to the fact that, GST does not ensure that, stored geoscientific data are complete and include all the necessary details, such as raw data, analyses, and reports. This lack of diligence compromises the quality and utility of the data for future reference and decision-making.

Despite the fact that, GST has been endeavouring to review and verify geoscientific data received from Mineral Rights Holders, it has not adequately reviewed and verified geoscientific data submitted by mineral rights holders to ensure its authenticity, accuracy, and reliability before storage. In this case, the stored geoscientific data are not organised and structured to facilitate easy access and retrieval. This lapse poses the risk of storing inaccurate and incomplete data, undermining the integrity of the geoscientific database. It also undermines the effective use of the data, making it difficult for stakeholders to find and utilise the information efficiently and in a timely manner.

4.3.3 The Ministry of Minerals does not Effectively Monitor the Performance of the GST

The Ministry of Minerals has not effectively monitored GST's performance in managing geoscientific data. The absence of robust oversight mechanisms has allowed inefficiencies to persist within GST, leading to less optimal implementation of its assigned roles and strategic objectives.

In this regard, the Ministry of Minerals (MoM) does not adequately plan to monitor GST's performance in terms of geoscientific data management. Hence, the lack of structured plans hinders effective oversight and improvement of GST's data management performance. This implies that, the Ministry of Minerals has not effectively implemented monitoring activities to assess GST's performance in managing geoscientific data.

Therefore, this ineffectiveness in monitoring the performance of GST prevents the identification and correction of deficiencies in GST's data management, impacting overall effectiveness. This has ultimately exacerbated the challenges in geoscientific data management, affecting the sector's overall performance.

CHAPTER FIVE

AUDIT RECOMMENDATIONS

5.1 Introduction

This chapter provides recommendations to the Ministry of Minerals and GST to improve their performance in the Management of Geoscientific Data. The audit findings indicate areas that need further corrective actions to improve the management of geoscientific data in the country effectively. The areas of emphasis include availability, acquisition, analysis, and interpretation; banking and storage of geoscientific data; and the monitoring function carried out by the Ministry of Minerals in overseeing the implementation of GST performance.

Based on the principles of the 3Es (Economy, Efficiency, and Effectiveness), the National Audit Office is of the view that, to improve the management of geoscientific data in the country, the recommendations made in this report need to be fully implemented.

5.2 Audit Recommendations

5.2.1 Recommendations to the Geological Survey of Tanzania

To improve the acquisition, analysis, and interpretation of geoscientific data, GST is urged to

- a) Develop and implement a comprehensive plan to expand geological mapping, geophysical, and geochemical surveys across all 322 QDS in the country;
- b) Establish standardised submission and review procedures of geoscientific data received from mineral rights holders;
- c) Formulate effective procedure for enforcing Mineral Right holders to submit geoscientific data to GST;
- d) Establish the infrastructure and standard procedures and methodologies for acquiring, analysing, and interpreting geoscientific data;

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- e) Upgrade its analytical and interpretative capacity for geoscientific data analysis and techniques; and
 - f) Develop and implement a comprehensive capacity-building strategy to enhance its ability to effectively acquire, analyse, and interpret geoscientific data submitted by MRH.

To improve banking, storage, and dissemination of geoscientific data, GST is urged to:

- a) Develop standardised data entry and verification protocols and implement procedures to ensure stored geoscientific data are accurate and complete; and
- b) Devise an efficient data management system with clear indexing, categorisation, and search capabilities to enhance usability and efficiency.

5.2.2 Recommendations to the Ministry of Minerals

To improve monitoring and evaluation of GST's performance, the Ministry of Minerals is urged to:

- a) Establish and implement monitoring plans, specific performance metrics as well as reporting mechanisms for monitoring the performance of GST on the management of geoscientific data activities; and
- b) Ensure that the planned evaluations and follow-ups are effectively implemented to drive improvements in the management of geoscientific data.

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 17. Mining (Mineral Rights) Regulations of 2018
 18. Mining (National Mineral Resources Data Bank) Rules of 2021
 19. Mining (National Mineral Resources Data Bank) Rules, 2021.
 20. Ministry of Mineral Annual Action Plan for the financial year 2020/21 to 2023/24.
 21. Ministry of Mineral Annual Performance Reports for the Financial year 2020/21 to 2023/24.
 22. [Ministry of Minerals - Republic of Tanzania \(madini.go.tz\)](http://www.madini.go.tz) accessed on 16 June 2024.
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 24. The Mining Act [CAP. 123 R.E. 2019].
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 26. United Nations, (2015): Transforming Our World: the 2030 Agenda for Sustainable Development.
 27. URT (2021): National Five-Year Development Plan 2021/22 - 2025/26.

