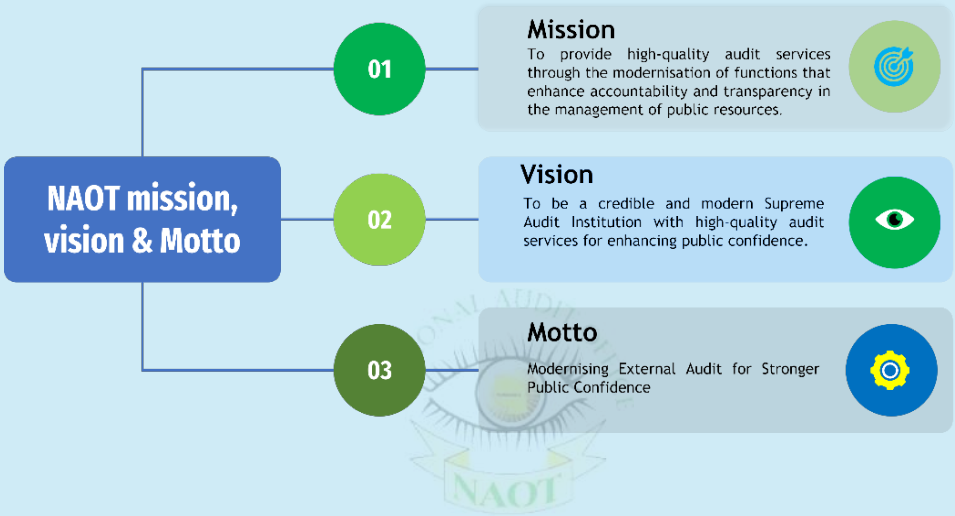
THE UNITED REPUBLIC OF TANZANIA
NATIONAL AUDIT OFFICE

PERFORMANCE AUDIT REPORT ON THE MANAGEMENT OF RESEARCH AND INNOVATION ACTIVITIES

CONTROLLER AND AUDITOR GENERAL
MARCH 2023

About National Audit Office

The statutory mandate and responsibilities of the Controller and Auditor General are provided for under Article 143 of the Constitution of the United Republic of Tanzania, 1977 and in Section 10 (1) of the Public Audit Act, Cap. 418.



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PREFACE

Section 28 of the Public Audit Act, CAP 418 [R.E. 2021] gives mandate to the Controller and Auditor General to carry out 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 Parliament of the United Republic of Tanzania, the Performance Audit Report on the Management of Research and Innovation Activities.

The report contains findings, conclusions, and recommendations that are directed to the Ministry of Education, Science and Technology and the Commission for Science and Technology.

The Ministry of Education, Science and Technology and the Commission for Science and Technology had the opportunity to scrutinize the factual contents of the report and comment on it. I wish to acknowledge that discussions with the Ministry of Education, Science and Technology and the Commission for Science and Technology have been useful and constructive.

My Office will carry out a follow-up audit at an appropriate time regarding actions taken by the Ministry of Education, Science and Technology and the Commission for Science and Technology in implementing the recommendations given in this report.

In completing the audit assignment, I subjected the draft report to a critical review of subject matter experts, namely Dr. Bitrina Diyamet from Science, Technology and Innovation Policy Research Organization (STIPRO) and Dr. Edephonce Nfuka from the Open University of Tanzania (OUT) who came up with useful inputs for the improvement of this report.

The report was prepared by Mr. Jeje D. William (Team Leader), Mr. Ahimidiwe Ngilangwa and Mr. Andrew Kazembe (Team Members) under the supervision and guidance of Mr. Michael D. Malabeja (Chief External Auditor), Mr. James G. Pilly (Assistant Auditor General) and Mr. George C. Haule (Deputy Auditor General).

I would like to thank my staff for their commitment in preparing this report. I also acknowledge the audited entities for their cooperation with my Office, which facilitated the timely completion of the audit.

Charles E. Kichere
Controller and Auditor General
United Republic of Tanzania
March, 2023

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LIST OF ABBREVIATIONS AND ACRONYMS

BRELA	Business Registration and Licencing Agency
CDTT	Centre for the Development and Transfer of Technology
COSOTA	Copyright Society of Tanzania
COSTECH	Commission for Science and Technology
CSOs	Civil Society Organization
CUHAS	Catholic University of Health and Allied Sciences
DIT	Dar es Salaam Institute of Technology
DKM	Directorate of Knowledge Management
EPZA	Export Processing Zones Authority
FY	Fiscal Year
GII	Global Innovation Index
HLIs	Higher Learning Institutions
HQ	Head Quarter
ICT	Information and Communication Technology
IPR	Intellectual Property Right
IRB	Institutional Review Board
IRDP	Institute of Rural Development Planning
ISO	International Organization for Standardization
KPI	Key Performance Indicators
LGA	Local Government Authority
M&E	Monitoring and Evaluation
MAKISATU	Mashindano ya Kitaifa ya Sayansi, Teknolojia na Ubunifu
MoEST	Ministry of Education, Science and Technology
MoU	Memorandum of Understanding
NDC	National Development Cooperation
NFAST	National Fund for Advancement of Science and Technology
NFRC	National Framework for Research Chairs
NIMR	National Institute for Medical Research

NRRC	National Research Registry Committee
NSC	National Steering Committee
OC	Other Charges
PE	Personal Emolument
R&D	Research and Development
REPOA	Research and Poverty alleviation
Sida	Swedish International Development Cooperation Agency
SIDO	Small Industries Development Organization
SP	Strategic Plan
STI	Science, Technology, and Innovation
SUA	Sokoine University of Agriculture
TAEC	Tanzania Atomic Energy Commission
TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forest Research Institute
TARI	Tanzania Agricultural Research Institute
TAWIRI	Tanzania Wildlife Research Institute
TEMDO	Tanzania Engineering and Manufacturing Design Organization
TIC	Tanzania Investment Centre
TIRDO	Tanzania Industrial Research and Development Organization
UDSM	University of Dar es Salaam

EXECUTIVE SUMMARY

Introduction

Research provides information that can improve people's living standards by stimulating growth and increasing productivity in critical sectors of the economy. At enterprises, research and innovation can bring about product innovations, product improvement, increased services, effectiveness, and improved performance in the market. This could happen if the research carried out was demand-driven, and in that regard, the results are used to solve societal and development challenges which are obstacles to development.

Despite government's efforts in research and innovation in the country, significant benefits of research and innovation have not been fully realized. This is because only a few research results and innovations have been converted into tangible products. This might be contributed to inadequate management in research and innovation. Therefore, the Controller and Auditor General has been motivated to conduct the audit on the management of research and innovation in the country.

The main objective of the audit was to assess whether the Ministry of Education, Science and Technology (MoEST) and the Tanzania Commission for Science and Technology (COSTECH) effectively manage research and innovation to foster innovation and technology in the country. The audit focused on assessing the adequacy of developed strategies and plans, overall management of the registered research and innovations, coordination of the key actors, and monitoring. The audit covered a period of four financial years from July, 2018/19 to June, 2021/22.

The adopted methodologies for data collection were mainly interviews and document reviews conducted at the Commission for Science and Technology (COSTECH), the Ministry of Education, Science and Technology (MoEST), the visited Research and Development Institutions (R&Ds) and Higher Learning Institutions (HLIs).

Main Audit Findings

Inadequate Implementation of the Developed Strategies and Plans to Identify and Register all Research and Innovation Activities

It was noted that the Commission for Science and Technology did not adequately manage to implement the developed strategies and plans for identifying and registering research and innovations. For instance, being part of the output that would be made from the identified and registered research and innovation activities, it was shown that by the end of June 2021, the Commission managed to produce 9 out of 15 planned Policy Briefs, provide training on evidence-based decision-making to 4 out of 100 planned MDAs, and conduct two out of five planned dialogues on Science, Technology, and Innovation.

It was further revealed that the plans were developed to implement the strategies in collaboration with the RDIs and HLIs or other key stakeholders. However, due to the different institutional set-ups, the counterpart R&Ds and HLIs did not effectively support the implementation of the plans, and therefore, the Commission was unable to effectively carry out its plans. It was further noted that research institutions were likely to pay attention to the research coordination procedures as per the directives of the respective sector ministries. On other hand, it was noted that the observed shortcomings in meeting the set targets were also caused by late government subsidy disbursement and staffing shortage at the Commission.

Inadequate Implementation of Planned Activities for Research and Innovation

According to a review of the Corporate Strategic Plan for fiscal years 2016/17-2020/22, it was shown that COSTECH intended to publish fifteen policy briefs and project briefs annually as part of the implementation of strategic objective one, which called for a stronger evidence-based decision-making culture. COSTECH also planned to support 10 Research and Innovation Chairs in Strategic Areas by June 2020, strengthen 76 R&D Institutions Review Boards (IRBs) by June 2019, connect 76 R&D institutions to information platforms and repositories by June 2021, and assist 20 R&D

institutions in acquiring relevant laboratory facilities through NFAST by June 2019.

However, a review of COSTECH Research and Innovation Impact Bulletins[1], indicated that from the fiscal year 2018/19 to 2020/21 there was a total of 30 research briefs produced from different R&Ds and HLIs funded through NFAST. In addition, nine of the twenty planned institutions received funding for laboratory infrastructure; and only 37 out of 76 planned capacity building programmes for Institutional Review Boards (IRBs) were conducted. Concerning the target of connecting 76 institutions to information platforms and repositories by June 2021, it was noted that this target covered only 29% of the 69 Research and Development and Academic Institutions that existed[2].

According to the Final Repository Project Report of the year 2022 and interviews with COSTECH officials; it was revealed that only 36 of the 76 institutions were affiliated with the repository. Also, it was shown that COSTECH through the Repository Project planned to connect 50 repositories to the central national repository which is hosted at COSTECH. This includes the connection of 10 institutions that had existing repositories and developing the institutional repositories for 40 identified institutions that had no repositories.

On the other hand, out of 36 connected institutions, only six of the institutions that were supposed to link to the COSTECH repository also did have repositories of their own. There were two institutions, namely the Catholic University of Health and Allied Sciences (CUHAS) and Tanzania Industrial Research and Development Organization (TIRDO) that were wrongly included in the activity of connecting only while they did not have existing repositories. Also, there were other two institutions, namely the Institute of Rural Development Planning (IRDP) and Research on Poverty Alleviation (REPOA) that had their repositories, but due to compatibility issues, it was not possible to connect to the COSTECH repository. One institution, namely the Institute of Rural Development Planning (IRDP) was

[1] COSTECH Research and Innovation Impact Bulletin, Vol 1 Issue 1, 2018; COSTECH Research and Innovation Impact Bulletin, Vol 2 Issue 1, 2020; COSTECH Research and Innovation Impact Bulletins, Vol 3, 2021.

[2] Appendix 2 of the National Research Registration and Clearance Guidelines, 2022; (List of Tanzanian Research and Academic Institutions)

using an old version of the open-source web-publishing platform repository and the other was using a cloud commercial repository that did not support connection to the central repository.

Inadequate Mechanism to Ensure Effective Implementation of the Available Plans for Registered Research and Innovation Activities

The audit team examined four annual plans for each financial year from 2018/19 to 2021/22 to see if the Commission had developed Strategies or Plans for tracking all registered research and innovation activities. Despite monitoring of the funded projects through COSTECH[3], the audit team noted that COSTECH did not have a clear plan outlining how they would monitor the registered research and innovation activities, key performance indicators, clear communication channels for tracking progress for all researches undertaken in different R&Ds and HLIs that are not directly funded through COSTECH. According to an interview with officials from the Commission, it was revealed that the monitoring plans were introduced in the new Strategic Plan 2022-2027, and as a result, the implementation of plan begun in the current fiscal year 2022/23.

In the absence of a monitoring plan in the previous four years, the audit team reviewed only the correspondence documents and found that monitoring of registered research and innovation activities was done on an ad hoc basis or at times arbitrarily based on instructions from top management or the Board of Directors. For instance, according to our review of the 2020/21 Performance Report of the Commission, it was indicated that during its 89th meeting, the Board of Commissioners directed the Management of the Commission to conduct a monitoring exercise for 59 MAKISATU innovation projects that were registered in the year 2019. The consequence of this was that the directive only applied to a small number of projects, although there was a total of 116 innovation activities registered and funded through NFAST in that year.

[3] Monitoring of the COSTECH funded projects is done as per the requirement of the Research and Innovation Grant Manual

Furthermore, it was noted that the conducted M&E is normally done for selected projects based on risk assessment and availability of financial resources, thus implying there is under coverage of the projects that ought to be monitored in each phase of M&E exercise. On the other hand, it was revealed that the content of what to monitor was limited to issues of interest to the Board of Commissioners rather than being comprehensive and holistic to the entire project cycle. As a result, the Commission could not protect taxpayer money by closely monitoring and appreciating the value-for-money of government-funded innovation projects. Given that TZS 450,600,000 had been invested in them, the audit team was unsure about the performance of the unmonitored projects. The lack of a system for tracking all registered research and innovation activities makes it difficult for the Commission to ensure that the funded projects were proceeding as planned and that material and financial resources were not misappropriated.

Inadequate Commercialization of Innovation Activities Funded through NFAST

It was noted that starting from the year 2019 to 2021, the Commission allocated a total fund of about TZS 1.1 billion to support innovation activities. In contrast, the innovations identified in 2019 were expected to be commercialized by June 2022. However, a review of the innovation list published by the Commission showed that only 9 of the 58 (15.5%) registered innovations in 2019 were commercialized, and the remaining 49 of the 58 (84.5%) registered innovations were either in other developmental stages or had no development status. On the other hand, despite the passage of time, none of the innovations registered in 2020 had been reported as commercialized as of June 2022.

However, it was revealed that the slow rate of commercialization was due to inadequate monitoring of the stated innovations to ensure that they are commercialized and sustainable. Other factors contributing to slowness include weak ties between the public sector, industry, and universities, as well as a lack of commercialization knowledge among local innovators.

Overlapping Mandates for the Registration of Technology Transfer Agreements

It was noted that several authorities are mandated to register technology transfer agreements under various Acts of their establishments. The audit reviewed respective Sections of the Acts of establishments of three (3) entities, namely COSTECH, Tanzania Investment Centre (TIC), and the Business Registrations and Licensing Agency (BRELA); it was indicated that Section 15(3) of the National Centre for Development and Transfer of Technology (CDTT) Act requires COSTECH to register all technology transfer agreements to assess compliance with the national laws. While Section 26(2) of the Tanzania Investment Act also requires that technology transfer agreements be registered with the Tanzania Investment Centre (TIC). Likewise, Section 47 of the Patents Act allows BRELA, to register all license agreements as the Office in charge of patenting.

The collaboration of the three entities was not working well. This has created a difficult environment for innovators because they must meet all regulatory requirements for each entity separately. This resulted in several delays and additional paperwork, as well as the innovator being responsible for paying all three parties. Due to these competing roles and responsibilities, COSTECH was unable to establish direct contact with all of these institutions, as they are primarily required to report to their parent ministries and are not bound to COSTECH. As a result, crucial data such as the total number of transferred technologies, the total number of innovations made, and the total number of research projects that could be used to produce useful policy briefs for the government are missing from the Commission.

In addition, conducted interviews with officials from the visited R&D and HLIs reiterated that the causes of the observed low level of compliance and low coordination efficiency of research activities in the country were due to systemic problems related to the existing institutional structural set-up of the Commission. It was further revealed that currently, the Commission reports to the Ministry of Education, Science and Technology, which puts it on the same level as other research institutions that are housed under the ministries of their respective sectors.

Slow Pace of Implementation of National Monitoring Framework for Research and Innovation

Despite the existing awareness of the National Monitoring Framework for Research and Innovation in the visited HLIs and R&Ds, none of them provided evidence to show that these institutions used this framework as a guide when reporting the results and impact of their research and innovations. This is because each of these institutions had its monitoring framework before the national framework was introduced, and the two have not been harmonised to complement one another or otherwise the national framework would need to prevail.

Furthermore, despite efforts made to ensure that the framework is electronically coordinated, the audit found that, aside from the awareness seminars held when the document was lodged, there had been no documented long-term efforts, such as including it in the annual budget, to ensure that the indicators in the framework were used to guide institutional outcomes and innovations. As a result of the lack of an institutionalized monitoring framework for R&D outputs, the Commission would be unable to conduct the analysis and updating the status of R&D activities at institutional levels and document the national status and impact of R&D activities.

Audit Conclusion

Despite ongoing efforts to ensure effective coordination of the research and innovation activities, both the Ministry of Education, Science, and Technology (MoEST) and the Tanzania Commission for Science and Technology (COSTECH) have not adequately guaranteed effective coordination in the course of the implementation of research and innovation activities geared to promote technology and innovation in the country.

The implementation of developed strategies for research and innovation has not been adequately realized and is hampered by insufficient coordination of the activities that ought to be done by the Commission. These challenges were mainly due to insufficient enforcement of the coordination function on research and innovation activities undertaken in different research institutions.

Registered research and innovation activities are not well managed. Although Tanzania has a well-planned strategy for tracking and registering all research and innovation activities, there is a significant gap between the developed strategies and their actual implementation. This is due to several factors, such as the lack of strong government commitment to invest in the research sector.

COSTECH lacked the mechanisms required to ensure that all research and development activities were properly coordinated. In connection with this, COSTECH also did not have a well-established mechanism for coordinating and facilitating the implementation of research and innovation activities. This was caused, in part, by a lack of clearly defined roles and responsibilities for stakeholders to support the effective coordination of research and innovation activities.

There had been inadequate monitoring of research and innovation activities by COSTECH as well as the parent Ministry of Education, Science and Technology. Despite research approvals made through the National Research Clearance Committee at the Commission, COSTECH lack of a mechanism through which it would be informed of the actual research activities undertaken in R&Ds and HLIs are being implemented according to the approval made.

Audit Recommendations

The Ministry of Education, Science and Technology is urged to:

1. Facilitate the procedures to ensure harmonization of the functions and roles of R&D sector ministries that appeared to be incoherent or overlapping; and

2. Develop a mechanism that will help to inform the progress and outcome of the undertaken research and innovation activities for R&Ds and HLIs residing in other sector ministries.

The Commission for Science and Technology is urged to:

1. Create a simplified digital mechanism to facilitate the coordination and promotion of research and innovation among research institutions in Tanzania;

2. Establish a mechanism that will enable electronic data capture and exchange that will help to inform the status of the research and innovation activities undertaken in R&D and HLIs;

3. Establish a mechanism that will help to inform the research funding system for research funds directly allocated to R&Ds and HLIs through respective sector ministries;

4. Ensure sustainable and well-allocated funding systems to cater for research and innovation activities;

5. Enhance the system for information sharing among stakeholders and monitoring or tracking the progress of research projects funded by research grants;

6. Establish a coordination mechanism that will help to inform the existing funding systems for the undertaken research and innovation activities in R&D and HLIs to avoid parallel funding;

7. Establish a system that will help to inform and facilitate the collection of information regarding the status of the undertaken research and innovation initiatives in R&Ds and HLIs;

8. Strategize on tracking stages of development for all identified and funded innovations through NFAST; and

9. Develop a mechanism that will help to inform and facilitate the overall monitoring of the implementation for the planned research and innovation activities.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Audit

Research produces knowledge that can improve people's living standards by stimulating growth and increasing productivity in critical sectors of the economy, and thereby provide employment for the masses. At enterprises level, research produces knowledge for innovation and bring about product innovations, product improvement, increased services, effectiveness, and improved performance in the market. At the national and institutional levels, research – normally in the field of social sciences – produces knowledge that informs policy and decision making, including knowledge for research and innovation policy.

This happens if the research carried out is demand-driven, and in that regard, the results are used to solve societal and development challenges which are obstacles to development. This is possible only when research and innovation in the country are properly managed...

Despite government's efforts in research and innovation in the country, significant benefits of research and innovation have not been fully realized. This is because only a few research results and innovations have been converted into tangible products and services. In addition, according to the Global Innovation Index (GII)[4] report of 2020, Tanzania ranks 88th among the 131 economies. Such scenarios might be the result of inadequate management in research and innovation. Therefore, the Controller and Auditor General has been motivated to conduct the audit on the management of research and innovation in the country.

1.2 The Motivation for the Audit

The management of research and innovation involves the following activities attracting funding, managing funds, liaising with funding bodies,

[4] Countries' innovation capabilities ranking index co-published by Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO), a specialized agency of the United Nations.

project planning, implementation, monitoring and evaluation, publications, research dissemination and commercialization.

On the other hand, the link between research and innovation is that the innovation is a knowledge generated through research, is when he research come up with new products, processes and services. In implementing and managing research and innovation, apart from managing research and its outcome, there is a need to manage relationships between researchers and users of research outcomes (producers and policy makers). This is extremely important for research to have impact on social and economic development.

The audit was motivated by the following factors:

Limited Resource Capacity

The National Case-Study Report on Tanzania for the Research Project (2017) illustrated that Higher Learning Institutions are not in a position to meet their expectations regarding research and innovation due to limited budgets[5]; and that there is a need for the provision of proper guidance and regulations to support the attempts of the institutions in the conduct of research and innovation that would enhance development in various sectors in the country.

It is further explained that despite limited resource capacity, there is a lack of research culture supported by weaknesses in management and leadership in public research institutes[6]. For instance, given a large number of graduate degree programmes from private institutions, there is a limited backup in terms of strong institutional commitment to research.[7]

[5] https://idl-bnc-idrc.dspacedirect.org/bitstream/handle/10625/56808/IDL-56808.pdf
[6] It is explained further that majority of graduates in the fields of education, law, economic, business management and development studies are mainly public servants with the interest of upgrading professional effectiveness and/or promotion
[7] Tanzania Investment and Consultant Group, URL: https://ticgl.com/2021/03/01/challenges-for-research-and-innovation/ Accessed on 21st April 2022

Limited Financial Commitment

The limited capacity of the government to fund priority research areas and innovation has also been explained as an impediment to realizing the potential benefits of research and innovation in various sectors of the country[8]. Likewise, it has been also pointed out that there are almost no incentives for scholars and/or highly qualified researchers to engage in research and innovation.

Weaknesses in Monitoring of Institutional Research Activities

Following the noted challenges that there were Research and Development (R&D) and Higher Learning Institutions (HLIs) having developed individual monitoring systems based on their needs and that of the funding entities, the Government developed Consequently, without standardization, data collected from HLI's, R&D institutions, and industry cannot be compared and making it difficult to gauge the contribution and progress made by a country as a result of investments in research and innovation.

1.3 Design of the Audit

1.3.1 Audit Objective

The main objective of the audit is to assess whether the Ministry of Education, Science, and Technology (MoEST) and the Tanzania Commission for Science and Technology (COSTECH) effectively manage research and innovation to foster innovation and technology development in the country.

The specific objectives of the audit were to assess the adequacy of:

(a) strategies and plans to identify and register all research and innovation activities in the country;

(b) administration of registered research and innovation activities;

(c) coordination of key actors in the implementation of research and innovation activities; and

[8] National Research and innovation framework

(d) Monitoring the implementation of research and innovation activities.

To respond to the above audit objectives, audit questions and sub-questions were developed as detailed in ***Appendix 2*** of this report.