APPENDICES

Appendix One: Responses from the Ministry of Mineral and Geological Survey of Tanzania

This part presents the responses from the audited entities.

Responses from the Ministry of Mineral

This part shows responses from the Ministry of Mineral. The responses are divided into general and specific comments for each issued audit recommendation.

Specific Responses

No	Recommendation	Comment (s)	Action(s) to be taken	Timelin e
1	Develop, establish, and implement monitoring plans, specific performance metrics as well as reporting mechanisms for monitoring the performance of GST in the management of geoscientific data activities	The auditor's recommendation is noted.	The Ministry in collaboration with GST have developed monitoring plan with specific indicators that will be implemented in close supervision with the Monitoring and Evaluation Department in the Ministry. The review includes implementation of quarterly monitoring plan done by appointed M and E Champion from respective institution to assure that it meets the targeted performance on the management and reporting of	By July 2027

			geoscientific data.	
2	Ensure that the planned evaluations and follow-ups are rigorously implemented and conducted to drive improvements in the management of geoscientific data.	The auditor's recommendation is noted.	The review of planned and follow-ups will be evaluated against the set out KPIs to improve the management of geoscientific data in the country. The appointed M and E Champion from respective institution have been mandated to monitor and reporting the results of follow-up via their respective institution to the Ministry according to the monitoring plan.	By July 2026

Responses from the Geological Survey of Tanzania

This part shows responses from the Geological Survey of Tanzania. The responses are divided into general and specific comments for each issued audit recommendation.

Specific Responses

No	Recommendation	Comment (s)	Action(s) to be taken	Timeline
1	Develop and implement a comprehensive plan to expand geological mapping, geophysical, and geochemical	The auditor's recommendations are well noted. GST has developed a comprehensive plan to conduct	Conduct mapping in 2 new QDSs and 2 strategic mapping in 2 QDS every financial year, aiming to	By the year 2030, dynamics may change in the

	surveys across all 322 QDS in the country.	<p>geoscientific surveys.</p> <p>(a) to complete geological mapping coverage from 97% to 100%.</p> <p>(b) to increase the regional Geochemical Survey coverage from 23% to 50%.</p> <p>(c) to increase a High-resolution airborne geophysical survey coverage from 16% to more than 60%</p>	<p>finalize geologically.</p> <p>Conduct geochemical surveys in 2 QDS every financial year and collaborate with donors through various projects aiming to increase the Geochemical Survey.</p> <p>Conduct high-resolution airborne surveys in 2 phases as follows; Phase I: Western block priorities II and IV, which will increase the coverage to 34% coverage to more than 60%.</p> <p>Phase II: Other remaining priority blocks will increase the coverage to more than 60%.</p>	<p>case of multi-stakeholder funding .</p> <p>By the year 2050, dynamics may change in the case of multi-stakeholder funding .</p> <p>By the year 2050</p>
2	Establish standardised submission and review procedures of geoscientific data	Auditors' recommendation is adhered to.	GST will establish the standardised submission and review	By the year 2025

	received from mineral rights holders.		procedures as recommended. Already, a team of three (3) personnel has been assigned to write the standardised submission and review procedures to be incorporated into the NGMRIS.	
3	Formulate effective procedure for enforcing Mineral Right holders to submit geoscientific data to GST	The auditor's recommendation is noted.	The newly amended Mining Act (The Written Laws Miscellaneous Amendment Act, 2024), under Section 12 (a) (6a & b), has imposed penalties enforcing MRH to submit correct information. In line with the amendments, GST will collaborate with the MoM and set new regulations for enforcing MRH to submit geoscientific data and reports that are also accurate. Failure and or submitting false or misleading data and	By the year 2025

			information will lead to imposing outlined penalties on an MRH who defaults.	
4	Establish the infrastructure and standard procedures and methodologies for acquiring, analysing, and interpreting geoscientific data.	Auditors' recommendation is well noted.	GST will establish the infrastructure, standard procedures, and methodologies for acquiring, analyzing, and interpreting geoscientific data. Currently, GST is in the process of acquiring the National Geoscientific Mineral Resource Information System (NGMRIS), which, among other things, will enable it to acquire, process, interpret, store and disseminate geoscientific data and information. Currently, a team of three (3) personnel has been assigned to write the standardised submission and review procedures will	2 years