1.3.2 Scope of the Audit

The main audited entities were the Ministry of Education, Science and Technology (MoEST) and the Commission for Science and Technology (COSTECH). The MoEST has the mandate to ensure the implementation of the Science and Technology Policy of 1996. Likewise, COSTECH is responsible for the formulation of policy on the development of science and technology, monitoring and coordination of the activities relating to research and technology development. Also, the audit covered Research and Development and Higher Learning Institutions (See the names of institutions in **Section 1.3.4(i)** of this report).

In assessing the adequacy of the developed strategies and plans, the focus of the audit was in examining the available plans concerning the mandated functions of COSTECH to manage research and innovations in the country. Similarly, the audit focused on determining whether the available resources are optimally allocated to ensure the effective implementation of the available plans.

In assessing adequacy in administering the implementation of the available plans for the registered research and innovation activities, the audit focused on the available mechanisms used to ensure effective implementation of the available plans. It also focused on assessing mechanisms used to ensure efficient utilization of the available resources, and sustainability of supported research and innovation activities.

In assessing adequacy in the coordination of the key actors, the audit focused on examining the defined roles and responsibilities of the identified key actors in the conduct of research and innovation activities. It also focused on mechanisms in place to ensure effective coordination of research and innovation activities, presence and functioning of research platforms to

ensure the usability of the produced results from research and innovation activities.

Furthermore, in assessing adequacy in monitoring the implementation of research and innovation activities, the audit focused on examining the available monitoring plans and adherence to the available guidelines, the existence of Key Performance Indicators to facilitate monitoring of the research results concerning the national research agenda and usage of monitoring results for informed decision-making. Also, the audit focused on assessing whether MoEST effectively monitors all activities performed by COSTECH in relation to coordination, registration and monitoring of research and innovation activities as conducted by R&Ds and HLIs in the country.

The audit covered a period of four financial years from July, 2018 to 30th June 2021. The aim was to assess the performance trend of the MoEST and COSTECH in managing research and innovation activities in the country. Also, this period provided room to assess improvements made in the overall management of research and innovation activities based on the set research priorities in the national research agenda from the year 2015 to 2020 and the first year of the current National Research Priorities 2021/22-2015/16.

1.3.3 Assessment Criteria

The assessment criteria were drawn from different sources such as Legislation, Strategies, and Guidelines.

(a) Strategies and Plans to Identify and Register all Research and Innovation Activities

Section 15(3)(j) of the Commission of Science and Technology Act, 1986 requires the Commission for Science and Technology (COSTECH) prepare plans for the development of technology in the critical sectors of the economy. Likewise, Section 15(3)(f) of the same Act requires that the COSTECH through the Centre for the Development and Transfer of Technology to maintain a registry of imported technology and register all of the available domestic technological resources and manpower.

(b) Administration of Registered Research and Innovation Activities

Clause 1 of the Strategic Plan (2016/17 to 2020/21) of the Commission for Science and Technology requires the Commission to identify and prioritize the existing constraints to further development of services offered by the Commission including those relating to the regulatory framework, policies, socio-economic structure, and research funding. Similarly, para f of the Research and Innovation Grant Manual requires the Commission to support innovation-related activities such as those of micro, small and medium-sized companies, hubs, labs, and co-creation networks.

(c) Coordination Arrangement in the Implementation of Research and Innovation Activities

Objective 4 of the Research Monitoring Framework of the Commission for Science and Technology (2020) requires that the Commission for Science and Technology has to ensure the institutionalization of research monitoring and communication system in Higher Learning, and Research and Development Institutions.

(d) Monitoring the Implementation of Research and Innovation Activities

Component Number 10 of the National Research and Innovation Monitoring Framework of the Commission of Science and Technology, 2020 requires the Commission for Science and Technology as the national research coordinating body to ensure the availability of systems support for Research and Development and Higher Learning Institutions whenever necessary; these include but not limited to strengthening electronic submission systems and capacity building for data management to personnel responsible for reporting of research results at the institutional level.

On the other hand, Objective 4 of the Research Monitoring Framework of the Commission for Science and Technology, 2020 requires the Commission for Science and Technology to identify and define Key Indicators to monitor and communicate research works. Also, the Framework requires the Commission to systematically track the research processes for the sake of monitoring the research outputs, outcomes, and impacts.

1.3.4 Sampling, Data Collection and Data Analysis Methods

(i) Sampling Method

A purposive sampling method was used to select the visited Research and Development Institutions (RDIs), and Higher Learning Institutions (HLIs) affiliated with the Commission to verify noted matters about the coordination function. The audit identified the main research priority areas from the year 2015 to 2020 for Health, Agriculture, Forestry, Wildlife, Fisheries and Energy. Research institutions were then selected based on whether they are involved in research and/or innovation activities grounded on the seven listed research priority areas.

Therefore, the selected institutions were: the National Institute of Medical Research (NIMR), University of Dar es Salaam (UDSM), Tanzania Fisheries Research Institute (TAFIRI), Dar es Salaam Institute of Technology (DIT), and Small Industries Development Organization (SIDO) in Dar es Salaam region; Tanzania Wildlife Research Institute (TAWIRI), Tanzania Atomic Energy Commission (TAEC), and Tanzania Engineering and Manufacturing Design Organization (TEMDO) in Arusha region; Tanzania Agricultural Research Institute (TARI) in Dodoma region; Tanzania Forestry Research Institute (TAFORI) and Sokoine University of Agriculture (SUA) in Morogoro region.

(ii) Methods of Data Collection

Interviews

Interviews were conducted with the selected officials from MoEST and COSTECH. At the Ministry of Education, Science and Technology, interviewed officials included the Director of Science, Technology, and Innovation, and Heads of Divisions for Science, Technology, and Innovation. Similarly, at the COSTECH, the interviewed officials included the Director General and Managers from the identified core Departments for Research Coordination and Promotion, Centre for Development and Transfer of Technology, and Knowledge Management.

On the other hand, to get clarity on COSTECH's overall performance on the coordination function, interviews were also conducted with the elected officials from the selected Public Research and Development Institutions and Higher Learning Institutions affiliated with the Commission. The officials interviewed were from both the strategic and operational levels. Further, at the visited Research and Development, and Higher Learning Institutions, interviews were held with Director Generals and Heads of Departments responsible for Research Coordination, Monitoring, and Promotion. See ***Appendix 4*** of this report for details on the list of officials interviewed and the reasons for interviewing them.

Documents Reviews

The audit team reviewed various documents from MoEST and COSTECH. Also, reviewed documents included those from the selected Research and Development and Higher Learning Institutions.

The reviews focused mainly on the documents relating to Planning, Implementation of the planned activities, Monitoring, and Dissemination. The documents reviewed were those containing information within the selected audit timeline; July, 2018 to June, 2022. The reviews of documents were meant to assess issues surrounding the management of research and innovation and corroborate with the information collected from interviews. See ***Appendix 5*** of this report for the list of reviewed documents and reasons for reviewing them.

(iii) Methods of Data Analysis

The audit used different techniques to analyse the data collected during the audit. Both quantitative and qualitative data analysis methods were used.

Quantitative Data Analysis

Quantitative data were compiled and analysed using an excel spreadsheet to ascertain emerged facts in tabular form. The facts were then described in texts based on the frequency of occurrence, proportions, and averages to explain the existing relationship and trend over time. In addition, to

further clarify the facts observed, the data collected were presented and described using simple charts.

Qualitative Data Analysis

Conceptual content analysis was used to analyse qualitative data to determine the existence and frequency of emerged concepts from the interviews and document reviews. The collected information was identified and coded based on the main themes focused on key concepts for each of the audit questions. As well, based on the frequency of occurrence of the emerged themes, information was then summarized and presented as narrated texts to affirm the noted facts.

1.4 Data Validation Process

The Audited Entities were given the opportunity to go through the draft report and comment on the information presented therein. Both the Ministry of Education, Science and Technology and the Commission for Science and Technology confirmed the accuracy of the information and figures used and presented in this report.

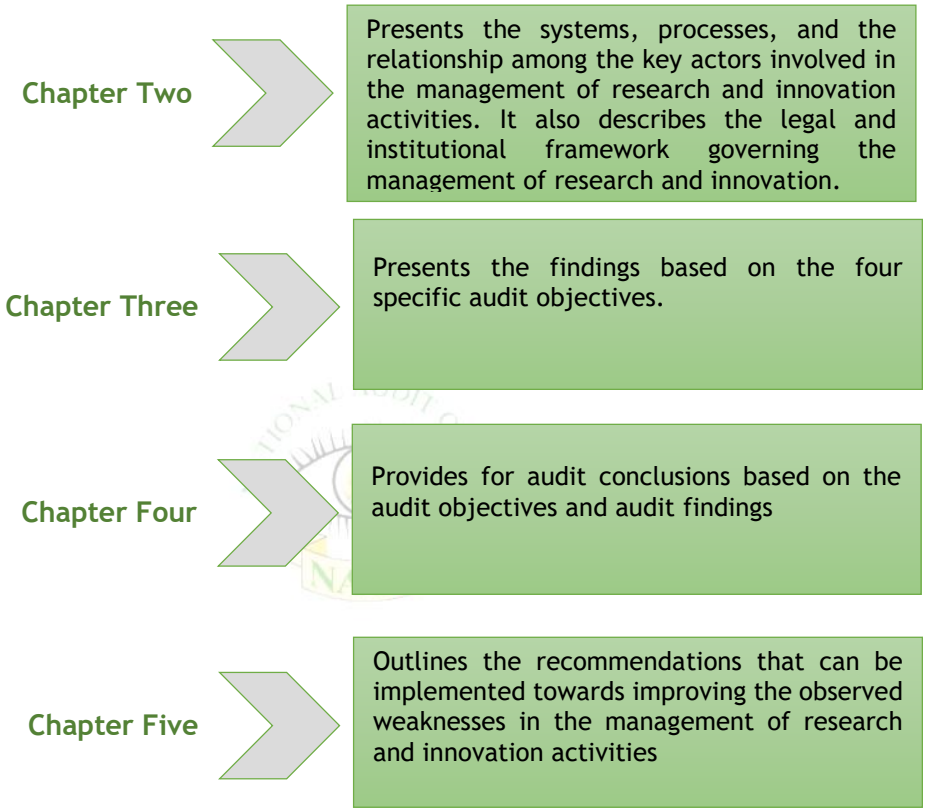
In the same way, the draft report was submitted to the subject matter experts in the field of research and innovation to get their independent opinions and authenticate the factual contents of the details presented in the report.

1.5 Standards 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 Organization of Supreme Audit Institutions (INTOSAI). These standards require that the audit is planned and performed to obtain sufficient and appropriate audit evidence to provide a reasonable basis for findings and conclusions based on the audit objectives. Generally, based on the objectives of the audit, the evidence obtained provided a reasonable basis for the findings and conclusions reached.

1.6 Structure of the Audit Report

The subsequent chapters of this report cover the following:



CHAPTER TWO

SYSTEM FOR THE MANAGEMENT OF RESEARCH AND INNOVATION ACTIVITIES IN TANZANIA

2.1 Introduction

This Chapter describes the system for the management of research and innovation activities in Tanzania. It presents the policy and legal framework governing the system for the management of research and innovation activities, and the roles and responsibilities of key players involved. The chapter covers the functions, goals, and strategies for the management of research and innovation activities.

2.2 Policy and Legal Framework

2.2.1 Policies

The following are the Policies which govern the management of activities on research and innovation in Tanzania.

The National Research and Development Policy, 2010

The National Research and Development Policy (2010) aims to guide researchers in the public and private sectors, policy and decision-makers, as well as development partners in addressing present and future national research challenges for socio-economic development. Also, the policy seeks to address the existing challenges in Research and Development (R&D).

On the other hand, among others, the National Research and Development Policy focused on the areas including (a) Strategic R&D leadership and institutional framework; (b) Prioritization of research areas; (c) Enhancement of research capacity in Information and Communication Technology (ICT) and socio-economic disciplines; (d) Commercialization and dissemination of research results; (e) Human resource development and management; and (f) Financing of research and development.

On the other hand, the National Research and Development Policy do recognize different sectoral policies as they are important in achieving its objectives. Also, for the implementation of this policy, the Ministry of Education, Science, and Technology which is responsible for research and development has to ensure that this policy is harmonized with other sectoral policies.[9]

The National Science and Technology Policy, 1996

The objective of the National Science and Technology Policy of 1996 among others include: (a) Promoting science and technology as a tool for economic development, and the improvement of human, physical and social well-being; (b) Promoting the scientific and technological self-reliance in support of economic activities through the upgrading of R&D capabilities by the creation of an environment conducive to scientific and technological creativity and improvement of relevant scientific infrastructures; (c) Establishing and/or strengthening national science and technology institutions through the provision of adequate facilities; (d) Institute a mechanism for identification, promotion, and development of special talents and aptitudes in science and technology among Tanzanians necessary for national development; and (e) Promoting commercialization of research results and technologies generated within the country.

Equally, the policy aim is to establish relative priorities of programmes for generating new knowledge and to determine strategies for the application of science and technology for development; it reflects the national goals, objectives, and aspirations. The policy also regulates the flow of technologies to reduce excessive dependence on imported technologies.

National Information and Communications Technology Policy, 2016

The National Information and Communication Technology (ICT) Policy of 2016 aims at accelerating socio-economic development to transform Tanzania into ICT driven middle-income economy and society. Regarding research and innovation, the policy aims to strengthen management and promote efficiency in spectrum allocation and utilization that guarantees

[9] National Research and Development Policy (2010)

availability and competition in both urban and rural areas. The policy stipulates further that this ought to be realized by ensuring the availability of spectrum for various uses and allocation that favours public interest, promote innovation, and research and development.

2.2.2 Legislations

The main legislation governing the management of research and innovation in the country is the Tanzania Commission for Science and Technology Act, 1986.

The Tanzania Commission for Science and Technology Act, 1986

The Tanzania Commission for Science and Technology Act, 1986 is an Act that established the Tanzania Commission for Science and Technology (COSTECH) and the National Centre for the Development and Transfer of Technology which also provides for their respective mandated functions.

The Act provides for the functions of the Commission as the principal advisory organ of the government on all matters relating to scientific research and technology development. Regarding the overall management of research and innovation activities, the Act provides for the following functions of the Commission:

(a) To advise the government on priority areas in scientific research along with the allocation and utilization of research funds according to the identified priority areas in scientific research;

(b) To monitor and co-ordinate the activities relating to scientific research and technology development of all persons or body of persons concerned with such activities;

(c) To acquire, store and disseminate scientific and technology information, and may, for that purpose held or sponsor conferences, symposia, meetings, seminars or workshops, or publish any newspaper, journal, or do any other act designed to promote interest in science and technology development;

(d) To consult, coordinate and supervise the determination, planning and allocation of funds by the national research institutions to research projects and programmes within their respective fields of research.

2.2.3 Goals and Strategies

As per the Strategic Plan of the Commission for Science and Technology (2021/22-2025/26), the following are the goals and strategies for the management of activities on research and innovation:

(i) ***To Enhance National Science, Technology and Innovation (STI) Governance***: To be realized through the adoption of the whole government approach to STI management, strengthening of the STI advisory functionality, and promoting evidence-based decision-making culture.

(ii) ***To Enhance the Utilization of Science, Technology and Innovation Products and Services***: To be realized through the strengthened linkage between R&Ds, HLIs, and Industry, strengthening of the mechanism for research results and technology uptake, strengthening of the registration and transfer of technologies, enhancing inventory for research capacity, and promoting technology acquisition and development.

(iii) ***To Improve the Capacity to Deliver Science, Technology and Innovation Services*:** To be realized through the strengthening of the working environment and human resource management of COSTECH staff, strengthening of the working environment and human resource management of R&D, Higher Learning Institutions (HLIs) and Industries, strengthening of the financial management, strengthening of performance management systems and standards, strengthening of the ICT systems, enhancing public awareness on STI, and strengthening of Innovation support infrastructures.

Communication Strategy

To improve the understanding and visibility of the functions and objectives of COSTECH to internal and external stakeholders, the Commission has established a Communication Strategy to play the role of providing a working platform for effective communication on coordination and promotion of STI services and products to the public and other users as well.

2.2.4 Guidelines and Frameworks

National Research Registration and Clearance Guidelines

The aim of the National Research Registration and Clearance Guidelines is to document all research activities in the country to enable coordination, promotion, and prioritizing of research, as well as the use of research results for sustainable development. Specifically, the guidelines are, among others, meant to (a) Ensure that research conducted in Tanzania is of required standards, which observe national rules and regulations; (b) Register and document diverse research activities in the country; (c) Secure results of research undertaken in the country and promote its utilization in policy and practice; and (d) Issue research permits for all research undertaken in the country.

On the other hand, Part-II Section 5 2(b) and (c) of the Tanzania Commission for Science and Technology Act, 1986 (R. E) provides that the National Research Registration and Clearance Guidelines shall apply to all individuals, institutions, and organizations conducting research. These include all higher learning, research, and development institutions that are under the government Ministries, Departments, Agencies, Private Companies/Enterprises, Non-Governmental and Intergovernmental Organizations, International Agencies, and Community-Based Organizations.

National Framework for Research Chairs of 2021

The aim of the National Framework for Research Chairs (NFRC) is to provide an overarching guide that sets minimum requirements for the establishment and management of Research Chairs in Higher Learning Institutions and Research and Development institutions. Among others, the NFRC targets to

(a) Ensure optimal utilization of national human and capital resources as well as attract and retain distinguished scientists to benefit from their expertise; (b) Promote innovation and commercialization of research products; (c) Enhance national, regional and international research partnerships and collaboration; and (d) Ensure ideal development of state-of-the-art research and innovation infrastructure.

National Research and Innovation Monitoring Framework

The aim of the National Research and Innovation Monitoring Framework is to enhance effective coordination, promotion, and dissemination of R&D and Innovation in the country as part of ensuring relevance and accountability to national development efforts.

In addition, among others, the framework targets to: (a) identify and define key indicators for monitoring and communicating research work; (b) systematically track the research process for monitoring of outputs, outcomes, and impacts; (c) facilitate the availability of research and innovation information in the country; (d) disseminate findings in a manner appropriate to the various stakeholders to support effective uptake of research results and innovation and informed decision for policymakers; and (e) monitor technological trends and determine specific research areas that need investment and capacity development.

National Research Integrity Framework of Tanzania of 2020

The objective of the National Research Integrity Framework is to require all Research Institutions, Higher Learning Institutions, Researchers, Research Funding Agencies, and Regulatory Bodies in Tanzania to commit themselves to the integrity standards in all aspects of research processes originating from basic principles of good research practice.

2.3 Roles and Responsibilities of Key Actors

2.3.1 Roles of Key Actors

Ministry of Education, Science and Technology

The Ministry of Education, Science and Technology (MoEST) has the mandate to ensure the implementation of the National Research and Development Policy and that national strategic goals are set and achieved. Similarly, the Ministry has the role of preparing an environment conducive to sectoral coordination and integration.[10] Likewise, the Ministry has role to ensure the implementation of Science and Technology Policy of 1996.

Tanzania Commission for Science and Technology

The Tanzania Commission for Science and Technology (COSTECH) was established by the Tanzania Commission for Science and Technology Act of 1986. The Commission is under the Ministry of Education, Science and Technology and is the principal advisory organ to the Government on all matters relating to scientific research, innovation, and technology development and transfer. According the COSTECH Act of 1986, among the functions of COSTECH include:

(a) Formulation of policy on the development of science and technology and recommend its implementation by the government;

(b) Monitoring and coordination of the activities relating to scientific research and technology development of all persons or body of persons concerned with such activities;

(c) Acquiring, storing and dissemination of scientific and technology information, and may, for that purpose held or sponsor conferences, symposia, meetings, seminars or workshops, or publish any newspaper, journal or periodical or do any other act or thing designed to promote interest in science and technology development;

[10] National Research and Development Policy (2010)

(d) Advise the Government on priorities in scientific research, the allocation and utilization of research funds according to research priorities, regional and international co-operation in scientific research and transfer of technology, matters relating to training and recruitment of research personnel, establishment and maintenance of national scientific standards;

(e) Consulting, coordinating and supervising the determination, planning and allocation of funds by national research institutions to research projects and programmes within their respective fields of research;

(f) Examining the research and development programmes of national research institutions and advise on the best ways of achieving their research objectives;

(g) Mobilizing funds for support and promotion of scientific research and technological development from both the Government and other sources;

(h) Advise the Government on better and more efficient ways of implementing the national science and technology policy; and

(i) Facilitating the full advantages of the application of research results for better social and economic development.

The National Fund for the Advancement of Science and Technology (NFAST)

The National Fund for the Advancement of Science and Technology (NFAST) was established by the COSTECH Act, 1986. Among others, the purpose of the resources of the NFAST include:

(a) Financing by way of loan or grant, any research or study carried on by or for the benefit of persons or organizations engaged in research in matters relating to the development of science and technology;

(b) Financing by way of loan or grant, the training of citizens of the United Republic by or for the benefit of organizations engaged in research in the development of science and technology;

(c) Providing support for scientific research and technology development and the application of the results in compliance with the national priorities determined by the Government upon advice by the Commission; and

(d) Commissioning the carrying out an institution or individual of any specific research which is of special national importance.

National Centre for the Development and Transfer of Technology

The National Centre for the Development and Transfer of Technology was established under the mandate of the Commission for Science and Technology. Among others, the functions of the Centre include:

(e) Identifying, within the framework of national, social, economic and political constraints technological need for utilization in different sectors of the economy;

(f) Acquiring and analysing information on alternative sources of technology and its delivery to users;

(g) Being a focal point on the role in the un-packing of imported technology including the assessment of the suitability of the technology as well as the direct and indirect costs of importing technology or development of such technology;

(h) Maintaining a registry of imported technology and a register of domestic technological resources and manpower;

(i) Registering of all technology transfer agreements;

(j) Preparing plans for the development of technology in the critical sectors of the economy; and

(k) Continuously, monitoring the execution of any contract or agreement registered.

Research and Development Advisory Committees

The general functions of the Research and Development (R&D) Advisory Committees are to act as the think-tank of the Commission for the advancements of various science, technology and innovation issues in the country. The structure of the Commission for Science and Technology and the R&D Advisory Committees include public and private universities, government departments, and major national R&D institutions that makes COSTECH a unique body for local R&D, regional and international linkages necessary for the development of science, technology and innovation in the country.

2.3.2 Roles of Other Key Actors

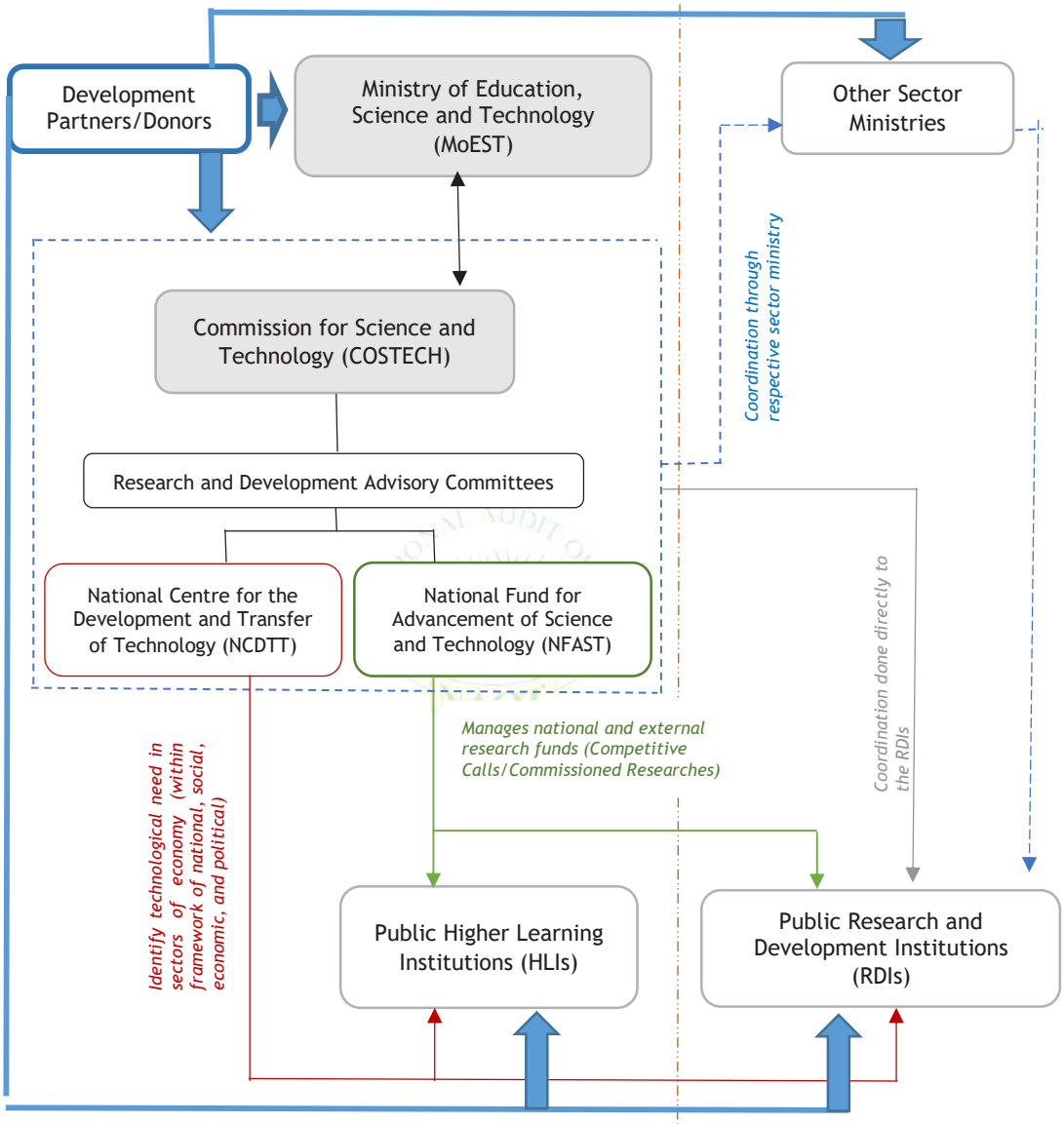
Public Research and Development Institutions

The role of Public Research and Development Institutions and Higher Learning Institutions is vital in the discovery of new technological developments through the conduct of research that reflect a positive impact on the economy.

Development Partners/Donors

Development Partners play a significant role in support of the conducted research through the financing of research and innovation activities; the main supports include capacity building, project planning, lobbying, advocacy as well as resource mobilization. **Figure 2.1** summarizes the relationship among key actors in the management of research and innovation activities in Tanzania.

Figure 2.1: Relationship among the Key Actors



***Source**: Auditors' Analysis from the Interviews held with Officials at the Commission for Science and Technology (2022)*

2.6 Allocation of Resources

Efficient management of activities on research and innovation requires optimal allocation of both financial and human resources. The Commission for Science and Technology has a pivotal role in ensuring the effective coordination of research and innovation activities in the country. Therefore, this section provides details on allocated resources to the Division of Science, Technology and Innovation of the Ministry of Education, Science and Technology and the Commission for Science and Technology.

2.6.1 Financial Resources

The source of funding for the management of activities on Science, Technology, and Innovation performed by the Ministry of Education, Science and Technology is mainly from the Central Government which is received as Other Charges (OC), Personal Emolument (PE), and Development Fund. **Table 2.1** indicates budgeted and received funds from the Financial Year 2018/19 to 2021/22 in billions TZS.

Table 2.1: Allocation of Funds at the Division of Science, Technology and Innovation

Item	Financial Year				Total
	2018/19	2019/20	2020/21	2021/22	
Budgeted	54.5	48.0	83.6	0	186.1
Received	34.0	37.3	73.6	0	144.9
Difference	**(-20.5)**	**(-10.7)**	**(-10.0)**	**0**	**(-41.2)**

***Source**: Estimates of Income and Expenditure - Division of Science, Technology, and Innovation (2018/19-2021/22)*

Table 2.1 establishes that from the financial year 2018/19 to 2020/21, the Division of Science, Technology, and Innovation at the Ministry of Education, Science and Technology received a total annual amount of TZS 144.9 billion with an annual difference varying from TZS 10.0 to TZS 20.5 billion below the budgeted amount.

Similarly, the source of funding for the management of activities by the Commission for Science and Technology is mainly from the Central Government and Donor Funding. **Table 2.2** indicates budgeted and actual received funds from the Financial Year 2018/19 to 2021/22 in billions TZS.

Table 2.2: Allocated Fund at the COSTECH

Item	Financial Year				
	2018/19	2019/20	2020/21	2021/22	Total
Budgeted	8.0	3.0	3.5	3.5	18.0
Received	0.8	0.1	1.2	3.5	5.6
Difference	**(-7.2)**	**(-2.9)**	**(-2.3)**	**0.0**	**(-12.4)**

***Source**: Estimates of Income and Expenditure – Commission for Science and Technology (2018/19-2021/22*

Table 2.2 shows that in total, from the financial year, 2018/19 to 2020/22 the Commission for Science and Technology received a total annual amount of TZS 5.6 billion. Though, from the financial year 2018/19 to 2020/21 the Commission had been receiving less than half of the budgeted fund.

2.6.2 Human Resources

For the Ministry of Education, Science and Technology (MoEST) through the Division of Science, Technology, and Innovation (DSTI), and the Commission for Science and Technology (COSTECH) to accomplish their roles, it is necessary to ensure optimal allocation of staff. **Table 2.3** provides for the status of the available number of Staff against those required in the Division of Science, Technology, and Innovation of the Ministry of Education, Science and Technology in the financial year 2021/22.

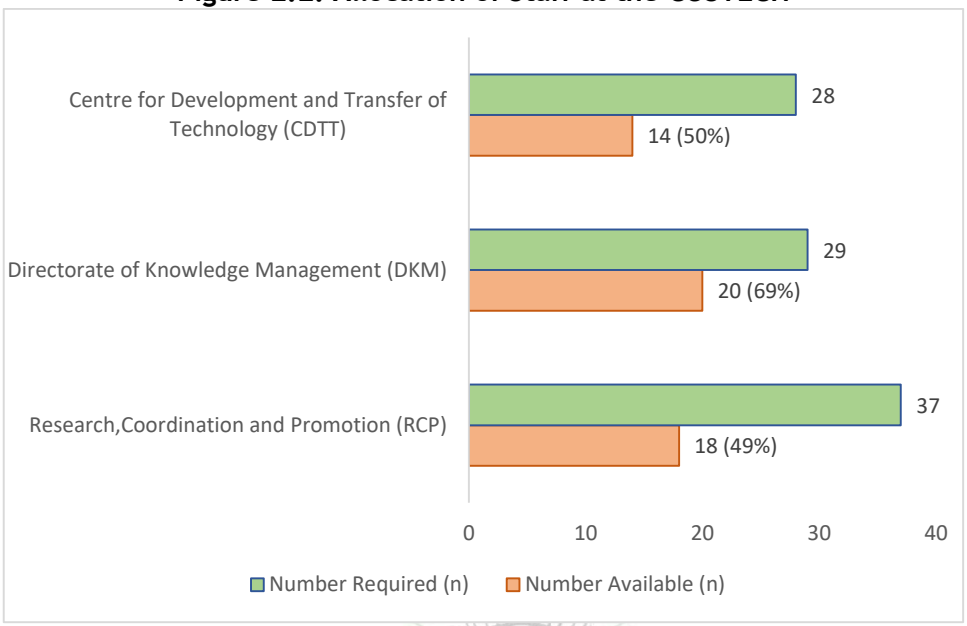
Table 2.3: Allocation of Staff at the DSTI-MoEST

Department	Number of Available Staff	Number of Required Staff	Deficiency
Research and Development	3	8	5
Science and Innovation	6	11	5
Total	**9**	**19**	**10**

***Source**: Department of Science, Technology and Innovation at the Ministry of Education, Science, and Technology (2022)*

Table 2.3 illustrates that as of the Financial Year 2021/22, the Division of Science, Technology, and Innovation has less than half of the required number of staff. On the other hand, staff allocation at the Commission for Science and Technology in core Departments of the Centre for Development and Transfer of Technology (CDTT), Directorate of Knowledge Management (DKM), and Research, Coordination and Promotion for the year 2022 is as indicated in **Figure 2.2**.

Figure 2.2: Allocation of Staff at the COSTECH



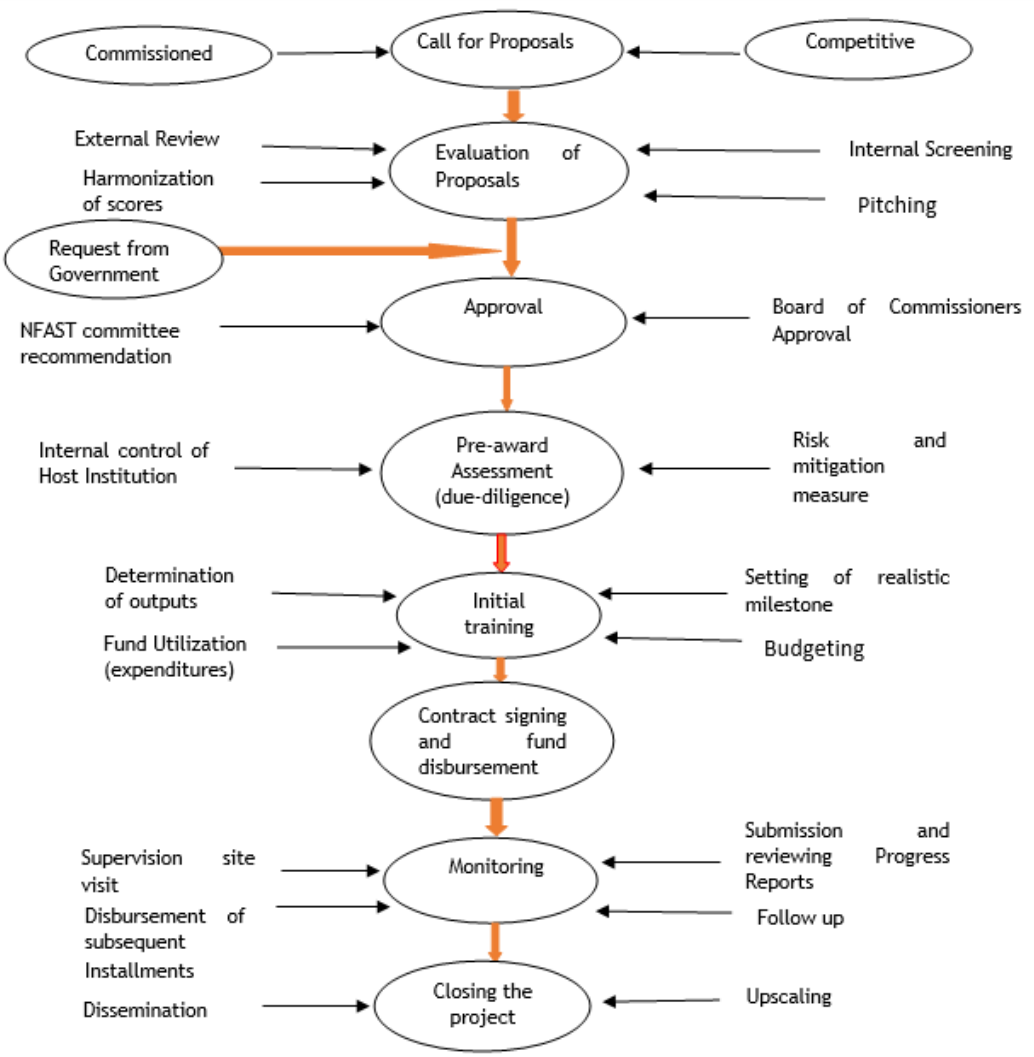
Source: *COSTECH Staffing Level (2022)*

Figure 2.2 indicates the need gap varying from 49 to 69 percent of the required number of staff in all core Departments of Research, Coordination and Promotion, Knowledge Management, and Centre for Development and Transfer of Technology.

2.7 Process Description in the Management of Research and Innovation Activities

The diagram provides for summary of the key steps in the process for overall management of research and innovation activities as performed by the Commission for Science and Technology. **Figure 2.3** summarizes the key processes in the management of research and innovation activities in Tanzania.

Figure 2.3: Process in the Management of Research and Innovation Activities



***Source**: COSTECH Research and Innovation Grant Manual (2019)*

CHAPTER THREE

AUDIT FINDINGS

3.1 Introduction

This Chapter presents the audit findings on the performance of the Commission for Science and Technology in the Management of Research and Innovation Activities. The findings are presented in accordance with the audit objectives, which include assessing the adequacy of developed strategies and plans, managing registered research and innovations, coordinating key actors, and monitoring.

3.2 Extent in the Management of Research and Innovation Activities

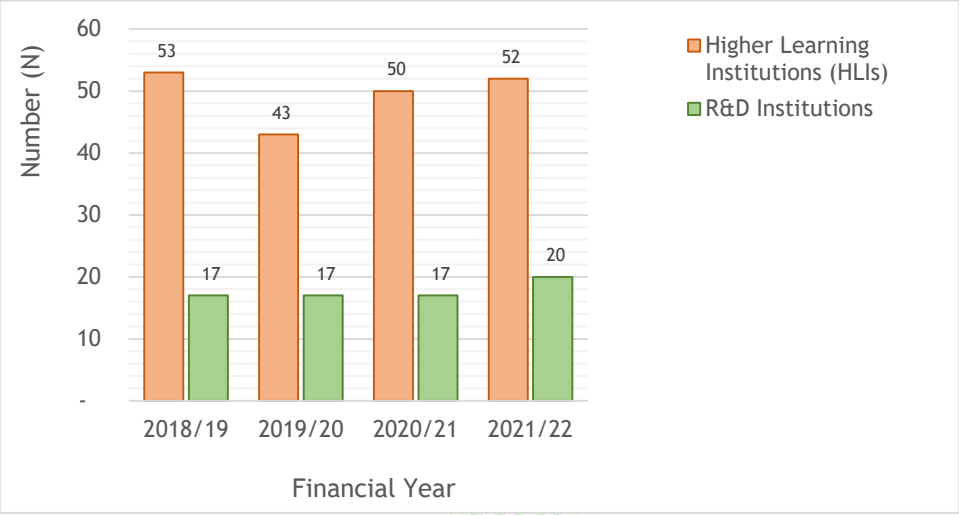
COSTECH conducted the performance review of their implementation of the five-year Strategic Plan (2016/17-2020/21) including research and innovation management. The review found several achievements in the implementation of the Commission for Science and Technology's strategic objectives, such as provision of evidence-based decision-making training to 15 out of the 100 planned governmental agencies and contributed to strengthening the culture of evidence-based decision making.

Likewise, to ensure promotion of industrialization through wider application of technologies, COSTECH managed to, among others, develop a database of grassroots innovators and establish innovation window within the National Fund for Advancement of Science and Technology (NFAST) to support innovation projects.

Also, to ensure increased strategic research with the national impact, the Commission planned to provide capacity building to Institutional Review Boards (IRBs) to all 76 Research and Development (R&D) and Higher Learning Institutions (HLIs). Also, in accordance with the strategic objective to support research projects, the National Fund for Advancement of Science and Technology (NFAST) managed to fund at least 59 research projects and supported 517 researchers from various institutions over the last five years of strategic plan implementation.

In addition to these accomplishments, the Commission carried out its mandate in terms of conducting registration of all research and issuance of research permits. **Figure 3.1** depicts the status of the available HLIs and R&Ds institutions in the management of research activities from the fiscal year 2018/19 to 2021/22.

Figure 3.1: Number of HLIs and R&Ds Conducting Research Activities



***Source**: Auditors' Analysis based on COSTECH Data on HLIs and R&Ds (2022)*

Figure 3.1 shows that the number of Higher Learning Institutions directly engaged in COSTECH research activities has been fluctuating over time. It ranged from 43 to 53, with the highest being in the financial year 2018/19 and the lowest in the financial year 2019/20. In comparison, the number of R&Ds directly engaged with COSTECH has remained relatively stable at 17, with a slight increase to 20 in the financial year of 2021/22. **Table 3.1** indicates a summary of the registered research undertaken in the visited R&D institutions from the financial year 2018/19 to 2021/22.

Table 3.1: Status of Registered Researches at COSTECH

Name of the Institution	Targeted Number of Research to be Registered	Number of Registered Research
DIT	13	0
NM-AIST	57	0
SIDO	No Records	0
TAEC	No Records	0
TEMDO	No Records	0
TAFIRI	84	0
TAFORI	34	0
TARI	No Records	0
SUA	100	0
NIMR	No Records	0
UDSM	809	0
TAWIRI	No Records	0
Total	**1,097**	**0**

***Source**: Data from the Visited Institutions (2022)*

Table 3.1 shows that none of the 12 institutions visited had any recorded registered research at the Commission. Despite the fact that from the financial year 2018/19 to 2021/22 the Commission managed to register between 309 and 402 research projects from various institutions, it is indicated that only 6 out of the 12 visited institutions had records of the actual number of research conducted though not registered by the Commission. **Table 3.2** summarizes the status of the number of issued research permits in the visited institutions from the financial year 2018/19 to 2021/22.

Table 3.2: Status of Issued Research Permits at COSTECH

Name of the Institution	Planned Number of Research Permits to be Issued	Number of Issued Research Permits as per COSTECH
DIT	13	0
NM-AIST	57	2
SIDO	No Records	0
TAEC	No Records	0
TEMDO	No Records	0
TAFIRI	84	28
TAFORI	34	35
TARI	No Records	45
SUA	100	72
NIMR	No Records	374
UDSM	809	397
TAWIRI	No Records	603
Total	**1,097**	**1,556**

***Source**: Data from the Visited Institutions (2022)*

Table 3.2 shows that neither DIT nor NM-AIST possessed research permits for their research projects. There were also no records available for the planned issuance of research permits, as well as the actual number of permits issued, for SIDO, TAEC, and TEMDO. Other R&D institutions were able to indicate the actual number of research permits issued, even though there was no information available on the planned permits. For instance, TAWIRI reported receiving 603 research permits, but the planned number of research permits was uncertain.

3.3 Strategies and Plans in the Identification and Registration of Research and Innovation Activities

The Commission for Science and Technology Act, 1986 requires COSTECH to register all researches conducted in the country and to issue research permits to both international and domestic researchers through the National Research Registry Committee (NRRC). The following subsection discusses the findings on the execution of strategies and plans to identify and register research and innovation activities.

3.3.1 Inadequate Implementation of the Developed Strategies and Plans to Identify and Register all Research and Innovation Activities

The COSTECH Strategic Plan (2016/17 to 2020/21) requires the Commission for Science and Technology to identify and prioritize all barriers to service expansion, such as those related to the regulatory framework, policies, socio-economic structure, and research funding. To address all identified challenges, the Commission is expected to always ensure that the Strategies and Plans developed are fully implemented.

The audit examined the Annual Performance Report for the financial year 2020/21 to determine the Commission's effectiveness in this regard. The results showed that the Commission did not adequately manage to implement the developed strategies and plans for identifying and registering research and innovations. For instance, being part of the output that would be made from the identified and registered research and innovation activities, it was shown that by the end of June, 2021, the Commission managed to produce 9 out of 15 planned Policy Briefs, provided training on evidence-based decision-making to 4 out of 100 planned MDAs, and conducted 2 out of 5 planned dialogues on Science, Technology and Innovation.

None achievement of various plans was due to a variety of factors, one of which was the inability of the HLIs and R&DIs to effectively collaborate with COSTECH. According to the COSTECH officials, the plans were developed with the intention of implementing them in collaboration with the R&Ds and HLIs or other key stakeholders. For example, one of such plans was the launching of the National Research and Innovation Monitoring Framework intended to be customised and implemented by research institutions. However, due to different institutional set-ups, the counterpart R&Ds and HLIs did not well-ensure that their initiatives in place align with and support the implementation of the prepared plans by the Commission.

It was further noted that since there were no clearly defined structural and functional linkages between R&D institutions as well as HLIs and the Commission, these institutions were more obliged to accomplishment of their research activities as per the requirements of legislation in their respective parent Ministries.

On other hand, according to COSTECH Officials and the reviewed Annual Performance Report (2020/21), the inadequate implementation of the planned activities to meet the set targets were also caused by late disbursement of government subsidy and staffing shortage. The main shortcomings were related to the commission's failure to adequately evaluate the research carried out in research organizations and universities, register imported and local technologies and domestic technological resources and manpower, identifying and support incubations and innovations. **Section 3.3.2 and 3.3.3** of this report contain more information on the state of the Commission resource-base in relation to the frequency of occurrence of different shortcomings.

3.3.2 Effective Identification and Registration of Research and Innovation Activities

Section 15(3)(f) of the COSTECH Act, 1986 requires COSTECH, through the Centre for the Development and Transfer of Technology (CDTT), to keep a register of all available domestic technological resources and manpower, as well as a register of imported technology. Section 5(d) requires COSTECH to advise the government on scientific research priorities; and the allocation and use of research funds based on scientific research priorities. COSTECH is expected to devote adequate resources (time, people, funds, and equipment) to implementing tasks such as technology registration, offering quality government advice on research activities, coordination, and others.

i) Inadequate Registration of Imported Technology and Domestic Technological Resources and Manpower

Section 15 of the COSTECH Act, 1986 required the Commission to establish the CDTT. The established centre had to carry out the mandate of COSTECH on technology transfer issues. This centre is responsible for unpacking imported technology, including determining its suitability and the direct and indirect costs of importing or developing such technology. In addition, the Centre is in charge of maintaining a registry of imported technology as well as a registry of domestic technological resources and manpower; keeping track of all technology transfer agreements; developing plans for technological development in critical sectors of the economy; and continuously monitoring the execution of any contract or agreement registered.