			be incorporated into the NGMRIS	
5	Upgrade its analytical and interpretative capacity for geoscientific data analysis and techniques	The auditor's recommendation is noted.	Currently, GST is in the process of constructing a state-of-the-art laboratory at Dodoma and modernised zonal laboratories at Chunya and Geita with improved analytical equipment and supportive tools for sample analysis. This is in line with capacity building through the attachment of employees at commercial laboratories for skills sharpening.	By the year 2027
6	Develop and implement a comprehensive capacity-building strategy to enhance its ability to acquire, analyse, and interpret geoscientific data submitted by MRH effectively	The auditor's recommendation is noted.	In addition to the ongoing in-house training facilitated by the CEO and also augmented by experienced geoscientists from the mining industry, GST will develop and implement a capacity-building strategy, including assigning personnel to mining and	By the year 2027

			exploration companies and related institutions for skills sharpening, in order to effectively acquire, analyse, and interpret geoscientific data submitted by MRHs.	
7	Develop standardised data entry and verification protocols and implement procedures to ensure stored geoscientific data are accurate and complete.	The auditor's recommendation is noted.	GST, through the department of the geo-scientific database, has a team for reviewing collected data and information, including the ones received from MRH. Standardised data entry and verification protocols for the cartographic section (chart) and library manual are in place and will be incorporated into the NGMRIS. Also a team of three (3) personnel is currently writing standardised data entry and verification protocols and procedures to	By the year 2027

			ensure stored geoscientific data are accurate and complete.	
8	Devise an efficient data management system with clear indexing, categorisation, and search capabilities to enhance usability and efficiency.	Auditor's recommendation is noted.	Ongoing construction process for the NGMRIS will incorporate an efficient data management system with clear indexing, categorization, and search capabilities to enhance usability and efficiency and will use algorithms in capturing, processing, data searching and dissemination in a user-friendly manner.	By the year 2027

Appendix Two: Detailed Audit Questions and Sub-questions

This part provides details of the audit and sub-audit questions used in this audit to answer each specific audit objective.

Audit Question No.	Audit question
Audit Question 1	To what extent does GST ensure the availability of geoscientific data to the public and government to facilitate mining operations and decision-making?
<i>Sub-Question 1.1:</i>	<i>Has GST adequately covered all parts of the country with Geological Mapping, Geophysical, and Geochemical Surveys to facilitate the availability of geoscientific data for developing the mining sector?</i>
<i>Sub-question 1.2:</i>	<i>Has GST adequately acquired the Geoscientific Data from the Mineral rights holders to facilitate the availability of geoscientific data for the development of the mining sector?</i>
Audit Question 2	Has GST effectively acquired, analysed, and interpreted geoscientific data to understand potential mineral resources available in the country?
<i>Sub-question 2.1:</i>	<i>Are the geoscientific data acquired by GST comprehensive and relevant to the mining sector's activities?</i>
<i>Sub-question 2.2:</i>	<i>Does GST analyse and interpret submitted geoscientific data to make them understood by the relevant users?</i>
<i>Sub-question 2.3:</i>	<i>Does GST have the capacity to acquire, analyse, and interpret geoscientific data to facilitate its timely availability?</i>
Audit Question 3	GST has effectively ensured the banking and dissemination of geoscientific data to enhance its availability and accessibility to the public and government for mining operations and decision-making.
<i>Sub-question 3.1:</i>	<i>Does GST ensure stored geoscientific data are complete and include all necessary details?</i>
<i>Sub-question 3.2:</i>	<i>Has GST reviewed and verified geoscientific data submitted by Mineral rights holders before storage to establish its aestheticism, accuracy, and reliability?</i>
<i>Sub-question 3.3:</i>	<i>Does GST ensure the stored geoscientific data are organised and structured to facilitate easy access and retrieval?</i>

Audit Question No.	Audit question
Audit Question 4	Does the Ministry of Minerals monitor and evaluate the performance of GST on the management of geoscientific data to ensure effective implementation of the assigned roles?
<i>Sub-question 4.1:</i>	<i>Has the MoM planned to monitor and evaluate the performance of GST undertakings related to the management of geoscientific data?</i>
<i>Sub-question 4.2:</i>	<i>Has the MoM effectively carried out the planned monitoring and evaluation activities regarding the performance of the GST in managing geoscientific data?</i>

Appendix Three: Sampled QDSs that were Reviewed During the Audit

This part provides details of the category QDS, total number of surveyed QDS, Publication of QDS, and index number of the QDS.