However, based on a review of Section 3.1 of the Report on Instruments for Registration of Technology Transfer Agreements and Assessment Processes for the year 2022, as well as responses from COSTECH officials interviewed, it was found that COSTECH had not registered the imported technology and domestic technological resources and manpower through CDTT since its inception. Interviews with officials in the visited institutions indicated that this was due to lack of clearly defined regulations for performing its roles in the assessment, registration, and oversight of technology transfer agreements. As a result, CDTT lacked tools and instruments for registering and assessing technology transfer agreements as well as registering and operationalizing procedures for technology transfer agreements and the ability to unpackage technologies. The lack of instruments and guidelines for carrying out COSTECH's mandatory roles through CDTT created uncertainty about how to carry out the commission's responsibilities.

Based on COSTECH officials' responses to this observation and a review of para 2.2.7 of the COSTECH Annual Report (2019), COSTECH was involved in facilitating technology transfer by directing applicants to organizations such as BRELA, TIC, COSOTA, NDC, EPZA, and the Plant Breeders' Rights Office under the Ministry responsible for Agriculture. The audit found that there was insufficient information sharing among these actors, which had an impact on COSTECH's mandate, which is to record and maintain a record of all technology transfer agreements and develop plans for technological advancement in significant economic sectors, and continuously monitor the performance of any contract or agreement registered for both domestically produced technological resources and labour as well as imported technology.

As a result, COSTECH was unable to fulfil its mandate to coordinate, monitor, and advise the government on how best to use the available technological resources and manpower because CDTT was unable to adequately carry out its duties regarding technology transfer, domestic technology, and manpower. This could also lead to technology duplication where the same existing technology is replicated and declared as a new technology in the country and result to the development of technologies that endanger human life and the environment as a whole.

ii) Unclear Mechanism to Consult, Coordinate, and Supervise the Allocation, Planning, and Determination of Funds for Research and Innovation Activities

According to Section 5 (e) of the COSTECH Act, 1986, COSTECH is required to consult, coordinate and supervise the determination, planning and allocation of funds by national research institutions to research projects and programmes within their respective fields of research. It also required to examine the research and development programmes of national research institutions on whether or not they are affiliated to the commission and advice on the best ways of achieving the objectives of those researches.

Interviews with officials from COSTECH and in the visited institutions revealed that COSTECH lacked a system for consulting, coordinating, and supervising planned research and innovation activities. This was brought on by the absence of a framework that governs COSTECH to consult, organize, and monitor the preparation and execution of the nation's research and innovation activities. Interviews with COSTECH representatives also showed that it was challenging to get the requested information about plans and funding for research and innovation activities because those institutions had their mandates and directly reported to their parent ministries.

The officials from COSTECH reiterated that, although COSTECH was not denied information, they depended mostly on goodwill to get the required information while sometimes they could not get the same. Furthermore, Article 4.1 of the Draft National Science, Technology and Innovation Policy, 2018 stated that R&D institutions in the country were set up under their legislations and whatever relationship existed with COSTECH was based on nonbinding affiliations.

On the other hand, it was further revealed that despite the contribution made to the research agenda by the individual research institutions, COSTECH was not in the position to be informed of the progress made for the undertaken research activities to verify their alignment to the national research agenda. As a result, COSTECH was unable to offer informed advice to the government and other key stakeholders on how to use the resources available for research activities. This was contributed by lack of a mechanism through which COSTECH could be informed of the status of

ongoing activities on research and innovation as implemented in R&Ds and HLIs. This also prevents COSTECH from maintaining a reliable database of the country's research and innovation activities, as well as a database of available resources in terms of manpower and financial resources.

iii) Inadequate Implementation of Planned Activities for Research and Innovation

According to the Corporate Strategic Plan of the COSTECH for fiscal years 2016/17-2020/21, COSTECH intended to publish 15 policy briefs and project briefs annually as part of the implementation of strategic objective one, which called for a stronger evidence-based decision-making culture. COSTECH also planned to support 10 Research Chairs and Innovation in Strategic Areas by June, 2020, strengthen 76 R&D Institutions Review Boards (IRBs) by June, 2019, connect 76 R&D Institutions to information platforms and repositories by June, 2021, and assist 20 R&D Institutions in acquiring relevant laboratory facilities through NFAST by June, 2019.

A review of COSTECH Research and Innovation Impact Bulletins[11]indicated that from the fiscal year 2018/19 to 2020/21 there was a total of 30 research briefs produced from different R&Ds and HLIs funded through NFAST. In addition, 9 of the 20 planned institutions received funding for laboratory infrastructure; and only 37 out of 76 planned capacity building programmes for Institutional Review Boards (IRBs) were conducted.[12]

Despite the target to connect 76 institutions to information platforms, the extent in the implementation of this target was not revealed[13]. On the other hand, it was shown that COSTECH through the Repository Project planned to connect 50 repositories to the central national repository hosted at COSTECH. This includes the connection of 10 institutions that had existing repositories and developing the institutional repositories for 40 identified institutions that had no repositories. However, the project for developing

[11] COSTECH Research and Innovation Impact Bulletin, Vol 1 Issue 1, 2018; COSTECH Research and Innovation Impact Bulletin, Vol 2 Issue 1, 2020; COSTECH Research and Innovation Impact Bulletins, Vol 3, 2021.

[12] The conducted capacity building was done to 15 NGOs and 22 R&D government institutions

[13] There is a total of 69 R&Ds and HLIs - Appendix 2 of the National Research Registration and Clearance Guidelines, 2022; (List of Tanzanian Research and Academic Institutions)

the central repository to connect only 50 institutions, did not meet the objective of connecting 76 institutions.

According to the Final Repository Project Report of the year 2022 and interviews with COSTECH officials; it was revealed that only 36 of the 76 institutions were affiliated with the repository. The Audit was given access to the repository to confirm this by checking the linked institutions. The outcome also supported the finding that there were only 36 connected institutions. This reflects the lowest level of connectivity, as 36 of the 69 R&D institutions and HLIs connected account for only 52% of all currently operating institutions in the country.

Out of 36 connected institutions, only six of the institutions that were supposed to link to the COSTECH repository also had repositories of their own. There were two institutions, namely the Catholic University of Health and Allied Sciences (CUHAS) and Tanzania Industrial Research and Development Organization (TIRDO) that were wrongly included in the activity of connecting only while they had no existing repositories. Also, there were other two institutions, namely the Institute of Rural Development Planning (IRDP) and Research on Poverty Alleviation (REPOA) that had their repositories, but due to compatibility issues, it was not possible to connect to the COSTECH repository. In addition, it was noted that one institution, namely the IRDP was using an old version of open-source web-publishing platform repository and the other institution, namely REPOA was using a cloud commercial repository that did not support connection to the central repository.

The review of the COSTECH Progress Reports (2017-2021) indicated that the COSTECH was able to ensure achievement in the implementation of the planned activities to varying degrees with the given resources at its disposal, as shown in **Table 3.3**.

Table 3.3: Status of Execution of Planned Activities Vs Actual

Planned Activity	Planned No.	Actual No. Produced				Total No.	Percentage (%)
		2018/19	2019/20	2020/21	2021/22		
Produce policy briefs and project briefs	60	12	9	9	0	30	50
Information platforms and repositories linked R&D institutions	76	0	0	36	0	36	47
Support R&D institutions to be equipped with relevant laboratory facilities through NFAST	20	0	9	0	0	9	45
Support Research and innovation chairs in strategic areas	10	0	0	2	0	2	20
Conduct capacity building for R&D Institutions Review Boards (IRBs)	76	0	0	4	0	4	5

***Source**: Auditors' Analysis of the Implementation of Targets Information from Annual Performance Reports and the Final Repository Report (2022)*

Table 3.3 demonstrates that implementation of all activities did not exceed 50%. Out of all five activities only the production of the policy brief attained half of its intended target for the past year covered in this audit. The lowest performance was recorded on the activity to conduct capacity building to R&D Institutions Review Boards (IRBs), which in the last four years, attained only five percent.

The IRBs are also responsible for ensuring that researchers adhere to research regulations, institutional policies, and national, regional, and international regulations. On the other hand, COSTECH showed a low level of performance in providing Support to R&D institutions in equipping them with relevant laboratory facilities through NFAST. Interviews with Officials at COSTECH indicated that over the last four years, only nine of the planned 20 R&D institutions received funding for laboratory construction. This gap is likely to limit the quality of research conducted in the country, and as a result, most of the problems researched may not have solutions because the research was not subjected to in-depth empirical analysis.

According to interviews with COSTECH officials, the noted deficiencies are associated with inadequate resources, such as staff in some specialized areas, a smaller number of employees, and so on. The audit assessed the human resource base at COSTECH to confirm the reasons stated during the interview; the results of the assessment at different departments are presented in **Table 3.4**.

Table 3.4: Existing Vs Required Staffing Level at Core Departments

Department	Required Headcount	Existing Headcount	Gap	
			N	%
Directorate of Knowledge Management (DKM)	29	20	9	31
Center for Development and Transfer of Technology (CDTT)	28	14	14	50
Directorate of Research Coordination and Promotion (DRCP)	37	18	19	51
Total	**94**	**52**	**42**	**45**

***Source**: Auditors' Analysis of Required Staffing Level and Human Resource Plan of the COSTECH (2020/21-2022/23)*

Table 3.4 indicates deficiency of 50% of the required staff in the core departments of CDTT and DRCP with 31% deficiency in the number of required staff in the Department of Knowledge Management (DKM).

This wide gap has resulted in numerous inefficiencies and increased the workload in each department. Although, COSTECH has not established the benchmarks to show the required load per person for each activity. The human resource gap shown in **Table 3.4** is still significant; it does not reflect the national efforts in strengthening its research and innovation initiatives to promote sustainable development.

According to the reviewed COSTECH budgets and plans, the COSTECH planned to have a total of 39 new transfer employees. However, there was a delay in the process because this required a permit from the President's Office Public Service Management (PO-PSM)[14]. Based on interviews with the

[14] The requested permit was for transfer as indicated in letter from president office, public service management and good governance Ref. No FA.97/228/019 of May, 2022

COSTECH officials, the Commission had attempted to request for an employment permit from the PO-PSM to employ more staff, with no success. However, the audit team did not find any reminder letter or meeting done with PO-PSM as a part of showing active follow-up on this matter. It was further explained that, while waiting for the permit from the PO-PSM, COSTECH issued an advertisement calling for government employees from other departments and ministries who might be interested in relocating to COSTECH. This was the alternative effort to close this human resource gap by recruiting personnel from other government agencies. However, all of these efforts were in vain because there was no tangible result, and the gap persisted up to the time of the audit.

In addition to lack of human resources, the commission lacked the necessary STI tools, such as Technology Transfer Agreements (TTA) for registration, assessment and monitoring tools at the macro level for foreign and local technologies for knowledge management.

iv) The possible Implications of the Observed Human Resource Gap at COSTECH

The noted gap in the number of staff had an impact on the coordination of COSTECH activities, particularly in the health sector where COSTECH did not adequately evaluate the research work done by NIMR and other health-related institutions. It was noted that COSTECH lacked statistics to show the coverage of research in the health sector. It was unclear how much in terms of quality and quantity research on health issues has been done in the country.

Similarly, the Directorate of Knowledge Management (DKM) had only 20 employees out of the 29 needed. Considering that COSTECH is the main advisor of government on all matters pertaining to innovation, science, and technology, a coordinated effort is required to mainstream STI information into various policies, strategic plans, and programs. One of the responsibilities of DKM is to develop and communicate scientific knowledge information from research to various stakeholders. It was noted that among the missing staff, there was a skill gap for employees with knowledge of system administration, programming, database management, and communication experts. According to COSTECH officials, the strategic goal

of the commission to translate research results and enhance public awareness on STIs may be jeopardized as a result of this skills gap.

Also, at the Centre for Development and Transfer of Technology (CDTT) among the missing staff, there was a skill gap for employees with knowledge in the areas of technology acquisition, technology transfer, technology management, and innovation. This gap hampered COSTECH in effectively ensuring efficiency in the performance of CDTT functions. Furthermore, despite the fact that CDTT intended to establish a Technology Transfer Framework, interviews with officials in the visited institutions revealed that no support was ever received from COSTECH regarding issues of technology transfer.

v) Inadequate Specialized Skills and Certified Staff Required to Coordinate, Supervise, and Advise on Research and Innovation

A review of the COSTECH Training Program for the financial year 2021/22, revealed that the Commission lacked the trained staff and certified staff in Leadership Skills; International Organization for Standardization (ISO) Certified Staff on Audit and M&E; patent and intellectual property experts; Certified Risk Management Staff and Certified Staff on Project Management and Evaluation. **Table 3.5** presents the conditions of different specialized Skills set at COSTECH.

Table 3.5: Details on the Missing Skills of Staff at COSTECH

Skills Required to Staff	No. of Staff Required	No. of Staff Available with relevant skills	Gap	
			Number	%
Leadership Skill	20	15	5	25
ISO Certified Staff on Audit and M&E	8	0	8	100
Certified Risk Management Staff	10	0	10	100
Certified Staff on Project Management and Evaluation	4	0	4	100
Total	**42**	**15**	**27**	**64**

***Source**: Staffing Levels at Commission for Science and Technology (2022)*

Table 3.5 shows that there was a 25% shortage of leadership-skilled personnel and that none of the eight ISO-certified personnel was present in the audit and M&E departments. The ten required Certified Risk Management Staff were also missing. In total, the deficiency was 27 out of 42 equivalents to 64%.

According to COSTECH officials, ISO certification had not yet impacted the performance of the commission in the management of research and innovation. However, the certifications are required so that the Commission can maintain the status of being ISO certified by having the ISO certified staff too as shown in **Table 3.5**. The Audit, on the other hand, emphasizes that ISO is a globally recognized certification which demonstrates that an organization has met the requirements for ensuring the quality, safety, and effectiveness of its systems.

Further, the audit observation noted a significant competence gap at COSTECH, which may limit the organization's effectiveness as a principal government advisor and national research coordinator. A review of the Internal Audit Report of April 2021 showed that there were reported expired innovation grant agreements while the projects were still ongoing since there was a lack of formal procedure for the projects followed up by COSTECH.

On the other hand, this means that the commission might have to spend more money and time to obtain quality services through outsourcing engagements that require the ISO Certified Audit and M&E Staff, Certified Risk Management Staff, and Certified Project Management and Evaluation Staff. As stated above, COSTECH indicated that there were no cost implications as a result of lacking the services from the missing expertise. However, maintaining ISO certification would ensure improved quality management systems for COSTECH, resulting in increased efficiency, productivity, and customer satisfaction. During the factual clearance, COSTECH revealed to the auditor that, following the audit, the commission had trained 20 employees to meet ISO certification. This is an improvement to which audit has added value.

3.3.3 Inadequate Mechanism to Identify and Support Innovations

According to Specific Objective 4 (vii) of the National Research and Innovation Monitoring Framework 2020, COSTECH is expected to keep track of all technological trends and identify research areas in need of funding and capacity building. This requirement is in line with para 15(3) f of the National Guideline for Identification and Promotion of Inventions, Innovation and Traditional Knowledge Practices, 2018 issued by the Ministry of Education, Science, and Technology (MoEST).

After examining both documents, the audit team found that the MoEST and COSTECH had similar roles and requirements for the same activity. The National Guideline requires the ministry to compile a database of domestic innovations, inventions, and traditional knowledge practices. This includes identifying and promoting traditional knowledge practices, inventions, and innovations in Tanzanian academia, public and private institutions, and people at all levels.

However, in Para 3.2.4 of the same national guidelines, COSTECH is also required to create a database management system for recorded inventions, innovations, and traditional knowledge practices which is the Ministry's responsibility. Both, the MoEST and COSTECH did not adequately address this issue and put it into practice because neither the MoEST nor COSTECH had a system for tracking and identifying the innovators in the country. Thus, because of such overlapping COSTECH had only kept records of winning innovations from the National Innovation Awards.

MoEST officials confirmed during the fact clearance process that there is no such overlapping and that all responsibilities are vested in the COSTECH mandate. The MoEST is in charge of policy issues. If the guideline is such that it was most likely a typing error, it does not work in practice like that.

The National Research and Innovation Monitoring Framework of 2020 is the one which requires COSTECH to keep track of all technological developments and identify research areas in need of funding and capacity building. A review of the Data Repository from the financial year 2018/19 to 2021/22 showed that COSTECH registered 154 innovations. However, none of the traditional knowledge practices was registered. In addition, it

was further noted that, of all the registered 154 innovations, 43.5% were at the Development stage, 5.8% in the Commercialization stage, and 13.6% at the Prototype stage. The status of ongoing innovation projects that were either registered in the visited institutions or registered with the Commission from the year 2019 to 2021 is summarized in **Table 3.6.**

Table 3.6: Records of the Registered Innovation Initiatives

Name of the Institution	Number of Registered Innovation Initiatives (n)	Number Available in the Commission Records (n)	Difference (n)
DIT	33	18	15
NIMR	2	0	2
NM-AIST	13	3	10
SIDO	29	16	13
SUA	28	0	28
TAEC	1	0	1
TAFIRI	9	0	9
TAFORI	4	0	4
TARI	4	1	3
TAWIRI	3	0	3
TEMDO	29	3	26
UDSM	5	5	0
Total	**160**	**46**	**114**

***Source**: Data from the Visited Institutions and the Commission for Science and Technology (2022)*

Table 3.6 Presents the status of comparison of the registered innovation records at the Commission to those registered by the institutions visited by the audit team. From **Table 3.6**, it is observed that the Commission was unaware of nearly 75% (114 records) of the registered and active innovation initiatives in the institutions visited during an audit. One of the primary causes of this disparity was inadequate of coordination between COSTECH and various R&D and innovation centres. During interviews with commission staff, the audit noted that COSTECH did not has a well-established database to monitor and record ongoing institutional innovation activities in the country.

Inadequate Performance of the Process for the Identification, Evaluation, and Selection of Innovators

To identify innovators, the commission invites applications through various media, including posting advertisements on its Website, National

Newspapers, Radio, and Television. All potential innovators are encouraged to submit applications. To select and evaluate applicant scores, the following criteria were used to evaluate applicants. The innovators have to:

a) Be enthusiastic and committed to his or her invention/innovation;
b) Have an invention/innovation which arouse from the inventor/innovator's routine work;
c) Have the basic skills for the development of the invention/innovation if not, the skills which are missing should be listed in the application forms;
d) To be interested in being involved in the development and commercialization of the invention/innovation; and
e) Have some experience in business ventures or commercialization.

All of these criteria were used to select winners in various categories. The evaluation was based on the information provided by the contestant. The audit noted that for the past 4 years under audit, COSTECH and MoEST issued three calls for innovators to contest. **Table 3.7** summarizes the list of selected innovators to the MAKISATU from the year 2019 to 2021.

Table 3.7: Number of Applicants and Selected Innovators

Year	Number of Applications	Number of Selected Applications	Percent (%)
2019	407	60	14.7
2020	651	70	10.8
2021	719	70	9.7
Total	**1,777**	**200**	**11.3**

Source: *Annual Performance Report (2019-2020)*

Table 3.7 indicates that despite increased number of applications recorded 407 in the year 2019 to 719 applications in the year 2021, the proportion of selected applicants decreased from 14.7% in the year 2019 to 9.7% in the year 2021.

However, the audit further noted that out of the 204 who were selected in total only 63 equivalents to 31% received support from the commission to further advance their innovations; while the rest were not supported. According to the M&E Report of the MAKISATU Program (2018/19), the main reason of auditors was inadequate funding to support all of the selected

innovators, this has resulted in unsustainable and non-continuous support to selected innovators. Also, from the review of the same M&E report, the audit noted the minor issues that reduced the effectiveness of providing financial and other support to the selected innovators, the report showed that:

a) Challenges were encountered in finding the innovators as the contact information they provided during the application was no longer valid and they could not be reached;

b) For the innovators who applied when they were still in secondary school, the commission faced difficulties in providing support when it was required. This was because some of these innovators had either completed secondary school and moved to different regions for high school, or completed school and returned to their hometown, making it difficult to locate them promptly as the commission did not have their updated addresses; and

c) Some innovators who were still in school did not attend the initial training program due to either being in the middle of taking exams or because their parents did not permit them to participate.

The lack of support for selected innovators could result into negative consequences, such as the killing of the creativity spirit among young innovators who are prevented from capitalizing on new technologies and also it simplifies the loss of job opportunities among young people. This has the potential to prevent the growth of the country's economy.

3.3.4 Inadequate Mechanism to ensure Usability of Research Results

Section 5 (2)(c) of COSTECH Act, 1986 requires COSTECH to acquire, store and disseminate scientific and technological information. Furthermore, para 4.1.1 of the COSTECH Strategic Plan (2016/17-2020/21) requires COSTECH to strengthen its evidence-based decision-making culture through a comprehensive set of guiding frameworks and tools for facilitating evidence-based decision-making (planning, funding allocations, etc.).

Interviews with officials at the University of Dar es Salaam (UDSM) and the Dar es Salaam Institute of Technology (DIT) revealed that the published guidelines from both entities did not require researchers to publish their research information in their institutional repository. Officials at UDSM clarified that researchers were motivated to publish in the University repository for academic promotion rather than for knowledge sharing. If a researcher was not interested, he or she was not bound to publish in the institutional repository. Consequently, not publishing in an open access institutional repositories can restrict both COSTECH and the general public to access such research data.

On the other hand, COSTECH was expected to encourage the use of evidence-based decision-making by creating and sharing knowledge products based on research and innovation. Interviews with representatives from each visited HLIs and RDIs revealed that COSTECH did not have a formal system in place for keeping track of different research products including research policy briefs that were published by HLIs and R&Ds. This was in part, because COSTECH lacked guidelines or documented procedures to ensure that research institutions comply with information-sharing requirement. According to COSTECH progress reports for the financial year 2016/17 to 2021/22. Based on interviews with official in the Visited HLIs and R&Ds another cause for the inadequate use of evidence-based decision-making based on result of research and innovation was related to COSTECH's weakness to raise awareness among all stakeholders about sharing their information with COSTECH and updating their repository for easy access by COSTECH.

3.4 Administration of Registered Research and Innovation Activities

3.4.1 Insufficient Monitoring of the Activities done by the Registered Research and Innovations

Section 3.9 (Policy Statement-ii) of the National Research and Development Policy of 2000 requires the Government, in collaboration with other stakeholders, to strengthen regulations and monitoring of internal and external research activities in the country. Likewise, the COSTECH Act, 1986, Cap 226 [R.E. 2002] clarifies the mandate and responsibility of the

COSTECH to monitor activities relating to scientific research and technology development that is done at organizational and individual levels.

Examination of four annual plans for each financial year from 2018/19 to 2021/22 showed that COSTECH did not have a clear plan outlining how they would monitor the registered ongoing research and innovation activities. The presented key performance indicators was not adequately used for tracking progress. According to the interviews with officials from the COSTECH, it was revealed that the idea of developing the monitoring plans were introduced in the new Strategic Plan 2021/22-2025/26.

As a result, based on the review of correspondence documents between COSTECH and Researchers and Innovators, it was found that monitoring of registered research and innovation activities was done on an ad hoc basis or at times arbitrarily based on instructions from top management or the Board of Directors. For instance, according to the 2020/21 Performance Report of the COSTECH, during the 89th meeting, the Board of Commissioners directed the Management of the Commission to conduct a monitoring exercise for 59 MAKISATU innovation projects that were registered in the year 2019. The effect of this was that the directive only applied to a small number of projects, despite the fact that there was a total of 116 innovation activities registered and funded through NFAST in that year.