Type of Survey Conducted	Category of Survey Coverage	Publication Status	No. of QDS Surveyed	No. of QDS Selected	List of QDS No. Selected
Geological	Scale of 1:250,000	<input checked="" type="checkbox"/>	1	1	64
	Scale of 1:125,000	<input checked="" type="checkbox"/>	130	9	32, 54, 80, 88, 152, 182, 225, 232, 260
		<input type="checkbox"/>	113	9	8, 47, 51, 120, 127, 157, 165, 216, 305
	Scale of 1:100,000	<input checked="" type="checkbox"/>	67	9	45, 53, 75, 89, 132, 142, 148, 204, 278
Geochemical	Low Density	<input checked="" type="checkbox"/>	270	10	32, 40, 117, 130, 178, 185, 250, 285, 307, 310
	High Density	<input checked="" type="checkbox"/>	74	9	8, 29, 62, 79, 95, 101, 162, 244, 305
Geophysical	Low Resolution	<input checked="" type="checkbox"/>	322	10	45, 55, 80, 91, 187, 196, 263, 282, 314, 318
	High Resolution	<input checked="" type="checkbox"/>	51	9	78, 84, 107, 127, 142, 144, 153, 167, 312

Source: Auditors' Analysis of the Geoscientific Progress Map, 2024

Key:

- = Published
- = Not Published

Appendix Four: List of Documents Reviewed and Reasons

This part provides the list of documents the Audit Team reviewed to obtain appropriate and sufficient information to develop the audit findings supported by sufficient evidence.

Category of the documents	Title of Documents Reviewed	Reasons for Reviewing
Planning Documents	Budgets and plans from MoM and GST for the financial year 2020/21 to 2023/24	To assess the performance of MoM and GST in: <ul style="list-style-type: none"> • In planning for activities and resources regarding the management of geoscientific data
Monitoring and Feedback Reports	<ul style="list-style-type: none"> • MoM Monitoring Plan for the Year 2020/21 to 2023/24 • Monitoring reports of GST for the financial year 2020/21 to 2023/24 	To assess: <ul style="list-style-type: none"> • If monitoring activities done by GST were effectively planned by MoM • Effectiveness of monitoring and evaluation of the performance of GST conducted by MoM
QDS geological mapping Reports,	QDS is mapping geological mapping Reports, Geochemical reports, and Geophysical reports for 2020/21 to 2023/24.	To assess: <ul style="list-style-type: none"> • The adequacy of information covered in each completed QDS • Elements covered during the analysis
QDS for strategic Mineral Mapping	QDS of strategic Mineral Mapping for 2020/21 to 2023/24.	To assess: <ul style="list-style-type: none"> • The adequacy of information covered in each completed QDS • Elements covered during the analysis
Annual Reports	Annual Performance Report for MoM and GST for the financial year 2020/21 to 2023/24.	To assess the: <ul style="list-style-type: none"> • Status of implementation of planned activities by GST • Performance of MoM in monitoring GST • Status of attainment of the set targets in the strategic plan
Laboratory equipment	<ul style="list-style-type: none"> • Reports of laboratory tools and equipment available 	To assess the: <ul style="list-style-type: none"> • Adequacy of available laboratory tools

Category of the documents	Title of Documents Reviewed	Reasons for Reviewing
	<ul style="list-style-type: none"> • Reports of need of laboratory tools and equipment • Conditions available laboratory tools and equipment 	
Ministry Advisory Board Minutes	<ul style="list-style-type: none"> • Quartey Implementations reports submitted by GST to the Ministerial advisory board from the directorates providing Geological services, laboratory services, and database services for the financial year 2020/21 to 2023/24; and • GST Board Meeting Minutes for the Financial year 2020/21 to 2023/24. 	<p>To assess:</p> <ul style="list-style-type: none"> • Status of implementation of planned activities by GST • Status of GST in the attainment of the set targets in the strategic plan • Various challenges were reported during the project implementation and actions taken/directives by the board

Source: Auditors' Analysis of Reports produced by GST and Ministry of Mineral, 2024

Appendix Five: Officials Interviewed During the Audit

This part presents the list of the officials interviewed from the Ministry of Minerals and Geological Survey of Tanzania.

Institution to be covered	Official Interviewed	Reasons for the Interview
Ministry of Minerals (MoM)	Mineral Commissioner and Assistant Commissioner - Mines and Minerals Development Section	To assess the: <ul style="list-style-type: none"> • Overall Coverage of Geoscientific data in the mining sector • Factors hindering country coverage of geoscientific data in the country and actions taken by the Ministry to alleviate the situation
	Director of Policy and Planning	To assess the: <ul style="list-style-type: none"> • Effectiveness of planning for monitoring of GST • Reason associated with inadequate monitoring of GST with respect to the management of geoscientific data for the mining sector
Geological Survey of Tanzania	Director National Geoscientific and Mineral Database	To assess the: <ul style="list-style-type: none"> • Ensure adequate banking of geoscientific data and the factors behind the inadequate
	Director National Geoscientific and Mineral Database	
	Manager Geoscientific database	
	Manager Libraries and Geo Museum	
	Director Geological Services	To assess the: <ul style="list-style-type: none"> • Effectiveness of acquisition, analysis, and interpretation of Geoscientific data for the development of the Mining sector • Reasons associated with inadequate acquisition, analysis, and interpretation of
	Mapping and Economic Geology Manager	
	Applied Geology Manager	
	Principle Geologist	
Director of Laboratory Services		