Furthermore, it was noted that the content of what to monitor was limited to issues of interest to the Board of Commissioners rather than being comprehensive and holistic to the entire project cycle. As a result, the COSTECH could not closely monitor the value-for-money of government-funded innovation projects. Given that TZS 450,600,000 had been invested in Team, the Audit could not ascertain the performance of the unmonitored projects. The lack of a system for tracking all registered research and innovation activities made it difficult for the COSTECH to ensure that the funded projects were proceeding as planned and that material and financial resources were not misappropriated.

3.4.2 Inadequate Commercialization of Innovation Activities Funded through NFAST

According to the COSTECH's Strategic Plan (2016/17-2020/21), one of the strategic goals was to promote the country's industrialization. This was to be accomplished by expanding the application of technologies by establishing an innovation window within the National Fund for Advancement of Science and Technology (NFAST). **Table 3.8** shows the number of innovations that received NFAST funding and were released to the market between the financial year 2018/19 and 2021/22.

Table 3.8: Innovation Activities Funded through NFAST

Item	Year		
	2019	2021	2022
Funded Innovations	58	73	24
Commercialized Innovations	9	-	-
Innovations in other Stages	35	73	24
Innovations with no provided status	14[15]	-	-
Total Received Fund (TZS)	**576,110,250**	**333,500,000**	**180,160,000**

***Source**: Innovation List of the Commission for Science and Technology (2019-2021)*

Table 3.8 illustrates that starting from the year 2019 to 2021, the Commission received a total fund of about TZS 1.1 billion to support innovation activities. According to the list of innovations from the COSTECH (2019-2021), the innovations identified in 2019 were expected to be commercialized by June, 2022, 2 years after registration contrary to the stated purpose of commercialization being to connect technology innovators to onward business and investment opportunities[16]. However, a review of the innovation list published by the COSTECH showed that only 9 out of 58 (15.5%) innovations registered in 2019 were commercialized, and the remaining 49 (84.5%) registered innovations were either in other developmental stages or had no development status. On the other hand, despite the passage of time, none of the innovations registered in 2020 had

[15] The innovator did not provide the updated program to COSTECH

[16] Section 3.1.1(c) of the COSTECH Research and Innovation Grants Manual (2019)

been reported as commercialized as of June, 2022. **Table 3.9** summarizes the status of the commercialized innovations in the visited institutions.

Table 3.9: Status of Commercialized Innovations

Name of the Institution	Number of Registered Innovations	Number of Innovations Commercialized
DIT	33	0
NM-AIST	13	3
SIDO	29	2
TAEC	1	0
TEMDO	29	7
TAFIRI	9	7
TAFORI	4	0
TARI	4	2
SUA	28	0
NIMR	2	2
UDSM	5	0
TAWIRI	3	0
Total	**160**	**23**

***Source**: Records on Registered Innovations from the Visited Institutions (2022)*

Despite having registered innovations as noted from the visited institutions, **Table 3.9** shows that 23 out of 160 registered innovations (equivalent to 14.4%) were commercialized. However, it was further noted that the affected innovations which did not end up in commercialization were mainly from the sectors of Education, Health, Energy, and Agriculture. Interviews with officials at the Commission revealed that the slow rate of commercialization is attributed to insufficient fund received by COSTECH to support the initiated innovations to the commercialization stage. Though, interviews with officials in 5 out of 12 visited institutions, revealed that the slow rate towards the commercialization stage was contributed by the following:

(i) ***Inadequate of Development Infrastructure*:** To help advance the initiated innovations to the commercialization stage there is a need to have infrastructure that could be used to ensure the development of the initiated innovations.

(ii) ***Inadequate Monitoring of the Stated Innovations***: It was noted that the progress of some initiated innovations was not sufficiently monitored to provide updates on the progress made and what needs to be accomplished for commercialization.

(iii) ***Weak Ties Between the Public Sector and the Industry*:** Despite various efforts to support innovations, it was noted that there is no proper system in place to effectively communicate information about these innovations and their progress between institutions. This suggests a minimal flow of information between the public sector, industry, and higher education institutions.

(iv) ***Lack of Commercialization Knowledge Among Local Innovators at basic levels*:** It was reported that for some innovations that were primarily developed by individuals at the medium level, some of them were observed to have an adequate understanding of the steps required to move the innovations to the commercialization stage while majority who were at basic level lacked of Commercialization Knowledge.

3.4.3 Sustainability of Supported Innovation Activities

Para 2.7 of the Research and Innovation Grants Manual of the Commission for Science and Technology (2019) requires the Commission to conduct systematic and objective evaluation or assessment on the fulfilment of objectives, developmental efficiency, effectiveness, impact and sustainability of the design, implementation, and results of the completed or on-going projects or programs.

Based reviewed Innovations program report documents in the visited institutions, revealed that Innovations projects implemented under the coordination of COSTECH did not meet their objectives, developmental efficiency, effectiveness, impact, and sustainability requirements. The following subsections present the weaknesses observed in each program or project that was implemented.

(i) Inefficient Implementation of Innovative Cluster Subprogram

According to Para 1.0 of the Field Monitoring Report for November 2021, COSTECH and the Small Industries Development Organization (SIDO) carried out an innovative cluster subprogram for TZS 4.91 billion. The main goal of the Innovative Cluster Subprogram was to develop a method for scaling up and replicating innovative and competitive clusters to develop knowledge for society. Another goal of the subprogram was to secure stakeholders' contributions to regional development and demonstrate their ability to collaborate and co-develop to increase cluster competitiveness.

The Innovative Cluster Subprogram was implemented locally with the assistance of regional administration and local government officials. The respective Regional Administrations and Local Government Authorities were expected to collaborate with relevant stakeholders to support innovative clusters and their businesses. It was expected that the ability of the regional administration and local government authorities should be able to oversee innovative cluster initiatives to improve after the implementation of the program.

In addition, despite not being clearly stated, a review of Section 1.0 of the Field Monitoring Report[17] of November, 2021, indicated that the implementation of the Innovative Cluster Subprogram had been delayed for two years; initially, the program was scheduled to complete the three-year plan by 30th June 2020. However, the financier granted an extension through the Specific Agreement[18] signed between COSTECH and the Swedish International Development Cooperation Agency (Sida) hence the new completion deadline was set to 30th June, 2022.

However, the Commission was unable to complete all of the activities within this time frame. Hence, the financier granted another extension through email dated 29th June 2022, to a new deadline of 31st December 2022.

[17] Fostering Innovation for Sustainable Socio-economic Development - Innovative Cluster Subprogram Field Monitoring Report, November 2021

[18] Fourth Amendment to the Specific Agreement on Research Collaboration between Sida and Tanzania Commission for Science and Technology (COSTECH) during the period 1 July 2015 - 30 June 2020

According to Para 4(b) of the Field Monitoring Report of the Innovative Cluster Sub Program, students and researchers who were nominated and assigned to the 15 clusters did not report on time as per the Universities calendar, which caused delays as they were expected to research the management of innovative clusters to contribute to knowledge dissemination and further research into the cluster model. This activity was supposed to be done in collaboration with R&D institutions, Researchers, and cluster members. As a result, the delay in engaging students and researchers impacted the implementation timeline. Up to November, 2021, 15% of expected researchers had reported to their respective clusters.

According to the Field Monitoring Report reviewed, another reason for the delay was insufficient feedback from SIDO and COSTECH to clusters as they were required to intervene so that stakeholders from the clusters could have the required assistance on how to go about and resolve anything whenever they faced any difficulties or ambiguity in performing their duties. This could somehow have demoralised and discouraged, members that were working in clusters as shown in Para 4. 0 (f) of the Field Monitoring Report, 2021. Based on a review of the Field Monitoring Report from November 2021, the audit team noted that COSTECH was falling behind schedule with the majority of the activities. For example, only 12% of the Innovative Cluster Subprogram's activities were implemented by November, 2021. **Table 3.10** summarizes the extent of the implementation of the planned activities and progress as of November, 2021.

Table 3.10: Extent of Implementation of the Planned Activities

Planned Activity/Milestone	Actual Progress	Progress Rating (%)
Progress Review meetings to engage students conducted	Progress Review Meeting Report shows that the meetings were conducted in 14 clusters with exception of one cluster, namely Kunamo Grain Millers	93
Eight Guidelines to support Cluster development activities developed	Seven of eight guidelines were developed, and five of the developed guidelines were under pilot in clusters	88
15 R&D researchers and students engaged in Cluster collaborative research projects	Researchers have nominated, identified, and assigned to the 15 clusters since June, but more than	80

Planned Activity/Milestone	Actual Progress	Progress Rating (%)
	85% are yet to report in their respective clusters	
Cluster support model proposal, field reports, data collection tools	Seen field monitoring reports, but the modal is still under testing and data collection is in progress	70
MoU signed with academia to conduct research in collaboration with clusters	MoU signed but there is a lack of common understanding among Researchers	60
Cluster advocacy to Government and exhibition	Advocacy to the Government awaits the final version	50
Five Guidelines to support Cluster development activities piloted and operationalized	The piloting of five cluster guidelines started in October 2021 in the five clusters. Very low understanding observed	50
Cluster database/website established	The cluster homepage has been established within COSTECH web but no data for the cluster	50
A cluster development committee established	The committee were established in 8 clusters but none of them is functional because of budgetary constraints	50
M&E and cluster development (Final report based on analysis of all M&E exercises) prepared	Fostering Innovation for Sustainable Socio-Economic Development Monitoring and Evaluation Report, 2022 was submitted after exit meeting. However, the report did not show the progress implementation of the set milestones	50
Three designs or prototyping from each cluster facilitated	Eventually, only 5 clusters are working on the prototype because of financial constraints	40
Re-establishment of the National Steering Committee (NSC) and experience sharing	Though the re-steering committee was not formed, COSTECH used advisory committee (Innovation and Technology committee) for overseeing the project since it was seen that formulating re-steering committee which was purposely for overseeing Sida project only lacked the national vision.	33
15 students conducted research and (done in clusters) publication in place	Four researchers conducted research in clusters and had already submitted their reports	27

Planned Activity/Milestone	Actual Progress	Progress Rating (%)
At least 3 explorations for securing IPR process among all of the selected clusters	Not yet	0
Individual format for individual cluster websites developed.	Clusters are yet to upload data to the homepage for various reasons	0
15 PhD/MSc students or researchers disseminate research in collaboration with clusters progress reports	Not yet	0
MoUs signed between clusters with LGAs, SIDO and COSTECH	12 out of 15 MoU have been stuck among the partners and therefore not signed	0

Source: *Auditors' Analysis of the Planned Activities/Milestones vs the Actual Progress (as reported in the Field Monitoring Report of November 2021) and the Fostering Innovation for Sustainable Socio-Economic Development Monitoring and Evaluation Report, 2022*

According to **Table 3.10** above, it is shown that the highest achievement on the activities was 93% of which was spent on holding progress review meetings in order to engage students in clusters. According to the Progress Review Meeting Report, the meetings were held in 14 clusters, with the exception of Kunamo Grain Millers. According to responses from interviewed COSTECH officials, the Kunamo Grain Millers cluster was not visited for the meeting because at the time COSTECH scheduled a visit for the meeting, the respective cluster researcher was not available at SUA, the host institution.

The second-best performance on the activities was at 88% which was on developing guidelines to support the progress of cluster activities. However, of the nominated researchers and students, it was shown that more than 85% were yet to report in their respective clusters; implying that, the high achievement made was on nominating only rather than engaging the nominated students and researchers to the clusters as expected.

Furthermore, it was noted that there were activities not done at all with zero percent of their achievement since they were interdependent among them. For instance, according to the Field Monitoring Report, 15 students were expected to conduct research in clusters and publish the results. This was not done since the students did not report to clusters as expected. Thus, no research results were available for dissemination and review.

According to Para 4.0 of the Field Monitoring Report, the main reason for the observed ineffective performance of the Innovative Cluster Subprogram was a lack of coordination among the stakeholders implementing the subprogram. Para 4.0 (d) of the Field Monitoring Report of the Subprogram showed that there was poor communication for sharing of implementation progress among key actors, with both COSTECH and SIDO, the body in charge of implementing the subprogram. The same showed that there was poor communication between SIDO HQ and SIDO Regional offices, to the extent that the regional offices lacked possession of the project.

It was further indicated by the Field Monitoring Report that the two implementing organizations had different approaches to the innovative cluster conceptualization. SIDO used an Industrial cluster approach focused on putting regional concentrations of industry clusters as related industries. On the other hand, the approach used by COSTECH to Innovative Clusters focused more on Triple Helix Model, which links academia, industry, and government to promote socio-economic development. The difference in Innovative cluster conceptualization resulted in a lack of coherence in the implementation of this subprogram where the stakeholders had no clear understanding of which approach to follow in the implementation of the subprogram as an aforementioned difference in approach.

According to the Field Monitoring Report, 2021, and interviews with officials from COSTECH, the stakeholders that were confused about which approach they had to follow on the implementation of the cluster subprogram were at the district level where the projects were implemented. Further, according to Para 3.2 of the Field Monitoring Report, 2021 of COSTECH, the field observation in the piloted five of the 15 clusters, there was low understanding about clusters among stakeholders. Furthermore, the confusion of the cluster concept to stakeholders hinders the impact and the sustainability of the initiative to be realized.

(ii) Ineffective Coordination on the Implementation of the Innovative Cluster Subprogram

A review of Para 4.0 (c) of the Field Monitoring Report, 2021 found that the organizational structure at the LGAs and RAS did not have a dedicated officer in charge of STI issues which includes Innovative Clusters hence the structure did not support the effective management of innovative cluster

activities. There was no position or function in any LGA or RAS for a person to be in charge of overseeing issues or organizing Science, Technology, and Innovation, as a result, the activities of the innovation cluster were delegated to either the community development officer, the business licensing officer, the agricultural officer, or another sector-related officer. These officers were not coordinated.

According to **Table 3.10,** about 12 of the 15 Memoranda of Understanding (MoUs) between the partnering institutions which included LGAs, SIDO and COSTECH were not signed while the implementation was taking place. The Memoranda of Understanding were primarily between Regional Administration and Local Government Authorities, SIDO, and COSTECH. MoUs were supposed to save as guiding documents that could help to establish a coordination structure with clear duties assigned to the appropriate officials.

The Field Monitoring Report of COSTECH also showed that the organizations implementing the cluster intervention were not communicating with one another. Particularly, SIDO HQ did not provide SIDO Regional offices with enough feedback on the clarifications and requests from the implementers at LGAs clusters, which led to the regional offices losing control of the project as they did not continue working on the project waiting for the feedback leading to delays on the implementation of the project. Also, according to Para 4.0 (d) of the Field Monitoring Report, 2021 of the Innovative Cluster Subprogram, there were inconsistencies in information sharing that were caused by frequent transfers of cluster facilitators from COSTECH working for SIDO or LGA. This resulted to incomplete information/feedback.

Similarly, according to Para 4.0 (h) of the Field Monitoring Report, 2021, the internal feedback system at COSTECH was not functioning properly. Interviews with commission officials showed that information and findings regarding the development of activities on the innovation clusters were not shared with COSTECH employees within or across directorates. Consequently, it was challenging for a COSTECH employee assigned to training or visiting a particular cluster, SIDO, or LGA to inform the public or other stakeholders about observations that required a COSTECH response

because the individual who visited the cluster after that was not aware of the issue.

(iii) Implementation of the Innovative Cluster Subprogram without Signing MoUs

According to the Field Monitoring Report of the Innovative Cluster Subprogram, 12 out of the 15 MoUs between LGAs, SIDO, and COSTECH were not signed, contrary to the plans, as shown in item no 15 in **Table 3.10**. According to the Field Monitoring Report and interviews with officials from COSTECH and SIDO, MOUs were not signed due to a lack of common understanding among the partners. The lack of common understanding might be partly caused by the difference in approaches on how to execute the Subprogram as stated above that SIDO and COSTECH are two different approaches hence caused difficulties for stakeholders to understand the project and their expected responsibilities. Further, according to COSTECH and SIDO officials, inadequate internal and external communication among the partners partly affected the signing of the MoUs.

Because the MoUs were not signed, the implementing partners, particularly the LGAs and SIDO Regional offices, did not have a strong sense of project ownership and commitment to work on it. All SIDO Regional offices did not have the project working documents like project proposals and project interventions because those were to be attached to the signed MOU.

As a result, they did not fully comprehend the project, which reduced their confidence in interacting with external stakeholders in their respective regions. Not only that, but also it had an impact on the quality of feedback such as complete information received and given by SIDO HQ and COSTECH, as well as feedback to innovators regarding various interventions. For example, according to Para 3.2 of the Field Monitoring Report, 2021, there was an identified intervention on the understanding of the guidelines in the five piloted clusters that they should be translated into Swahili which however was neither implemented nor feedback given to clusters.

As a result of this gap, the audit noted a lack of consistency in the information conveyed to clusters. For example, after identifying the cluster intervention at Headquarters, the feedback on the final agreed-upon

intervention was supposed to be communicated back to clusters, but in this case, this was not done.

According to interviews with officials from SIDO and COSTECH, almost all 15 clusters voiced complaints about feedback breakdowns and delays in giving the feedback.

(iv) Implementation of the Innovative Cluster Subprogram without Operationalization of Cluster Development Committees

The review of Para 2.0 of the Field Monitoring Report of the Innovative Cluster Subprogram showed that COSTECH planned to establish and operationalize the Cluster Development Committee for all the fifteen clusters.

However, only 8 out of the 15 clusters were found to have established Cluster Development Committees. Furthermore, the report claims that due to a lack of funding, none of the eight established committees in the respective clusters was operational. Interviews with the COSTECH officials showed that the implementation of the innovative cluster subprogram was not hampered by financial constraints.

This implies that the goal of establishing and implementing Cluster Development Committees for all clusters was not met. The committees were formed to deliberate and control the activities of Innovative Clusters to ensure their viability. The committees also were supposed to make sure that all cluster stakeholders get together to talk about opportunities and challenges unique to their districts. Since these committees were inactive, the sustainability of clusters in the country is likely to be affected. For instance, hot topics like the support of STI officers in charge of overseeing grassroots innovation in each district were not discussed or brought forward to policy and decision-makers at the national level. As a result, National efforts to identify and develop emerging technologies through the use of sustainable Cluster Program Initiatives would be hampered.

3.5 Coordination of Key Actors in the Implementation of Research and Innovation Activities

Coordination among the key actors in the implementation of research and innovation activities is essential to ensure effective management of research and innovation activities. Objective Number 4 of the Research Monitoring Framework of the Commission for Science and Technology, 2020 requires the Commission to ensure the institutionalization of research monitoring and communication system in Industries, Higher Learning and Research and Development Institutions. The following subsection provides details of the noted issues in the coordination of key actors involved in the implementation of research and innovation activities. Below are noted shortfalls:

3.5.1 Contradictory Roles and Responsibilities in the Coordination of Research Activities

The National Research and Development Policy of 2010 requires the Ministry of Education, Science, and Technology to harmonize the roles of different sector ministries, departments and agencies in coordinating research matters. On the other hand, according to the section 5 (2) b of COSTECH Act, 1986, COSTECH is also responsible to monitor and coordinate activities related to scientific research and technology development.

Despite the fact that Research Institutions are aware of the role of COSTECH as a regulator and coordinator of research in the country, the audit noted several legal provisions in research institutions that prevented COSTECH from fully exercising its statutory mandate to coordinate activities related to scientific research and technology development in the country. Furthermore, a review of the Acts and Regulations establishing these institutions revealed the presence of clauses that make them to be more accountable to their respective sector ministries on matters relating to the overall coordination of research and scientific activities. **Table 3.11** summarizes legal provisions regarding the coordination of research activities in the visited research institutions.

Table 3.11: Legal Provisions in Coordination of Research Activities

Legal Provision	Statement Regarding Research Coordination and Reporting Structure
Section 15 of the Small Industries Development Organization (SIDO) Act 1973	The Director-General shall, within sixty days of the end of each financial year, prepare a report on the activities of the Organization during such year and submit such report to the Chairman who shall forward the same to the Minister.
Section 67 of the Tanzania Atomic Energy Commission (TAEC), 2002	The Commission shall within six months after the close of the Annual statement financial year, cause to be prepared and submitted to the Minister a report detailing the activities and operations of the Commission during that year.
Section 10 subsection 1 of the Tanzania Wildlife Research Institute (TAWRI), 1999	The Board shall, within six months after the close of the financial year, cause to be prepared and submitted to the Minister a report dealing generally with the activities and operations of the Institute during that financial year
Section 23 subsection 1 of the Tanzania Forest Research Institute, 1980	The institute shall cause to be prepared and submitted to the Minister within six months after the close of each financial year an annual report dealing with the activities and operations of the institute during that year.
Section 4(3) of the National Institute for Medical Research Act, 1979	For better performance of its functions, the institute shall establish and maintain a system of collaboration, consultation and cooperation with the Tanzania National Research council established by the Tanzania National Research Council Act,1968
Section 26 of the National Institute for Medical Research Act, 1979	The council shall, within six months after the close of the financial year, cause to be prepared and submitted to the minister a report dealing generally with the activities and operations of the institute during that year.
Section 68 of the Sokoine University of Agriculture Charter, 2007	The Vice Chancellor shall at the end of each financial year prepare a report on the activities of the University during that financial year and submit such report to the Chancellor and the Minister.

***Source**: Auditors' Analysis of the Legal Requirements as Provided in Respective Acts in the Visited Institutions (2022)*

Based on **Table 3.11** the Legal Provisions Regarding the Coordination of Research Activities vary significantly among different actors. In addition, it was further noted that the R&D institutions were set up under their legislations and whatever relationship existed between these institutions and the Commission is based on nonbinding affiliation making it difficult for the COSTECH to effectively accomplish its mandated roles. Despite the

noted challenges, it was further revealed that to avoid these legal contradictions, the existing Science, Technology and Innovation Policy of 2018 is currently revised to empower the COSTECH to fully exercise its mandate.

According to Section 5(2) (c) of the COSTECH Act, 1986, COSTECH has the mandate to acquire, store and disseminate scientific and technology information. However, interviews with officials in the visited research institutions revealed that the existing practice requires that submission of the scientific information originating from these institutions is made on request-basis and is not obliged to directly submit to COSTECH.

In addition, interviews with officials in the visited institutions reiterated that the reason for the observed contradictory roles in the coordination of research activities was due to systemic problems related to the existing institutional structural set-up of the Commission and other sectoral ministries. It was further revealed that currently, the Commission reports to the Ministry of Education, Science and Technology which puts it on the same level as other research institutions that are housed under the ministries of their respective sectors.

(i) **Overlapping Mandates for the Registration of Technology Transfer Agreements**

Regarding registration of technology transfer agreements, the audit noted that there were three entities, namely the COSTECH, Tanzania Investment Centre (TIC), and the Business Registrations and Licensing Agency (BRELA) with the mandate to register technology transfer agreements. **Table 3.12** describe the summary of the legal provisions regarding mandates in registration of technology transfer agreements as per the legal requirements of each entity.