Institution to be covered	Official Interviewed	Reasons for the Interview
	Manager Chemical section Manager of Petrology, Mineralogy and Mineral Processing Section	Geoscientific data for the development of the Mining sector

Source: Auditors' Analysis of GST and Ministry of Minerals Organisation Structures, 2024

Appendix Six: Staff Requirement at the GST

This part shows the details of the available number of staff and the actual required number of staff as per GST's Personnel Enrolment of Staff Establishment as of 2023/24.

Name of required professional	Required number of staff	Available number of staff	Additional Staff Required
Principle Geologist I	3	3	0
Principle Geologist II	9	5	4
Senior Geologist	18	10	8
Geologist I	27	10	17
Geologist II	21	10	11
Principle Technician	12	10	2
Technician I	8	6	2
Technician II	17	11	6
Assistant technician	2	2	0
Principal Chemist I	2	0	2
Principle Chemist II	2	0	2
Senior Chemist	2	1	1
Chemist I	5	3	2
Chemist II	4	4	0
Principal Engineer I	5	3	2
Principal Engineer II	2	1	1
Senior Engineer	2	1	1
Engineer I	7	3	4
Engineer II	4	4	0
Principal Information Communication Technology Officer II	2	0	2
Information Communication Technology Officer I	1	0	1
Senior Information Communication Technology Officer	2	2	0
Information Communication Technology Officer II	1	0	1
Librarian Grade I	0	0	0
Librarian Grade II	2	1	1
Principle Librarian Assistant	1	1	0

Name of required professional	Required number of staff	Available number of staff	Additional Staff Required
Librarian Assistant I	1	1	0
Librarian Assistant II	0	0	0
Senior Information Officer	1	1	0
Information Officer I	1	0	1
Information Officer II	1	0	1
Total	165	93	72

Source: Auditors' Analysis of Personnel Enrolment of Staff from GST, 2024

Appendix Seven: Capacity of the Available Equipment and Required Capacity

This part shows the capacity of the available equipment and the required capacity at GST.

Equipment	Available Number	Capacity	Required Capacity
Bore logger	1	The covered area is designated for small-scale miners, which are not more than 10 hectares, equivalent to 0.049km ²	To cover a large area of more than 2916km ² within a short time
Current Reels with cable wire (1500m)	5		
EM transmitter (PROMISE TX)	1		
EM IP TX controller	4		
EM receiver	2		
EM transmitter	1		
Emanometer (Old)	1		
Gamma-ray spectrometer	3		
Generator (Honda)	7		
Genie/hlem transmitter	1		
Gravity meter(G-112) (OLD)	1		
Ground Penetration Radar (GPR)	1		
Hammer (Mallet)	4		
IGS-2 System control console	1		
IP receive	4		
IP Transmitter	5		
Land film holder	1		
Magnetometer	10		
Mount Sopris	2		
Multimeter	1		
Non-polarised Electrodes	50		
Porous Ports	10		
Portable Gamma Ray Spectrometer	2		
Portacorder/RV -320B	1		
Potential Reels with wire cable(50m, 100m, 150m, 200m,250m 300m 350m,	10		

Equipment	Available Number	Capacity	Required Capacity
Radio Calls (Kenwood and Motorola)	24		
Scintilla meter	1		
TEM 57 receiver	1		
TEM 57 transmitter	1		
Threshold gamma ray scintilla meter	1		
Threshold gamma-ray spectrometer	1		
Tool Box mechanical	2		

Source: Auditors' Analysis on Geophysics Equipment List, 2024

Appendix Eight: Status of Procurement of Geological Equipment

This part shows the status of procurement of Geological Equipment that was planned to be implemented in the financial years from 2020/21 to 2023/24.

Financial Year	Tender No (As per APPs)	Equipment	Use of the Equipment	Status of Procurement	Reason for not Procuring the Equipment
2020/21	AE/059/2020-2021/G/24	Supply of geological equipment and installation	Conducting geological surveys	Not procured	Not planned in their action plan
	AE/059/2020-2021/G/12 Lot 1-3	Supply of Seismic equipment	Studying the ground conditions to a significant depth and over a large area.	Not procured	Not planned in their action plan
2022/23	AE/059/2022-2023/G/20	Supply of Geological field consumables , gear and equipment	Used for safety during field works	Not completed	Not planned in their action plan
	AE/059/2022-2023/G/21	Supply of geological investigation facilities	To identify characteristics of the foundation soils and rocks.	Not completed	Not in their action plan
	AE/059/2022-2023/G/54	Supply of tents and camp equipment	Used by surveyors during field work	Not completed	Not in their action plan
	AE/059/2022-2023/G/09	Supply and installation of geological equipment	Data collection and processing	Completed	NA

Financial Year	Tender No (As per APPs)	Equipment	Use of the Equipment	Status of Procurement	Reason for not Procuring the Equipment
		(Computer and ICT)			
	AE/059/2023/G/13	Supply of crucibles-making materials	Production of crucibles	Not completed	Planned TZS 239,200,000 budget was not disbursed. Heavy rainfall makes it hard for suppliers to supply materials in a timely
2023/24	AE/059/2024/G/94	Supply of generators	Electrical supply during field works	Not procured	Not included in the action plan
	AE/059/2024/G/78	Geological equipment (Tough Book, GPS, IRIS, Gas analyser, Magnetometers, etc.)	Geological mapping	Not completed	Not included in the annual action plan

Source: Auditors' Analysis of GST's Procurement Plans and Reports, 2024

Appendix Nine: Status of Delay in Procurement of Selected Geoscientific Equipment

This part shows the extent of delay in procurement of selected geoscientific equipment at GST.

Tender No (As per APPs)	Equipment	Invitation Date	Expected Completion Date	Extent of delays (in Days (In Years))	Status up to September 2024	Reason for its Incompleteness
AE/059/2022-2023/G/20	Supply of Geological field consumables, gear, and equipment	25-Aug-22	26-Sep-22	2.01	Incomplete	Not planned in their action plan
AE/059/2022-2023/G/21	Supply of geological investigation facilities	25-Aug-22	26-Sep-22	2.01	Incomplete	Not in their action plan
AE/059/2022-2023/G/54	Supply of tents and camp equipment	02-Sep-22	04-Oct-22	1.99	Incomplete	Not in their action plan
AE/059/2022-2023/G/13	Supply of crucibles-making materials	25-Aug-22	26-Sep-22	2.01	Incomplete	<ul style="list-style-type: none"> • Planned TZS 239,200,000 budget was not disbursed • Heavy rainfall makes it hard

Tender No (As per APPs)	Equipment	Invitation Date	Expected Completion Date	Extent of delays (in Days (In Years))	Status up to September 2024	Reason for its Incompleteness
						for suppliers to supply materials in a timely manner.
AE/059/2023-2024/G/94	Supply of generators	26-Sep-23	16-Nov-23	0.87	Incomplete	Not included in the action plan
AE/059/2023-2024/G/78	Geological equipment (Tough Book, GPS, IRIS, Gas analyser, Magnetometers, etc.)	28-Sep-23	16-Nov-23	0.87	Incomplete	Not included in the annual action plan

Source: Auditors' Analysis of GST's Procurement Plans and Reports, 2024

Appendix Ten: Analysis of Staff Productivity

This part shows the analysis of staff productivity based on the number of available staff at GST.

Directorate	Number of Staff	Tasks /Roles	Targeted Output	Actual Output	Ratio of Staff to Perform the Task (Output/Input)	Performance Gap (%) = ((Targeted Output - Actual Output) / Target) × 100	Remarks
Directorate of National Geoscientific and Minerals Database	13	Digitize 24 existing and new geological maps	24	9	1	63	On average, one staff member was digitising one geological map per year, while GST underperformed the task by 63%
		Edit 30 maps	30	21	2	30	On average, one staff member was digitising one geological

Directorate	Number of Staff	Tasks /Roles	Targeted Output	Actual Output	Ratio of Staff to Perform the Task (Output/Input)	Performance Gap (%) = ((Targeted Output - Actual Output) / Target) × 100	Remarks
							map per year, while GST underperformed the task by 63%
		Review, verify, process and store geoscientific data/information and reports from Mineral Right Holders (MRH)	Not set	405	31	NA	One staff member collected 43 reports. However, GST did not set the target.
		To scan 500 existing geoscientific maps	500	526	40	(5)	One staff member scanned 40 existing geoscientific

Directorate	Number of Staff	Tasks /Roles	Targeted Output	Actual Output	Ratio of Staff to Perform the Task (Output/Input)	Performance Gap (%) = ((Targeted Output - Actual Output) / Target) × 100	Remarks
		and reports					ific maps and reports, whereas GST overperformed by 5%
		Capture 500 booklet metadata and upload it to the database	500	233	18	53	One staff member captured 18 booklets' metadata and uploaded them to the database. However, GST underperformed the task by 53%

Directorate	Number of Staff	Tasks /Roles	Targeted Output	Actual Output	Ratio of Staff to Perform the Task (Output/Input)	Performance Gap (%) = ((Targeted Output - Actual Output) / Target) × 100	Remarks
Laboratory Services	49	Facilitate laboratory tests for 17,000 samples	23,000	25,793	526	(12)	One staff member facilitated laboratory tests for 526 samples, whereas GST overperformed by 12%

Source: Auditors' Analysis of Available Human Resources and Delivered Output, 2024

Appendix Eleven: Content of the Training Program and their Reflection on the Annual Action Plan

This part shows the content of the training program and their reflection in the Annual procurement plan.