Table 3.12: Legal Provisions in Registration of Technology Transfer Agreements

Institution	Legal Provision	Role	Comment
Commission for Science and Technology (COSTECH)	Section 15(3) of the COSTECH Act of 1986	Requires the National Center for Development and Transfer of Technology (CDTT) to register all technology transfer agreements to assess compliance with the national laws	The CDTT is required to make follow up with all entities that register technology transfer agreements. CDTT is now in the progress of preparing technology transfer agreement registration tools and framework.
Tanzania Investment Center (TIC)	Section 26(2) of the TIC Act of 1997.	Requires technology transfer agreements to be registered to the Tanzania Investment Centre	All the registered technology transfer agreements have to be reported to COSTECH. However, this has not been done and efforts are being made to allow COSTECH to access investment documents to seek technology registrations.
BRELA	Section 28(2) of the Patent Act (cap 217 R.E 2002)	Requires registration of granted patents to BRELA.	All the granted patents registered by BRELA have to be reported to CDTT-COSTECH. BRELA has recently agreed to share information with COSTECH, and an official request has been sent to come up with a MoU.

***Source**: Auditors' Analysis of Legal Provisions Regarding Registration of Technology Transfer Agreements (2022)*

Based on **Table 3.12,** the legal provisions regarding mandates in the registration of Technology Transfer Agreements vary among different actors. Interviews with officials from the COSTECH revealed that despite the known roles of each entity regarding their mandates, there was no coordination to ensure effective operations regarding the requirements in the overall management of matters relating to the registration of technology transfer. In addition, Interviews with officials from the Commission confirmed that such weaknesses were a result of the low awareness of entities that legally mandated for Registration of Technology Transfer Agreements.

This created a challenging environment for innovators as they are required to comply with the regulatory requirements of each entity separately. As a result, it creates conditions that would not favour COSTECH to ensure informed and thorough coordination of the activities regarding the transfer of technology.

3.5.2 Insufficient Coordination of the Activities on Research and Innovation

Section 5 Subsection 2(b) of the COSTECH Act, 1986 provides for the functions of the Commission to monitor and coordinate activities related to scientific research and technology development of all persons or body of persons concerned with such activities. The Act stipulates further that, research coordination includes setting research priorities and preparing guidelines, administration of research funds, oversight of research implementation, and dissemination of research findings. The Audit, however, found insufficient coordination of ongoing research and innovation activities as presented in the following section:

(i) Insufficient Coordination for Administration of Research Funds

Section 5 (c)(i) of the COSTECH Act, 1986 requires the COSTECH to oversee and coordinate the selection, planning, and funding of research projects and programs within the scope of national research institutions. The Act also requires the COSTECH to mobilize funds from both the government and other sources to support and promote scientific research and technological

development. The National Fund for the Advancement of Science and Technology (NFAST) was established to manage government research funds.

NFAST receives government funds and manages research grants received by COSTECH. Thus, all HLIs, R&Ds, and research organizations are supposed to rely upon the NFAST as the government body in charge of funding their research. Therefore, to implement the National Research Agenda, COSTECH through NFAST has to establish a budget based on needs or plans from R&D and HLIs. However, there is no such coordination, and research funds are administered in silos by each R&D and HLI. This is partly due to the fact that NFAST does not receive enough funds to support research activities in the country; as a result, each R&D and HLI would devise their own methods of funding research, either through donors or their own sources.

(ii) Difficult to Track Total Funds Set for Research

As a signatory to the Lagos Plan of Action, 1980, the government of Tanzania set a goal of allocating one percent (1%) of the Gross Domestic Product (GDP) to research and development activities. However, Section 3.1.2 of the Draft National Science, Technology and Innovation Policy, 2018, showed that there was a low level and weak mechanism to implement the Agreement of Lagos Plan of Action of 1980 which required the country to allocate one percent (1%) of GDP to support R&D activities.

A review of objective six of the Implementation Plan of NRDP[19]showed that the approach adopted for allocating the government funds for research and development was decentralised. In this approach, the funds were allocated to the public research institutions through their respective parent sector ministries. As a result, tracking research funds was difficult because each entity operates independently and without coordination.

Also, the audit team, noted that there was no linkage between the commission and the Ministry of Finance and Planning who manages payment of all funds to these entities. As a result, the COSTECH was unable to collect research funding statistics directly from the Ministry of Finance and Planning. On the other hand, the interviews made with officials in the visited institutions revealed that, realizing achievement of the target of

[19] Implementation Plan of the National Research and Development Policy for 2011 – 2020 of MoEST

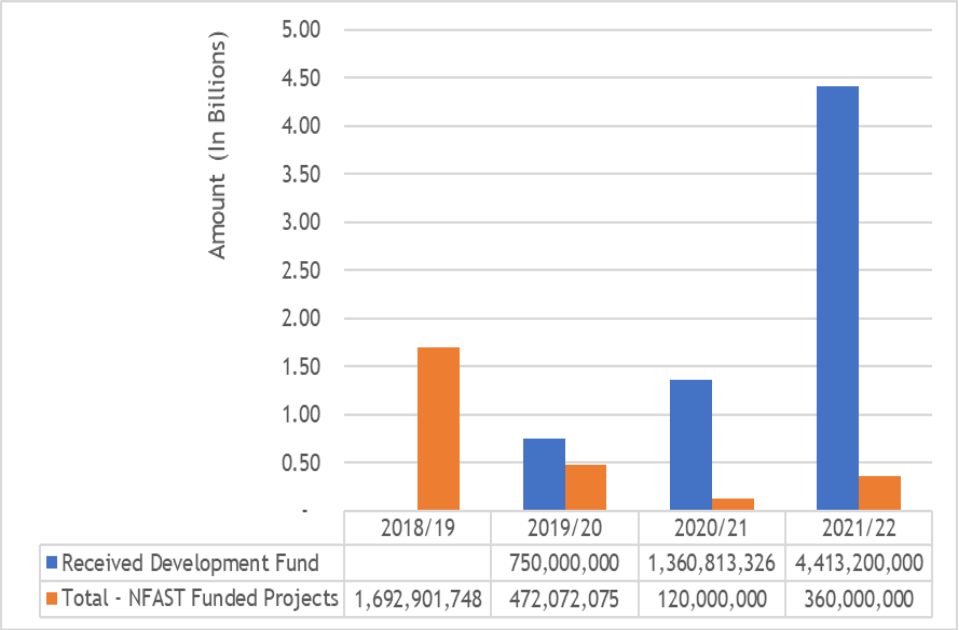
allocating one percent of GDP had been a challenge since the government practice of allocating funds for research and development in the public research institutions through their respective parent sector ministries led to difficulties to COSTECH (through NFAST) tracking the total fund set for this purpose across ministries.

Furthermore, it was demonstrated that this decentralized funding approach has shortcomings such as It does not encourage competition in the allocation of funds to specific activities; does not allow for the accurate evaluation of the effectiveness of allocated funds and clear monitoring; difficult in measuring overall government R&D budget spending and evaluation of the economic impact. As a result, there may be uncertainty about the government's ability to meet its commitment to the Lagos Plan of Action of allocating at least one percent of GDP annually.

(iii) Insufficient Administration of the Allocated Research Funds

The audit team noted that there was insufficient administration of the allocated research funds that were channelled into respective research institutions. This to a great extent contributed to the lack of autonomy of COSTECH through the NFAST to fully have control in the overall management of research funding. Because the affiliations between COSTECH and R&D institutions are nonbinding, this also goes to the management of research funding, and this could have the risk of having parallel research funding or duplication between research institutes in respective sector ministries. **Figure 3.2** depicts the funds received from the treasury through NFAST from the financial year 2018/19 to 2021/22.

Figure 3.2: NFAST Fund Received from Treasury (2018/19-2021/22)



	2018/19	2019/20	2020/21	2021/22
Received Development Fund		750,000,000	1,360,813,326	4,413,200,000
Total - NFAST Funded Projects	1,692,901,748	472,072,075	120,000,000	360,000,000

***Source**: Received Fund from Treasury NFAST (2022)*

Figure 3.2 shows that from the fiscal year (FY) 2018/19 to 2021/22 a total of TZS 6.52 billion were received as development funds, varying from TZS 0.75 billion in the FY 2019/20 to TZS 4.41 billion in FY 2020/21; though, there were no development funds received in FY 2018/19. Despite the increasing trend in the received development fund, the total allocated fund to cater for NFAST-funded projects was decreasing from TZS 1.69 billion in FY 2018/19 to TZS 0.36 billion in FY 2021/22.

Furthermore, **Figure 3.2** shows that starting from the FY 2019/20, the allocated fund to NFAST-funded projects was less than the allocated development fund, varying from 8.2% to 62.9% of the total received development fund. **Table 3.13** indicates the number of NFAST-Funded projects from FY 2018/19 to 2021/22 and the total allocated funds.

Table 3.13: Number of NFAST-Funded Projects and Allocated Funds

Description	Fiscal Year (FY)				Total (TZS)
	2018/19	2019/20	2020/21	2021/22	
Number of NFAST-Funded Projects per Year	7	4	2	2	15
Total Fund (TZS in Billions) Allocated per Year	0.13	0.94	1.55	4.56	7.17
Total Funds (TZS in Billions) Utilized for Projects per Year	1.69	1.43	0.12	0.53	2.64

***Source**: Auditors' Analysis of Received Fund from Treasury through NFAST (2022)*

Table 3.13 illustrates that there were 15 projects which were funded through NFAST with a total cost of TZS 2.64 billion spent from the FY 2018/19 to 2021/22. On the other hand, it was indicated that for each year, there was an average annual allocation of TZS 1.79 billion while the average utilised funds per year was TZS 0.66 billion, implying an average of TZS 1.13 billion was not utilised in four years from FY 2018/19 to 2021/22.

Furthermore, a review of the expenditure report revealed that the NFAST did not meet its targets as shown in **Table 3.2** under **Section 3.3.2** although NFAST received the funds and did not fully utilise them for financing the projects. Further, the funds that were termed as OC that were disbursed through NFAST which is the basket for research means that the funds were used to pay for operational costs within the COSTECH, contrary to the NFAST's purpose of financing projects related to research.

On the other hand, a portion of the NFAST fund was supposed to be used to conduct site visits to innovation grantees to monitor project progress and ensure that the grant contract is being followed. The requirement is that these visits must be conducted at least four times a year. According to a reviewed Supervision Visit Report of Ongoing Funded Research and Innovation Projects, 2020, no visits were made to check on the progress of projects funded by NFAST in the financial years 2018/19, 2020/21 and 2021/22, the only exception being the financial year 2019/20.

The COSTECH Supervision Visit Report, 2020 further report stated that during the 2019/20 financial year, the COSTECH visited 35 out of 36 research projects, 12 Innovation Hub-supported projects, 67 Innovation Projects (20 innovation projects under Sida and HDIF and 47 MAKISATU). According to an interview with officials from COSTECH, the reason for not visiting the

projects was a reallocation of the supervision budget to other activities and insufficient manpower. Since COSTECH did not visit the projects for verification, it was unable to evaluate the progress of the implemented projects, assess difficulties encountered, and devise actions to be taken to facilitate the execution of those targeted deliverables of the projects. Additionally, comparing submitted progress reports with actual grantee progress could also provide a solid foundation for future disbursements.

On the other hand, the officials from COSTECH indicated that the funds that were not utilised were waiting to be paid in accordance with the agreements entered between the COSTECH and either researchers or innovators. They indicated that the funds were being paid in instalments based on the fulfilment of the conditions of agreements and the progress of the projects they were being paid for. However, as stated above, COSTECH not visiting the projects for monitoring and supervision has been one of the factors led to not having the projects' status to fulfil the conditions for payments. This may bring concern about the capacity of COSTECH to the administration of research funds through NFAST in the country including funds that are channelled to the sector ministries.

(iv) Lack of Clarity on the Responsible Authority or Institution to Issue Research Permits

According to Para 1.3 of the National Research Registration and Clearance Guidelines, 2018, the COSTECH through the National Research Registration Committee (NRRC) have the authority to grant research permits. However, interview with Officials from COSTECH, R&Ds and HLIs indicated that there were other R&Ds and HLIs which were issuing research permits. They further indicated that the institutions that were issuing the permits had their establishment legislations that gave them the mandate to issue research permits. Furthermore, it was shown that the University of Dar es Salaam (UDSM) was issuing research permits based on the Government directive through a letter[20] to delegate to UDSM the mandate to issue research clearance on behalf of the COSTECH.

[20]Government directive through letter with Reference No. MPEC/R/10/1 dated 4 July 1980 titled Research Clearance on delegating issuance of Research Clearance. The aforementioned letter was sent to all Principal Secretaries, Regional Development Directors on the Tanzanian Mainland, the Vice-

However, it was unclear whether this clearance mandate gave the University of Dar es Salaam the authority to also grant research permits. Also, according to interviews with officials from COSTECH and HLIs, other universities in the country had been using the same directive to manage research clearance and research permit processes, which are entirely COSTECH's responsibility.

A review of the Report of the Stakeholders Meeting on Research Registration and Permits dated 10th August, 2020, noted that there were different perspectives on the legitimacy granted to research and higher education institutions in issuing research permits. It was shown that there was lack of clarity on whether those institutions were issuing research clearances or research permits. On the other hand, the officials from COSTECH, R&D and HLIs indicated that this has been the practice since the directive was issued.

The lack of clarity on the responsible institution in issuance of research permits was attributed to lack of awareness of these institutions. On the other hand, the officials indicated that to some extent, some of the institutions were seeing themselves being legally mandated to issue the permits from their establishment.

To address this, the Ministry of Education, Science, and Technology convened a meeting of research stakeholders to discuss and resolve conflicts in the coordination of research registration, clearance, and permit issuance. The meeting took place on 10th August 2020, and the stakeholders in attendance suggested that there was a need to resolve legal conflicts regarding institutional mandates. According to the Meeting Report, it was stressed during the meeting that HLIs and R&Ds should prioritise conducting research over coordination. Due to a lack of clarity in this regard, the COSTECH might not be able to consistently track completed and ongoing research activities that would require research permits in Research and Higher Learning Institutions.

Chancellor of the University of Dar es Salaam, and COSTECH, which was then known as Directors of Research Institutes, by the then Ministry of Planning and Economy, which was under the Vice President Office.

(v) Acquiring, Storing and Dissemination of Research and Innovation Information

Section 2(c) gives the COSTECH the legal mandate to acquire, store and disseminate scientific and technology information. To fulfil its mandated task of gathering, storing, and disseminating data about research and innovation, COSTECH established an information repository platform. As previously presented in section 3.5.2 of this report, the established repository did not provide full access to the research and innovation data from the relevant R&D and Higher Learning Institutions.

Despite COSTECH having established a Central Repository in 2018, which aimed at fetching (acquiring) the information on the respective research; having them stored in that Central Repository; and disseminating that information through that repository. The repository had to serve as an electronic library platform for the dissemination of those research information and results to visitors. However, the audit noted that since the financial year 2018/19 to 2020/21 the Commission was not receiving (fetching/acquiring) information from all R&D and Higher Learning Institutions for storing and disseminating. The audit revealed that the information on research could not be retrieved or accessed by system users at COSTECH and other users who visited the repository.

According to COSTECH officials, the deficiency was caused by system configuration incompatibility after either the central repository systems or the integrated systems were updated. Furthermore, based on interviews with COSTECH officials, it was further revealed that the initially established research repository provided a platform that could be accessed by the limited number of R&D and HLIs affiliated with the COSTECH. Based on reviewed correspondence files at COSTECH, the audit noted that there was a concern from stakeholders in the research sector about this issue, hence they are calling for improvement of the repository system. The improvement is expected to strengthen the research coordinating mandate of COSTECH and enable it to exercise authority over all research data in the country.

The failure to monitor research conducted in the country undermines the objectives of granting research permits, which are emphasized in Para 1.4 (i-vi) of the Research Registration Guideline to ensure that research conducted in the country meets the required standards, follows the rules and regulations, and is done in accordance with the terms and conditions granted in the research permit.

Also, to secure the results of Tanzanian research and promote their use in policy and practice; safeguard the dignity, rights, safety, and well-being of all study subjects and flora/fauna; and reduce systemic risks imposed by the research undertaking. Furthermore, the lack of adequate records of research done for reference on granting permits to new applicants may result in duplication of the same subject matter.

In addition, a review of the letter[21] with Reference No. NSC/2000/Vol.V/04a, dated 28th September, 2018 showed the concern raised on the security risk in the country imposed by research done, that were associated with the failure of the COSTECH to acquire, control, monitor and regulate the ongoing research studies in the country. Since the system (central repository) could not acquire and store the information and results of the research done in the country, the aim of disseminating the same in the repository as an electronic library to the visitors was not realised.

(vi) The Commission did not adequately Register and Monitor the ongoing Innovation Activities in R&Ds and HLIs

According to Section 15(3)(g) of the COSTECH Act, 1986, the COSTECH was required to act as a catalyst for the development of indigenous technology. It was noted that COSTECH only registered innovations and had the innovation records presented during the National Innovation Competition (MAKISATU) only. Interviews with the officials from COSTECH, R&Ds and HLIs revealed that the COSTECH did not register and monitor the ongoing innovation activities in R&Ds and HLIs. This hindered COSTECH to keep track of the status of ongoing innovations at R&D and HLIs.

[21] Subject of a letter from the National Security Council to COSTECH; "Appointment to meet with the Main Executives of COSTECH in the Country" translated from Swahili.

The audit noted that in the year 2020, COSTECH established the National Research & Innovation Monitoring Framework to enhance effective coordination, promotion and dissemination of innovation in the United Republic of Tanzania as part of ensuring relevance and accountability to national development efforts as stated in Para 4 of the framework. Further, a review of Para 7 and 8 of the National Research & Innovation Monitoring Framework, 2020 showed that R&D and HLIs and industries were required to report the innovation activities' progress once per year, during the first quarter of a new Government financial year.

R&D and HLIs institutions through their monitoring system/unit had to deliver complete, accurate and timely data as per established indicators continuously to enable tracking of developments in research and innovation in their respective institutions. COSTECH through the National Research & Innovation Monitoring Framework required R&D and HLIs and the industry to fill out a national monitoring tool on annual basis and submit it to COSTECH. However, as stated above, the audit noted that there were no records of registration and monitoring of the ongoing innovations at R&D and HLIs rather than those registered at MAKISATU.

As a result, COSTECH was found to be uninformed about ongoing innovation initiatives at R&D and HLIs because it had not visited them, which led them, not be in a good position to contribute to the development of those technologies emerging from innovators. Furthermore, COSTECH were also found to lack enough information to use for data aggregation, processing, analysing and producing a report that could be used to advise the Government accordingly as required in Para 7 of the National Research & Innovation Monitoring Framework, 2020.

According to officials at the R&D and HLIs visited, the commission has been requesting such data not on regular basis but on an as-needed basis. Further, the officials from COSTECH showed that information from R&Ds and HLIs was shared with COSTECH whenever requested in the act of goodwill which implies that COSTECH was not guaranteed of having the required information. **Table 3.6** in **Section 3.3.3** of this report contains examples of discrepancies in the numbers of the requested innovation activities between the records at the Commission and those at the visited R&D and HLIs.

Another reason for COSTECH not to have the required information on the ongoing innovations from R&Ds and HLIs was that it lacked the muscles to hold them accountable as they were established under their legislations with nonbinding affiliations with COSTECH as stated in Section 4.1 of the Draft National Science, Technology and Innovation Policy, 2018.

(vii) Inadequate Monitoring of Innovations

A review of the Innovation Register showed there were approximately 59 start-ups and/or innovations initiated by COSTECH but implemented at R&D and HLIs. For such engagement, COSTECH was obligated to closely monitor and follow up on the status of their development. However, the audit did not receive the report for their monitoring status, making it difficult to determine their status.

Based on the reviewed innovation register for the innovations managed by the COSTECH, the audit team found information of only 32 innovations out of 59. In that register, it was shown that 17 innovations equivalent to 28.8% were still in the technical development stage, while 15 equivalent to 25.4% were in the prototyping stage. The information of the remaining 27 equivalents to 45.8% of the innovations remained unknown. This was attributed to lack of an appropriate system at COSTECH to monitor the status of the innovations that they initiated.

COSTECH officials stated that the commission was not completely denied information on the status of those Startups and/or Innovations undertaken in the host institutions, which are R&Ds and HLIs. It was the weakness of the COSTECH to plan and develop a system to collect this information. In the current situation, the information was shared on a goodwill basis. This led to not always getting the required information since they were not in a position to hold them accountable for not providing the information. The probable consequence of not monitoring the status of start-ups development, COSTECH was unable to determine whether the start-ups and/or innovations initiated by COSTECH were on the right track to achieve the intended goals. Furthermore, COSTECH was the inability to advise the government based on the facts derived from those Start-ups and/or Innovations.

3.5.3 Inadequate Coordination of Innovation Results to Ensure Usability

(i) To a large extent, COSTECH managed to implement the planned Seminars, Workshops, and conferences

The Directorate of Knowledge Management (DKM) of the COSTECH is in charge of planning seminars, conferences, and workshops as part of advocating the use of research results and innovations to policy and decision-makers. On the other hand, this includes having the responsibility for gathering data on ongoing research projects at the national level and listing innovations in business, science, and technology. From the reviewed Annual Reports, it was noted that COSTECH did manage to implement the planned seminars, conferences, and workshops during the audited years as indicated in **Table 3.14**.

The main reason for small gaps in implementations was linked to the lack of consistent funding from the government to implement the planned activities. The Commission has been receiving less than half of its budget as shown in **Table 2.2** in this report therefore, in some years priority was not given to issues related to conducting seminars, conferences, and workshops.

Table 3.14: Status of Planned Number of Different Fora

Financial Year	Fora	
	Planned	Actual
2018/19	14	13
2019/20	17	16
2020/21	19	25

Source: *COSTECH Annual Reports (2018/19-2020/21)*

Table 3.14 indicates that the Commission to a large extent has managed to implement its planned Different Fora (Seminars, Conferences, and Workshops). For example, in the financial year 2020/21, the Commission exceeded its target for the number of Fora to be conducted by 6 Fora. However, the audit team was not given sufficient information to explain this over-achievement. On other hand, the audit team was not availed of the reports for the conducted Seminars, Conferences and Workshops. This could imply that there may be a lack of transparency and accountability in how these events were conducted. The absence of reports could make it

difficult to assess the effectiveness and impact of the events and could lead to questions about the proper use of resources. It may also raise concerns about the integrity and reliability of the information that is being reported.

(ii) Less than One-third of Planned Policy Briefs were Produced Annually

Para 4.1.1 of COSTECH Rolling Strategic Plan: 2016/17 – 2020/2021 clarified Strategic Objective 1 on COSTECH on Evidence-based decision-making culture strengthening. In this strategic objective, COSTECH set a target of having 15 Policy briefs and Project briefs being produced per annum as of June, 2017. However, the Monitoring and evaluation report showed that the production of policy brief per year was 26%, 30%, 26%, and 26% in all four years as shown in **Table 3.15**.