Financial Year	Planned Training Content in the Training Programme	Status of Coverage in the Annual Plan	Status of Implementation
2020/21	Geographical Information System and Cartographic Processing	Not Covered	Not Implemented
	Mineral resources estimation	Not Covered	Not Implemented
	Geological Mapping	Not Covered	Not Implemented
	Seismic Survey, data acquisition, processing and interpretation	Not Covered	Not Implemented
	Training on machine Operation and Troubleshooting	Not Covered	Not Implemented
	Ore Microscopy	Not Covered	Not Implemented
	Gemstone identification	Not Covered	Not Implemented
	Geographical Information System	Not Covered	Not Implemented
	Geophysics and Induced Polarisation (IP) Management	Not Covered	Not Implemented
	Software Engineering/Programming	Not Covered	Not Implemented
	Digital Library and Information System	Not Covered	Not Implemented
	Digital Library	Not Covered	Not Implemented
	Database and Website Development	Not Covered	Not Implemented
	Remote sensing and Geographical Information System	Not Covered	Not Implemented
2021/22	Mineral Resource Estimation	Not Covered	Not Implemented
	Ore Microscopy	Not Covered	Not Implemented
	Petrographic /gemological Studies Practical	Not Covered	Not Implemented

Financial Year	Planned Training Content in the Training Programme	Status of Coverage in the Annual Plan	Status of Implementation
	Training on machine Operation and Troubleshooting	Not Covered	Not Implemented
	Geophysics and Induced Polarisation (IP) Management	Not Covered	Not Implemented
	Mineral processing management	Not Covered	Not Implemented
	Gemstone identification	Not Covered	Not Implemented
	Mineral resources and reserve estimation	Not Covered	Not Implemented
2022/23	Remote sensing and Geographical Information System	Not Covered	Not Implemented
	Ore Microscopy	Not Covered	Not Implemented
	Mapping Geology	Not Covered	Not Implemented
	Library management	Not Covered	Not Implemented
	GIS Interface and Spatial Data Infrastructure - Database Modelling and Management	Covered	Implemented
	Geophysical data acquisition, processing, and interpretation	Not Covered	Not Implemented
	Geophysical modelling	Not Covered	Not Implemented
	Application of Remote Sensing in Mineral Exploration	Not Covered	Not Implemented
2023/24	Data acquisition, processing, and interpretation using Ground penetrating radar (GPR) and bore logger	Not Covered	Not Implemented
	Training on machine Operation and Troubleshooting	Covered	Not Implemented
	Gemstone identification	Not Covered	Not Implemented
	Machine Operation	Not Covered	Not Implemented
	GIS and Remote Sensing	Not Covered	Implemented
	Ore Microscopy	Not Covered	Not Implemented
	Mapping Geology	Not Covered	Not Implemented

Financial Year	Planned Training Content in the Training Programme	Status of Coverage in the Annual Plan	Status of Implementation
	Geophysical data interpretation and report writing	Not Covered	Not Implemented
	Geophysical data acquisition, processing, and interpretation	Not Covered	Not Implemented
	Geoscientific data processing and prediction using AI techniques	Not Covered	Not Implemented
	Geophysical data acquisition, processing, and interpretation on ERT/IP	Not Covered	Not Implemented
	Modelling and Resource Estimation	Covered	Not implemented
	Mineral Resource Estimation	Not Covered	Not Implemented -

Source: Auditors' Analysis of Training Program and Annual Action Plan for 2020/21-2023/24

Appendix Twelve: Activities that Received Less than 50% of the Planned Budget

This part shows the activities that received less than the planned amount of funds to facilitate the acquisition of the geoscientific survey data.