Table 3.15: Policy Brief Statistics

Year	Year			
	2018	2019	2020	2021
Number of Target Policy Brief	15	15	15	15
Number of Actual Policy Brief	4	5	4	4
Percentage Policy Brief Produced	**26**	**30**	**26**	**26**

Source: *COSTECH Annual Performance Reports (2017/18-2020/21)*

Table 3.15 shows the performance in producing Policy Briefs. According to the findings, the Commission's performance was low, reaching only 30% the highest in 2019. **Table 3.15** shows that less than one-third of planned Policy Briefs were produced annually. This was due to a lack of priority in disseminating information through the use of a Policy Brief. Both inadequate of planning and the allocation of funds to these activities revealed a lack of priorities as evidenced by the low performance in the production of the policy brief.

The main implication is that the Commission did not adequately inform the scientific community and the general public about new scientific, technological, innovative developments and their outcome in the society. Government policymakers and other stakeholders involved in policy formulation or influence in various sectors were unable to obtain

summarized research results that would assist them in their decision-making process. The audit team was not able to assess the most impacted sector because of inadequate of policy briefs, because each prepared brief did not focus on a single sector.

3.6 Monitoring the Implementation of Research and Innovation Activities

Section 5(2b) of the COSTECH Act, 1986 requires the COSTECH to monitor activities relating to scientific research and technology development of all persons concerned with such activities. It entails making sure that all research carried out in the nation adheres to the laws and regulations, meets the necessary standards, and is done in accordance with the terms and conditions of the clearances and/or permits granted for that research.

Despite having a planned monitoring and evaluation system to track the implementation progress of the Strategic Plan (2016-2021), the audit team observed that for the period from in the financial year 2018/19 to 2020/21, COSTECH had no specific unit at the institutional level that would be accountable for monitoring of the research and innovation activities since there was no evidence to indicate that monitoring was done during this period. Instead, it was done by a team of people from various units that were formed whenever research activity monitoring was required. This section or unit would provide details regarding monitoring the overall management of research and innovation activities.

3.6.1 Slow Pace of Implementation of National Monitoring Framework for Research and Innovation

The National Monitoring Framework for Research and Innovation (2018) contains indicators which are required to be used by research institutions to monitor the outcomes, outputs, and impacts of investments in research and innovation. This framework is also a tool used to coordinate and report on issues related to research and innovations. According to the interviews with officials from COSTECH, it was indicated that, since the framework was developed and published, COSTECH has been able to introduce and sensitize the framework to 73 R&D and Higher Learning Institutions.

Interviews with officials in the visited institutions indicated that they are aware of the existence of the National Monitoring Framework for Research and Innovation. However, none of them provided evidence to show that they make use of the framework as a guide when reporting the results and impact of their research and innovations. It was further revealed that this was because initially, these institutions had their frameworks before the introduction of the national framework, and the two were not harmonized to complement each other. **Table 3.16** provides the status of the availability of institutional monitoring framework in the visited institutions.

Table 3.16: Availability of Institutional Monitoring Frameworks

Name of the Institution	Availability of Institutional Framework	Status on Migration to the New Framework (Yes/No)	Comment(s)
DIT	No	No	Not aware of the launched National Framework for Research and Innovation.
NM-AIST	Yes	No	Migration necessitates alignment with the Strategic Plan which is still under implementation.
SIDO	No	No	Though in the process to adopt the National Framework.
TAEC	Yes	No	Still implementing the current Strategic Plan
TEMDO	No	Yes	Currently, make use of the National Framework in reporting research/innovation outputs
TAFIRI	They make use of the Strategic Plan	No, though, currently in the process	The framework is an integral part of the Strategic Plan, initially, the indicators as per National Framework were missing, though, currently in the process to ensure inclusion in the new Strategic Plan (2022/23-2026/27)
TAFORI	No	No	-
TARI	Yes	No	The initially prepared monitoring framework was set to align with the five-year Strategic Plan before launching the new National Framework. Therefore,

Name of the Institution	Availability of Institutional Framework	Status on Migration to the New Framework (Yes/No)	Comment(s)
			harmonization will be done at the time of developing the 2nd Strategic Plan.
SUA	Yes	Yes	-
NIMR	Yes	No	By the time the National Framework was launched, they were in the midst of implementation of the five-year Strategic Plan and therefore it was not possible to harmonize.
UDSM	Yes	No, they are currently planning to migrate to the New National Framework	Not involved in the sensitization seminar to ensure institutionalizing of the National Framework.
TAWIRI	Yes	Yes	-

***Source**: Interviews with Officials in the Visited Institutions (2022)*

According to **Table 3.16**, the most frequently cited reason for not being able to migrate to the National Research and Innovation Monitoring Framework was that these institutions were in the final process of implementing their respective five-year strategic plans, and thus, alignment of the framework would need to be adopted concurrently with the newly developed strategic plans.

According to the review of the Annual Performance Report (COSTECH, 2020/21), the audit observed that even the COSTECH itself did not adequately use the monitoring framework to monitor all research work in the country. The COSTECH did, however, use the framework to monitor MAKISATU and NFAST-funded innovations because they were part of the data available or accessible by the COSTECH.

Furthermore, it was noted that, despite the currently developed system to ensure the framework is electronically coordinated, there were no documented long-term efforts to ensure that available monitoring frameworks in the R&Ds and HLIs are harmonised and make use of the indicators in the national monitoring framework so that COSTECH can be

informed of the undertaken research and innovation outputs at institutional levels. According to the COSTECH, lack of an institutionalized monitoring framework for R&D outputs was primarily due to lack of a standardized reporting structure that would ensure information comparability across sectors.

Therefore, as a result of the lack of an institutionalized monitoring framework for R&D outputs, COSTECH will not be able to be informed of the ongoing activities on research and innovations undertaken at institutional levels and that would help conduct the analysis and updating of the status of R&D activities at institutional levels as well as their documentation.

Consequently, the absence of a uniform institutionalized monitoring framework and reporting structure across institutions might have led to inconsistent research and innovation outputs, making it challenging to assess the impact and advancement made from investments in research and innovation. Moreover, it could also limit the ability to track progress and identify areas for improvement, leading to missed opportunities for growth and development in the research and innovation sector.

3.6.2 Key Performance Indicators Did Not Facilitate Monitoring of Results from the Conducted Researches

Objective 4 of the Research Monitoring Framework (COSTECH, 2020) requires COSTECH to identify and define Key Performance Indicators that can be used to monitor and communicate research works. Also, the framework requires COSTECH to systematically track the undertaken research processes to monitor their outputs, outcomes, and impacts.

Despite the strategy to strengthen evidence-based decision-making through the conducted research (COSTECH Strategic Plan, 2016/17-2020/21), a performance review of the Strategic Plan[22] indicated there was minimal use of the research outputs derived from the R&Ds and HLIs. It was further noted that the developed indicators were not set to inform monitoring of the extent to which stakeholders would make use of the results from the conducted research.

[22] COSTECH Strategic Plan (2016/17-2020/21)

Table 3.17 shows status of the Key Performance Indicators (KPIs) to facilitate monitoring of research results with regard to the National Research Agenda as well as the assessment of the auditors on the relevance of the KPIs to the objective and expected result. ***Appendix 8*** of this report contains an in-depth explanation of the assessment performed to determine the KPIs' relevance or irrelevance to the objective and expected outcome.

Table 3.17: Assessment of Key Performance Indicators

Planned Target/Output	Expected Outcomes	Outcome Indicators	Relevance of Key Performance Indicators (KPIs)
National postdoctoral research framework established	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of postdoctoral candidates supported	Not relevant
R&D outputs of high-quality products, processes, and services (Publications, Patents, Licenses, Policy briefs) from postdoctoral research increased continuously	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of postdoctoral projects leading to spin-off companies	Not relevant
Five (5) Commissioned research projects geared towards industrialization supported continuously	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of companies established from R&D results	Not relevant
Capacity building of all 76 R&D Institutions Review Boards (IRBs) conducted	Improved research quality and ethics adherence	Number of quality research in line with ethics Number of functioning IRBs	Relevant
Twenty (20) multi-disciplinary research teams established and supported	Improved quality and relevance of research for socio-economic development	Number of research carried out by multi-disciplinary research teams	Not relevant
Twenty (20) R&D institutions equipped with relevant laboratory facilities	Improved quality and relevance of research for socio-economic development	Number of research results translated into products, processes and services	Not relevant

Source: *Auditors' Analysis of the Set Key Performance Indicators on the Strategic Plan, 2018 to Facilitate Monitoring of Research Results with Regard to the National Research Agenda*

Table 3.17 shows that only one out of six Key Performance Indicators (KPIs) related to the planned target/output with the expected outcomes is relevant. The established Key Performance Indicator reflects the planned target and anticipated outcome in terms of the number of quality research that adhere to ethical standards. The KPI also mentions the number of operational Institutional Review Boards, which was the goal of strengthening them. However, five KPIs were considered not relevant as they were not directly linked or were not aligned with the planned target and expected outcome. Additionally, the established KPIs did not include information on the quality and quantity of research projects, which is necessary to reflect the expected outcome of the planned target.

The observed weaknesses were due to COSTECH prioritizing an increase in the number of research projects and researchers involved, without adequately evaluating the impact on the improved culture of using research results in planning and decision-making in various sectors.

Therefore, COSTECH is unlikely to attain the set objective of promoting evidence-based decision-making and the use of research results by MDAs, as a result of the aforementioned weaknesses. A review of performance and monitoring reports from the 2017/18 to 2021/22 financial years showed that this was due to the failure of COSTECH to evaluate target achievement against predetermined indicators, which was linked to assessing the culture of using research results in decision-making. The information gathered by COSTECH was insufficient or unrelated to evaluate the goal achievement of research-based decisions made.

3.6.3 Usability of Monitoring Results for Informed Decision-Making

COSTECH is required to monitor the implementation of research and innovation activities, this involves developing monitoring plans and adherence to the available guidelines, the existence of Key Performance Indicators and asses the usage of monitoring results for informed decision-making.

The audit team noted that, COSTECH prepared Monitoring Reports which showed the performance in implementing activities. Monitoring was done by receiving reports from research institutions and visits made for inspections. Ideally being the custodian for the research in the Country,

COSTECH is supposed to evaluate the trends of pertinent research activities and use the monitoring results for decision-making to improve their operations.

A review of the Monitoring Reports has indicated that there was no documented evidence for the actions taken based on issues raised during the monitoring. A review of the Monitoring Reports showed that recommendations were not issued so as to be implemented by the R&Ds and HLIs.

The audit team also did not find any report showing how COSTECH tracks the implementation of different agreement and instruction by R&Ds and HLIs. The nature and kind of issued recommendation issued to R&D, and HILs can be grouped into eight aspects as follows:

1. Enhancing the capacity of researchers through training and professional development programs;
2. Promoting the use of research results in decision-making processes;
3. Increasing investment in research infrastructure and providing adequate funding for research activities;
4. Encouraging the publication and dissemination of research findings to increase their visibility and impact;
5. Implementing measures to ensure the ethical conduct of research activities;
6. Encouraging interdisciplinary and collaborative research to enhance the quality of research outcomes;
7. Establishing partnerships with industry, government, and other organizations to increase the relevance and impact of research activities; and
8. Developing and implementing a comprehensive monitoring and evaluation framework to assess the progress and impact of research activities.

The audit team found that COSTECH was not maintaining a record of the number of recommendations made to HLIs and R&D. Most of the recommendations were either verbally issued based on arbitrary agreement and discussion made during the visit or the issued recommendations were recorded in temporary documents that were not properly documented and

translated into a formal report that could be reviewed by a third party. This lack of proper documentation made it harder to assess the implementation of the recommendations.

The issues COSTECH was expected to monitor for each HLI and R&D include the number of completed research projects, funding for research, collaboration among institutions and researchers, if there is an increase in published research results, usage of research results in decision-making, if more researchers are participating in research activities, and if there is an improvement in research quality and ethics.

The main reasons for this shortfall were that COSTECH did not institute a robust monitoring system. A system that will allow the COSTECH to implement a systematic approach for documenting and tracking the number of recommendations made to each HLI and R&D. This will allow the commission to have clear processes and procedures for monitoring key indicators such as the completion of research projects, funding for research, a collaboration between institutions and researchers, publication of research findings, utilization of research outcomes in decision-making, the involvement of researchers in research activities, and the quality and ethics of research.

Also, a robust system will allow the COSTECH to ensure that the data collected through the monitoring process is analysed and used to assess the implementation of recommendations and make informed decisions and communicate to stakeholders about the progress and impact of the recommendations made to the HLIs and R&D.

The consequences of the lack of follow-up on the issued recommendations include that there would be a lack of accountability and transparency in the implementation of recommendations and also the COSTECH will not be able to conduct assessments of the impact and effectiveness of the issued recommendations. This will limit the commission to identify areas for improvement and make informed decisions. Also, has the Potential to waste resources, time, and effort and there is a risk of affecting the reputation of COSTECH because it will be seen as it has no power.

3.6.4 Effectiveness in Monitoring Research and Innovation Activities by the Ministry of Education, Science and Technology

According to the Strategic Plan of the Ministry of Education, Science, and Technology (2016/17-2020/21), the Ministry planned to improve its capacity for management and coordination of research institutions in critical areas such as industries, agriculture, medicine, the environment, and natural resource use.

The review of this Strategic Plan further showed that there was a total of 19 Indicators developed to track the implementation of the strategic goal. Some of these indicators included the number of research institutions facilitated, the number of quality research outputs produced, the number of people with skills and knowledge of STI, the number of innovations commercialised, and the number of intellectual Property registered and commercialized.

However, a review of the COSTECH Annual Report, (2020) revealed that the reported accomplishments were not tied to the indicators suggested in the Strategic Plan. According to the interviews with officials at COSTECH and MOEST, part of the reason for this gap was that the ministry needed input from R&D institutions in the relevant sectors to implement these targets, but neither the R&D institutions nor the ministry were able to effectively coordinate this activity to ensure the sharing of this information was effective.

Table 3.18 shows the status of the reported accomplishments in relation to the available indicators under the goal of enhanced coordination of research development and innovation for social economic growth and industrialization.

Table 3.18: Status of the Reported Accomplishments

Available Indicator(s)	Reported Accomplishment(s)	Comment(s)
Number of Quality Research Output Produced	A total of 88 projects were supported	There was no mention of the outputs from the supported projects.
Number of people with skills and knowledge of STI	Promotion of innovation hubs by facilitating the inauguration of innovation spaces and launching of innovation activities. The support also includes the provision of focused mentorship and coaching to newly enrolled innovators in skills that would assist in managing innovations, linking up with potential investors as well as entrepreneur training.	There was no recorded status of the number of people with skills and knowledge of STI and there is no recorded status of the hubs facilitated.
Number of Innovations Commercialized	A total of 56 innovators signed contracts and were provided with financial and technical support.	Despite signed contracts, there was no provided status of the number of commercialized innovations.
Number of Intellectual Property Registered and Commercialized	73 innovation grantees emanating from (MAKISATU) eighteen (18) had developed a product while 46 innovators were at prototype development and 9 were in the ideation	The 73 innovation grantees none of the products were neither commercialized nor patented.

***Source**: Auditors' Analysis of the Reported Accomplishments against the Set Indicators (COSTECH, 2022)*

Table 3.18 shows the status of the reported achievements in relation to the available indicators.

The audit team noted that monitoring of the research and innovation activities undertaken in R&Ds and HLIs was not done to all institutions rather are done to the institutions under jurisdiction of the MoEST namely Nelson Mandela African Institution of Science and Technology (NM-AIST), Tanzania Atomic Energy Commission (TAEC), Dar es Salaam Institute of Technology (DIT), Mbeya University of Science and Technology (MUST), and the Commission for Science and Technology (COSTECH). However, despite the

fact that the Ministry is informed of the overall progress in the undertaken research and innovation activities through the mapping exercise on essential indicators of research and innovation, it was noted that this exercise aimed to determine research capacity and output of R&Ds and HLIs. The audit team is of the view that the conducted research mapping was done following completion of the undertaken research and innovation activities in these institutions and therefore, the Ministry was not informed of the actual progress made on such research and innovation activities from those institutions.

On the other hand, it was further revealed that the Ministry failure to monitor research and innovation activities undertaken in other institution because they are operating and managed by their respective parent Ministries, is an indication that there is no adequate ministerial coordination for monitoring of activities implemented by different ministries.

However, a review of the COSTECH Annual Report, 2020/21 revealed that the Ministry issued a directive to COSTECH to monitor the research and innovation projects, particularly those which are linked with winners from MAKISATU, this included the monitoring of 59 innovators that originated from MAKISATU[23]. Though, the audit inquired on the performance of each year in the four years covered by this audit to assess the number of projects registered against the number of projects monitored by the MoEST through COSTECH; it was shown that in the financial year 2019/20, 18 out of 171 COSTECH-funded projects (equivalent to 10.5%) were monitored by MoEST[24]. What was the problem that caused this underperformance?

On the other hand, it was noted that, despite the plan to monitor activities undertaken in R&Ds and HLIs, the audit team noted that, MoEST budgeted for and allocated an estimated TZS 2.7 billion to cater for expenses in the monitoring of the research activities in R&Ds and HLIs from the financial year 2018/19 to 2020/21[25].

[23] Annual Performance Report (MoEST, 2020/21)
[24] Annual Performance Report (COSTECH, 2018/19-2020/21)
[25] The allocated funds were TZS 929,969,402,000 in FY 2018/19, TZS 862,719,800,260 in FY 2019/20, and TZS 857,514,224,000 in FY 2020/21

Consequently, failure to constantly monitor the undertaken activities on research and innovation in R&D and HLIs suggests that the MoEST cannot be informed of the real-time progress made so far based on the set target to popularize STI and promote creativity and innovation in strategic STI areas.

CHAPTER FOUR

AUDIT CONCLUSION

4.1 Introduction

This chapter presents the conclusion based on the overall objective and specific objectives of the audit, as detailed hereunder.

4.2 Overall Conclusion

The overall conclusion of this audit is that research and innovation activities have been inadequately managed. Despite ongoing efforts to ensure effective coordination of the research and innovation activities, the Ministry of Education, Science, and Technology (MoEST) and the Tanzania Commission for Science and Technology (COSTECH) have not adequately ensured effective coordination in the implementation of activities aimed at promoting Research, Technology and Innovation in the country. The implementation of established research and innovation strategies has been limited by insufficient coordination of activities by the COSTECH. This is mainly due to a lack of adequate enforcement of coordination responsibilities by COSTECH for research and innovation initiatives carried out by different research organizations.

The administration of registered research and innovation activities was ineffective. Despite the existence of a plan for monitoring and recording research activities, there was a significant gap between the plan and its implementation. This has been attributed to a variety of factors, including insufficient government funding for research to ensure that all registered research conducted as explained further in the findings of this report. The reported deficiencies also have been a result of COSTECH lacking necessary structures and expertise required to efficiently coordinate R&D activities, but also shear negligence, like the cluster project. The lack of clearly defined roles and responsibilities among stakeholders involved in these activities exacerbates the problem.

On other hand, COSTECH, as well as the parent Ministry of Education and Science and Technology, did not adequately monitor the research and innovation activities in the country. Despite research approvals made

through the National Research Clearance Committee at the Commission, the observed weakness was partly contributed by lack of a mechanism through which COSTECH could be informed of the actual research activities undertaken in R&Ds and HLIs.

4.3 Specific Conclusions

4.3.1 Inadequate Implementation of the Developed Strategies and Plans to Identify and Register all Research and Innovation Activities

The implementation of developed strategies to ensure effective coordination of research and innovation activities has not been adequately realized. This was because the implementation of these strategies in part needs to be done in collaboration with other COSTECH affiliated institutions which due to challenges of the existing structural set-up these institutions are prompted to operate and align with the requirements as per mandates of their establishments, especially in aligning with the requirement of their line ministries.

On the other hand, COSTECH has not fully ensured its mandate to register imported technology and domestic technological resources. This was contributed by the lack of clearly defined regulations to perform its roles in assessment, registration, and oversite of technology transfer agreements. Similarly, COSTECH has not proved well-performing in its function as regulator and coordinator of the undertaken research and innovation activities in the country, this is because of insufficient of personnel with the competence to ensure wide scope in the implementation of its mandate.

Because of inadequate commercialization strategies, Potential innovations made are likely not to be visible or commercialized because there is no optimized system to identify and track the development made so far of the innovations initiated at individual or organizational levels.

4.3.2 Administration of Registered Research and Innovation Activities

Innovation initiatives funded through NFAST were less likely to be commercialized because of the inadequate infrastructure. However, innovations that were developed was not based on a clearly established

mechanism to ensure their sustainability due to insufficient coordination of the initiated strategy of innovative cluster subprograms. For instance, the implementation of innovative cluster programs without signed Memorandum of Understandings (MoUs) and the implementation operationalization of cluster development committees.

Similarly, given the structural institutional set-up, tracking the allocated research funds across R&D institutions has been a challenge. This is because research funds are channelled to the R&Ds through their respective parent sector ministries and therefore, COSTECH through NFAST is not in a position to fully control and manage government research funds as expected.

4.3.3 Coordination of Key Actors in the Implementation of Research and Innovation Activities

Regarding the overall implementation of research and innovation activities, MoEST and COSTECH have not adequately ensured coordination among stakeholders involved in the implementation of research and innovation activities. This is because MoEST as a line ministry, is not well placed to coordinate research organizations that are under other ministries. As a result, sector ministries have made minimal efforts to ensure that R&Ds harmonize and mainstream the prepared guiding documents prepared by COSTECH in their existing operating structures.

As a result, innovations recognized remained to be those in MAKISATU exhibitions, there is no mechanism to identify and track progress made on innovations originating from R&Ds. This was to a great extent contributed by the lack of a system in place to help COSTECH be informed of the undertaken innovations at institutional levels.

4.3.4 Monitoring the Implementation of Research and Innovation Activities

COSTECH has not well-ensured that it is informed of the progress of research and innovation activities undertaken in different R&D Institutions and higher learning institutions. On the other hand, despite the initiative to launch the National Research and Innovation Monitoring Framework, the adoption of

the framework to align with the existing institutional frameworks in R&D and Higher Learning institutions is still a challenge.

Likewise, monitoring of the results emanating from the conducted research was not facilitated enough by COSTECH so that it is informed of the research outputs. Moreover, developed indicators to monitor results from the conducted research are not appropriate in gauging the extent to which research result has been used.

Despite the role to oversee the coordination of the Science, Technology and Innovation (STI) issues in the country, the Ministry of Education, Science and Technology (MoEST) has not adequately ensured monitoring of the STI activities undertaken in R&D and Higher Learning Institutions. This was contributed by the fact that the existing R&D and higher learning institutional structural set-up does not allow for the MoEST to monitor or enquire about STI issues.

CHAPTER FIVE

AUDIT RECOMMENDATIONS

5.1 Introduction

The audit findings and conclusions highlighted several weaknesses in the overall management of research and innovation activities as performed by both the Ministry of Education, Science and Technology (MoEST) and the Commission for Science and Technology (COSTECH). The areas that need to be further improved include Coordination, Administration, Monitoring, human resources for the management of research and innovation – both at COSTECH and R&D institutions.