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	% Disbursed
2020/21	Preparation of the specifications for acquiring, calibration and Servicing laboratory equipment	93.80	39.57	42
	Purchasing/renewing and installation of 20 data processing software, upgrading the server, and maintaining communication networking in GST's	18.27	7.46	41
2021/22	Acquire Application Software Systems and Licenses	325.00	40.83	13
	Improvement of laboratory equipment and software	93.80	32.49	35
2022/23	<ul style="list-style-type: none"> • Updating and maintaining ICT systems (Computer preventive maintenance, Procuring and installing antivirus • Procurement and installation of access control at Mbwanga) 	32.35	7.75	24
	Updating mineral occurrences database, a Book of Madini Yapatikanayo and Minerogenic (Field Collection and verifying mineral occurrence for 16 regions of Tanzania,	83.85	12.82	15
	Collection, reviewing, processing, verification and storage of Geoscientific data/information and reports from 40 Mineral Right Holders	24.20	6.87	28

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	% Disbursed
	Procurement of geoscientific equipment	580.00	74.37	13
	Upgrading and maintaining the ICT system	31.35	7.75	25
	Improving laboratory equipment and software (Preparation of specifications and purchase of software for operation and equipment, Equipment service and maintenance	56.70	19.47	34
2023/24	Geological mapping in two (2) unmapped QDS and strategic Mineral Potential Mapping into two (2) QDS	296.24	20.92	7
	Digitization of 24 existing and new geological maps; editing 30 maps and processing satellite imageries for 10 QDSs	278.44	134.38	48
	Collection, verification, review, process and store geoscientific data/information and reports from Mineral Right Holders	33.87	5.51	16
	Updating of mineral occurrences database on a Book of Minerogenic Map of Tanzania	70.54	2.60	4
	Scanning of 500 existing geoscientific maps and reports; capturing 500 booklets metadata and uploading in the database; and collecting 100 specimens for Geo-museums	26.81	0.0015	1
	Testing of 400 geotechnical samples, 200 metallurgical samples, 1000 Petrographic and mineralogical samples, 11,200 rocks, soils, plants, water and mineral	153.40	72.30	47

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	% Disbursed
	samples, 200 environmental samples			
	Quality assurance/control programmes	36.00	14.30	40
	Preparation of specifications, Outsourcing, Budget preparation and application, spare parts procurement and installation	51.65	23.63	46

Source: Auditors' Analysis of the Action Plan and Progress Report, 2024

Appendix Thirteen: Activities that were allocated above 50% of the Planned Budget

This part shows the activities that were allocated with less than 50% of the planned budget.

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	Disbursed (%)
2020/21	To conduct Regional geological and geochemical mapping in two (2) QDSs at a scale of 1:100,000 conducted by June 2021	304.36	315.28	104
	To upgrade the geo-scientific and mineral database of the country	212.04	146.36	69
	To verify geoscientific data and information collected from the mineral right holders	94.50	87.49	93
	To conduct geo-scientific investigations in one (1) demarcated area for small-scale miners by June 2021	74.94	68.53	91
2021/22	To conduct geological mapping in two (2) QDS and geoscientific investigation in two (2) selected areas by June, 2022	277.30	281.61	102
	To conduct 4 special geoscientific investigations, 4 Research, 1 Industrial/Strategic Metals Investigation by June 2022	243.35	243.35	100
	To digitize 30 existing and new geological maps; edit 15 maps, Process Satellite imageries for 10 QDSs; computerize and scan 1,000 reports	165.58	96.51	58
	To collect/verify existing/new raw-geoscientific data/information from MRH and geoscientific research companies/institutes	135.16	93.31	69

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	Disbursed (%)
	To upgrade the geo-scientific and mineral database of the country	60.91	84.91	139
	To facilitate quality assurance/control programmes by June 2022	72.40	58.64	81
	To acquire Laboratory equipment and instruments (Preparation of specifications, Outsourcing Budget preparation and application of spare parts)	2,040	1,250.14	61
2022/23	To digitize 24 existing and new geological maps; edited 30 maps and processed satellite imageries for 10 QDSs by June 2023	137.20	74.37	54
	To conduct geological mapping in two (2) unmapped QDS and strategic Mineral Potential Mapping into two (2) QDS by June 2023	278.18	250.44	90
	To conduct 2 special geo-scientific and 4 geotechnical investigations, 1	255.99	243.53	95
2023/24	Conduct 4 special geo-scientific investigations on geotechnical investigations, geo-tourism, research papers, and Industrial/Strategic Mineral Investigation by June 2024	108.20	84.97	79
	Conduct a geo-scientific investigation in one (1) demarcated area for small-scale miners	29.39	20.92	71
	To update and maintain ICT systems by June 2024	31.77	23.70	75
	To facilitate national geoscientific and mineral data management and dissemination	157.02	131.61	84

Financial Year	Activity	Planned Amount (TZS Million)	Disbursed Amount (TZS Million)	Disbursed (%)
	At least 5000 geochemical samples are to be analysed by June 2024	609.69	433.29	71

Source: Auditors' Analysis of the Action Plan and Progress Report, 2024

Bukoba

Lake Victoria

Musoma

Fig. 2

Mwanza

Geita

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