The National Audit Office believes that the recommendations that have been given in this report need to be fully implemented to improve the management of research and innovation activities in the country. The proposed audit recommendations guarantee economy, efficiency, and effectiveness in the use of the available public resources.

5.2 Audit Recommendations

5.2.1 To Enhance Effectiveness of the Prepared Strategies and Plans for Identification and Registration of Research and Innovation Activities

The Commission for Science and Technology should:

1. Create a simplified digital mechanism to facilitate the coordination and promotion of research and innovation among research institutions in Tanzania; and

2. Establish a mechanism that will enable electronic data capture and exchange that will help to inform the status of the research and innovation activities undertaken in R&D and HLIs.

5.2.2 To Improve Administration and funding of Research and Innovation Activities

The Commission for Science and Technology should:

1. Establish a mechanism that will help to inform the research funding system for research funds directly allocated to R&Ds and HLIs through respective sector ministries;

2. Ensure sustainable and well-allocated funds to cater for research and innovation activities;

3. Enhance the system for information sharing among stakeholders and monitoring or tracking the progress of research projects funded through research grants; and

4. Establish a coordination mechanism that will help to inform the existing funding sources for the undertaken research and innovation activities in R&Ds and HLIs to avoid parallel funding.

5.2.3 To Ensure Effective Coordination of the Key Actors in the Implementation of Research and Innovation Activities

The Commission for Science and Technology is urged to:

1. Establish a system that will help to inform and facilitate the collection of information regarding the status of the undertaken research and innovation initiatives in R&Ds and HLIs; and

2. Strategize on tracking the development of all identified and funded innovations through NFAST.

5.2.4 To Improve Monitoring of the Research and Innovation Activities

The Commission for Science and Technology is urged to:

1. Develop a mechanism that will help to effectively inform and facilitate the overall monitoring of the implementation for the planned research and innovation activities.

The Ministry of Education, Science and Technology (MoEST) is urged to:

1. Facilitate the procedures to ensure harmonization of the functions and roles of R&D sector ministries that appeared to be incoherent or overlapping; and

2. Develop a mechanism that will help to inform the progress and outcome of the undertaken research and innovation activities for R&Ds and HLIs residing in other sector ministries.

REFERENCES

1. Commission for Science and Technology: “Field Monitoring Report, 2021”
2. Commission for Science and Technology: “National Research and Development Policy (2010)”
3. Commission for Science and Technology: “National Research and innovation framework”
4. Commission for Science and Technology: “National Research and Innovation Monitoring Framework, 2020”
5. Commission for Science and Technology: “National Research Registration and Clearance Guidelines, 2018)”
6. Commission for Science and Technology: “Report of the Stakeholders’ Meeting on Coordination of Research Registration and Permits, 2020”
7. Commission for Science and Technology: “Repository Project Report, 2021”
8. Commission for Science and Technology: “STI Indicator Report, 2020”
9. Commission for Science and Technology: “Strategic Plan (2016-2021)”
10. Commission for Science and Technology: “The Global Innovation Index (GII) Report, 2020”
11. Commission for Science and Technology: “The Grants Manual”
12. Commission for Science and Technology: COSTECH Research and Innovation Impact Bulletin, Vol 1 Issue 1, 2018;
13. Commission for Science and Technology: COSTECH Research and Innovation Impact Bulletin, Vol 2 Issue 1, 2020;
14. Commission for Science and Technology: COSTECH Research and Innovation Impact Bulletins, Vol 3, 2021.
15. Commission for Science and Technology: Fostering Innovation for Sustainable Socio-economic Development - Innovative Cluster Subprogram Field Monitoring Report, November 2021

16. Commission for Science and Technology: National Framework for Research Chairs
17. Commission for Science and Technology: National Research Integrity Framework
18. Commission for Science and Technology: National Research Registration and Clearance Guidelines, 2022
19. Commission for Science and Technology: Research Registration and Clearance Guidelines
20. COSTECH Annual Performance Report (2018/19-2020/21)
21. Fourth Amendment to the Specific Agreement on Research Collaboration between Sida and Tanzania Commission for Science and Technology (COSTECH) "1 July 2015 - 30 June 2020"
22. The United Republic of Tanzania: Government Directive - Letter - Reference No. MPEC/R/10/1 Dated 4th July 1980 Titled Research Clearance on delegating issuance of Research Clearance
23. The United Republic of Tanzania: Ministry of Education, Science and Technology - Annual Performance Report (2020/21)
24. The United Republic of Tanzania: National Information and Communications Technology Policy, 2016
25. The United Republic of Tanzania: National Research and Innovation Monitoring Framework (2020)
26. The United Republic of Tanzania: The National Science and Technology Policy, 1996

APPENDICES

Appendix 1(a): List of Recommendations and Responses from the Ministry of Education, Science and Technology

This part provides details on the general comment and the list of responses on the planned actions and implementation timelines based on the issued audit recommendations.

General Comment:

The Ministry agrees that recommendations given are needed for the improvement of the management of research and innovation activities in the country.

Specific Comments:

S/N	Recommendations to the Ministry of Education, Science and Technology	Comments from the Ministry of Education, Science and Technology	Planned Action(s)	Implementation Timeline(s)
1	Facilitate the procedures to ensure harmonization of the functions and roles of R&D sector ministries that appeared to be incoherent or overlapping.	Accepted	Review of COSTECH Act to strengthen harmonisation of functions and roles of the RD sector	FY 2024/25
2	Develop a mechanism that will help to inform the progress and outcome of the undertaken research and innovation activities	Accepted	Review of COSTECH Act to collect the progress and outcome of the undertaken research and innovation activities for R&Ds and HLIs residing in other sector ministries	FY 2024/25

S/N	Recommendations to the Ministry of Education, Science and Technology	Comments from the Ministry of Education, Science and Technology	Planned Action(s)	Implementation Timeline(s)
	for R&Ds and HLIs residing in other sector ministries.		Create a platform for R&D and HLIs institutions to share plans, progress and outputs of research and innovation activities	Ongoing
			Enhancing education programs to inform the public on the progress and outcome of the undertaken research and innovation activities	Ongoing

Appendix 1(b): List of Recommendations and Responses from the Commission for Science and Technology

This part provides details on the general comment and the list of responses on the planned actions and implementation timelines based on the issued audit recommendations.

General Comment:

The report acknowledged availability of strategies for research and innovation coordination in the Commission, however it identifies insufficient mechanism for enforcement in effective research and innovation coordination activities. Thus, the Commission here under has come out with action points to address the specific gaps cited in the report that will contribute to effective coordination as mentioned in the matrix.

Specific Comments:

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
1	Create a simplified digital mechanism to facilitate the coordination and promotion of research and innovation among research institutions in Tanzania.	Development of STI system	COSTECH has embarked in the development of STI System which will be implemented in the following phases: • Phase 1: User Needs Assessments • Phase 2: Stakeholders workshop to deliberate the user requirements • Phase 3: Development of System Requirement Specifications	• Phase 1 – 3 will be completed on June, 2023 • Phase 2. Will start on July, 2023 to June, 2024

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
			• Phase 4: Development of the system	
2	Establish a mechanism that will enable electronic data capture and exchange that will help to inform the status of the research and innovation activities undertaken in R&D and HLIs.	1.Data sharing framework 2. Preparation of database system that will enable Commission to collect, store and disseminate Data from R&D and HLs	Preparation of baseline data framework	By June, 2023 By June, 2024
3	Establish a mechanism that will help to inform the research funding system for research funds directly allocated to R&Ds and HLIs through respective sector ministries.	The development of STI system will enable enable researchers, policy makers, funders to get information on the fund allocation and other important information for R&Ds	STI survey will be performed as follows: • Collection of baseline data for development of the System • Development of the system	• Activity 1 will be completed on June, 2024 • Activity 2. Is expected to end in 2026
4	Ensure sustainable and well-allocated funding systems to cater for research and innovation activities.	The Resource Mobilization Strategy has been developed to help COSTECH to solicit funds from other sources and	Resource Mobilization Strategy implementation plan is in place There is Resource mobilization implementation budget allocation in the financial year 2023|2024	Resource mobilization Strategy is for three years (2023-2026)

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
		from Government subventions.		
5	Enhance the system for information sharing among stakeholders and monitoring or tracking the progress of research projects funded by research grants.	The national Research and Innovation Framework and Monitoring, evaluation and learning are in place. has been developed and it is operational. COSTECH has been receiving and reviewing progress reports from the funded projects COSTECH has also Research Management system where all information of the funded project can be tracked. Research Management System will be one of the components of the STI System	After the completion of STI system all these documents will be included in the system. Moreover, the STI system will provide the opportunity for tracking and monitoring of the progress of funded research.	• Phase 1 will be completed on June, 2023 • Phase 2. Is expected to end in 2026

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
6	Establish a coordination mechanism that will help to inform the existing funding systems for the undertaken research and innovation activities in R&D and HLIs to avoid parallel funding.	STI system and Research Management System. Research Management System display call for specific research proposal by Commission. STI System will enable Commission to control and coordinate all research conducted in R&D and HL institution, hence avoid parallel funding	STI survey will be performed in phases: Phase1. Collection of baseline data for development of the System Phase 2. Development of the system	• Phase 1 will be completed on June, 2023 • Phase 2. Is expected to end in 2026
7	Establish a system that will help to inform and facilitate the collection of information regarding the status of the undertaken research and innovation initiatives in R&Ds and HLIs.	Through HEET Project implementation, COSTECH will develop On-line system for sharing and monitoring of STI information regarding the status of undertaken research and innovation initiatives in R&Ds and HLIs	2022/2023 annual action plan implementation	By June, 2025
8.	Strategize on tracking stages of development for all identified	There is a continual budget allocation to	2022/2023 annual action plan implementation	By June, 2023

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
	and funded innovations through NFAST.	facilitate the supervision and monitoring of research and innovation projects funded through NFAST Signed MOUs between COSTECH and researchers and Innovations requires them to submit either quarterly of annual project performance reports in order to enable COSTECH to continuously track stages of development for all identified and funded innovations and researches through NFAST		
9.	Develop a mechanism that will help to inform and facilitate the overall monitoring of the implementation for the planned	COSTECH will continue to operationalize its Monitoring, Evaluation and Learning (MEL) Plan, set a budget and put in its	2022/2023 annual action plan implementation	By June, 2023

S/N	Recommendations to the Commission for Science and Technology	Comments from the Commission for Science and Technology	Planned Action(s)	Implementation Timeline(s)
	research and innovation activities.	annual plan. Conduct Quarterly visit to innovation and research projects.		

Appendix 2: Audit Questions and Sub-Audit Questions

This part provides details on the list of main audit questions and sub-audit questions used based on the specific audit objectives.

Audit Question 1	Has COSTECH developed strategies and plans to identify and register all research and innovation activities?
Sub-Audit Question 1.1	Are the developed plans address the mandated functions to identify and register all research and innovation activities?
Sub-Audit Question 1.2	Are there optimal allocations of the available resources to ensure the effective implementation of the research and innovation activities?
Sub-Audit Question 1.3	Does the Commission for Science and Technology adequately identify grant applications for incubation/innovation-hub support programs?
Audit Question 2	Has COSTECH adequately administered the implementation of the registered research and innovation activities?
Sub-Audit Question 2.1	Are there mechanisms used to ensure the effective implementation of the available plans for registered research and innovation activities?
Sub-Audit Question 2.2	Are there mechanisms used to ensure efficient utilization of the available resources in the administration of research and innovation activities?
Sub-Audit Question 2.3	Are there mechanisms to ensure the sustainability of all supported research and innovation activities?
Audit Question 3	Does the existing coordination arrangement between COSTECH and key actors in research and innovation support the effective implementation of research and innovation activities?
Sub-Audit Question 3.1	Are there defined roles and responsibilities between stakeholders to support effective coordination in research and innovation activities?
Sub-Audit Question 3.2	Are there mechanisms in place used to ensure proper coordination of all activities on research and innovation?
Sub-Audit Question 3.3	Are the existing research and innovation platforms effectively coordinated to ensure the usability of results from research and innovation activities?
Audit Question 4	Do the Ministry of Education and COSTECH adequately monitor the implementation of research and innovation activities?

Sub-Audit Question 4.1	Are all activities relating to scientific research and technology development monitored concerning the available guidelines?
Sub-Audit Question 4.2	Are the set Key Performance Indicators facilitating the monitoring of research results with regard to the national research agenda?
Sub-Audit Question 4.3	Are the results from the monitoring of the conducted research and innovation activities used for informed decision-making?
Sub-Audit Question 4.4	Does MoEST effectively monitor all research and innovation activities as performed by COSTECH?

Appendix 3: Details of Criteria used to select Research and Development, and Higher Learning Institutions

This part provides details on the criteria used to select Research and Development Institutions and Higher Learning Institutions for verification purposes.

(a) Research Activities					
Priority Research Area	**Prominent Institution(s)**	**Residing Region(s)**	**Identified Region/Institution**	**The basis for Identification:**	**Selected Region(s)**
Health	NIMRI	DSM	DSM/NIMRI	Health Research	**DSM** (Health, Fisheries, Academic, Industrial, and Organizational)
Agriculture	TARI	Dodoma	Dodoma/TARI	Agricultural Research	**Dodoma** (Agriculture)
Forestry	TAFORI	Morogoro	Morogoro/TAFORI	Forestry Research	**Morogoro** (Forestry)
Wildlife	TAWIRI	Arusha	Arusha/TAWIRI	Wildlife Research	**Arusha** (Wildlife, Energy, and Organizational)
Fisheries	TAFIRI	DSM	DSM/TAFIRI	Fisheries Research	
Energy	TAEC	Arusha	Arusha/TAEC	Energy Research	
Academic	UDSM	DSM	DSM/UDSM	Academic Research	
(b) Innovation Activities					
Academic/ Industrial	DIT	DSM	DSM/DIT	Academic/ Industrial Research	
Organization	SIDO	DSM	DSM/SIDO	Organizational Innovation	
	TEMDO	Arusha	Arusha/TEMDO	Organizational Innovation	

Appendix 4: List of Interviewed Officials

This part provides details on the list of interviewed Officials.

Name of the Institution	Interviewed Official(s)
Commission of Science and Technology (COSTECH)	Director General
	Director of Research
	Manager of Social Science
	Manager of Life Science
	Manager of physical science
	Director of Knowledge Management
	Director of Center for Development and Technology Transfer
	Manager Innovation, Technology, Foresight and Emerging Technology
	Manager-NFAST
	Manager-Human Resource
	Legal Officer
	Manager-Planning, monitoring and Evaluation
	Planning and Evaluation Officer
	Manager-Internal Auditing
National Medical Research Institute (NIMR)	Director General
	Acting Director of Research Coordination and promotion
Dar es Salaam Institute of Technology (DIT)	Deputy Principle Academic, Research and Consultancy
	Head of Research and Publications
Small Industries Development Organization (SIDO)	Director General
	Director Marketing
	Chief Internal Auditor
	Ag Director of Technology Development and Innovation
University of Dar es Salaam (UDSM)	Deputy Vice Chancellor Research
	Coordinator Research Grant Centre
	Director UDIEC
Tanzania Fisheries Research Institute (TAFIRI)	Director of Research
Tanzania Agriculture Research Institute (TARI)	Director of Research and Innovation
	Monitoring and Evaluation Manager
The Nelson Mandela African Institute of Science and Technology (NM-AIST)	Coordinator Research and Innovation
	Vice Chancellor
Tanzania Engineering and Manufacturing	Manager Research Development
	Director General

Name of the Institution	Interviewed Official(s)
Development Organization (TEMDO)	
Tanzania Atomic Energy Commission (TAEC)	Head of Research Development
Tanzania Wildlife Research Institute (TAWIRI)	Director General
Tanzania Forest Research Institute (TAFORI)	Director General
	Director of Forest Utilization Research
	Principle Research Officer
	Research Officer
Sokoine University of Agriculture (SUA)	Coordinator Technology Transfer
	Senior Administration Officer Technology Transfer

Appendix 5: List of Key Documents Reviewed

This part provides details on the list of the key documents reviewed during the audit and the reasons for reviewing.

Name of the Institution	Name of the Document	Reason(s) for Review
Ministry of Education, Science and Technology (MoEST)	National Guideline for Identification and Promotion of Inventions, Innovation and Traditional Knowledge Practices (2018)	To assess the existing guidelines on Identification and Promotion of Inventions, Innovation and Traditional Knowledge Practices.
	Annual Performance Report of MoEST (2020/21)	To evaluate the progress on the implementation of planned targets in relation to the Research and Innovation activities.
	Draft National Science, Technology and Innovation Policy (2018)	To assess the goals of the policy set to enhance the ability of Tanzania to innovate for the benefit of its socio-economic development.
	Implementation Plan of the National Research and Development Policy for 2011 – 2020 of MoEST	To assess and evaluate the arrangements and plans for the implementation of the National Research and Development Policy
	Science and Technology Policy of MoEST (1996)	To evaluate the developed arrangements for the management of Science and Technology activities in the country.
	The National Research and Development Policy (2010)	To assess the National arrangements and commitment to guide researchers, policy and decision makers, as well as development partners in addressing present and future national research challenges for socioeconomic Development.
Commission for Science and Technology (COSTECH)	Strategic Plan (2016-2021) of the Commission for Science and Technology	To assess the planned activities and the set targets based on the mandated functions of COSTECH as regards overall management in the coordination of research

Name of the Institution	Name of the Document	Reason(s) for Review
		and innovation activities in the country.
	STI Indicator Report (2020) of the Commission for Science and Technology	To assess different STI indicators in place.
	National Research and Innovation Framework of the Commission for Science and Technology	To evaluate the existing procedures that ought to be considered during the overall management of research and innovation activities.
	National Research Registration and Clearance Guidelines (2018) of the Commission for Science and Technology	To assess the existing guidelines on research registration and clearance during the overall management of research and innovation activities.
	National Research and Innovation Monitoring Framework (2020) of the Commission for Science and Technology	To evaluate the existing research and innovation monitoring framework as regards overall management of research and innovation activities.
	The Grants Manual of the Commission for Science and Technology	To assess the guidelines and procedures for the provision of various grants and awards.
	Repository Project Report (2021) of the Commission for Science and Technology	To assess the existing coordination and the overall management of the project's repository.

Source: Auditors' Analysis on the List of the Documents Reviewed (2022)

Appendix 6: Legal Requirements for the Coordination of Research Activities in Research and Development Institutions

This part provides the summarized provisions in legal requirements for the coordination of research activities in Research and Development Institutions

Name of Institution	Line Ministry	Legal Framework (Name/Section)	Statement Regarding Coordination of Research Activities
National Institute for Medical Research (NIMR)	Ministry of Health (MoH)	Section 4(3) of the National Institute for Medical Research Act, 1979	For better performance of its functions, the institute shall establish and maintain a system of collaboration, consultation and cooperation with the Tanzania National Research council established by the Tanzania National Research Council Act, 1968
		Section 26 of the National Institute for Medical Research Act, 1979	The council shall, within six months after the close of the financial year, cause to be prepared and **submitted to the minister a report dealing generally with the activities and operations of the institute during that year.**
		Section 27 of the National Institute for Medical Research Act, 1979	The **Minister** shall, as soon as practicable after **receiving the report**, lay before the national assembly the audited accounts of the institute together with the auditors' report of accounts together with **annual reports.**

Name of Institution	Line Ministry	Legal Framework (Name/Section)	Statement Regarding Coordination of Research Activities
Tanzania Fisheries Research Institute (TAFIRI)	Ministry of Livestock and Fisheries (MoLF)	Section 6 subsection (3a) of the Tanzania Fisheries Research Institute Act, 2016	The Institute shall, for the better carrying out of its functions, establish and maintain a system of collaboration, consultation, and cooperation with the national, regional and international community which among others are; (a) Commission for Science and Technology was established by the Tanzania Commission for Science and Technology Act.
		Section 32 of the Tanzania Fisheries Research Institute Act, 2016	The Board shall, within six months after the close of the financial year, cause to be prepared and **submitted to the Minister a general repor**t of the activities and operations of the Institute during that financial year
		Section 33 of the Tanzania Fisheries Research Institute Act, 2016	**The Minister** shall, as soon as practicable after receiving the report submitted to him by the Board, **lay before the National Assembly** the audited accounts of the Institute, together with the auditors' report on the accounts and the **annual report of the Institute.**
Small Industries Development Organization (SIDO)	Ministry of Investment, Industry and Trade. (MIT)	Section 15 of the Small Industries Development Organization Act, 1973	The Director-General shall, within sixty days of the end of each financial year, **prepare a report** on the activities of the Organization during such year and **submit such report** to the Chairman who shall forward the same to the **Minister.**

Name of Institution	Line Ministry	Legal Framework (Name/Section)	Statement Regarding Coordination of Research Activities
		Section 19 of the Small Industries Development Organization Act, 1973	The Minister shall, as soon as may be practicable after he has received them (accounts) and not later than seven months after the close of a financial year, or such longer period or the National Assembly may, by resolution approve on that behalf, lay before the National Assembly the following documents concerning such financial year Laying of accounts before the National Assembly (c) a copy of the Director General's annual report.
Tanzania Agricultural Research Institute (TARI)	Ministry of Agriculture (MoA)	Section 32 of the Tanzania Agricultural Research Institute, 2016	The Minister shall, as soon as practicable after receiving the report, lay before the national assembly the audited accounts of the institute together with the auditors' report of accounts together with annual reports.
Tanzania Wildlife Research Institute (TAWIRI)	Ministry of Natural resource and Tourism. (MNRT)	Section 10 subsection 1 of the Tanzania Wildlife Research Institute,1999	Every person engaged, or intending to engage, in any aspect of research on or connected with wildlife within the United Republic shall, at his own expense, furnish to the Institute information relating to that research and shall make available to the Institute copies of any relevant records or findings in the form and within the period specified.

Name of Institution	Line Ministry	Legal Framework (Name/Section)	Statement Regarding Coordination of Research Activities
		Section 27 of the Tanzania Wildlife Research Institute, 1999	The Board shall, within six months after the close of the financial year, cause to be prepared and submitted to the Minister a report dealing generally with the activities and operations of the Institute during that financial year
Tanzania Atomic Energy Commission (TAEC)	Ministry of Education Science and Technology. (MoEST)	Section 67 of the Tanzania Atomic Energy Commission, 2002	The Commission shall within six months after the close of the Annual statement financial year, cause to be prepared and submitted to the Minister a report detailing the activities and operations of the Commission during that year
Tanzania Forest Research Institute (TAFORI)	Ministry of Natural resource and Tourism. (MNRT)	Section 23 subsection 1 of the Tanzania Forest Research Institute,1980	The institute shall cause to be prepared and submit to the Minister within six months after the close of each financial year an annual report dealing with the activities and operations of the institute during that year.
		Section 23 subsection 2 of the Tanzania Forest Research Institute,1980	The Institute shall also submit to the Minister such other reports on its financial affairs as the Minister may by writing reasonable requests from time to time.
Tanzania Engineering and Manufacturing Development Organization (TEMDO)	Ministry of Investment, Industry and Trade. (MoIT)	Section 25 of the Tanzania Engineering and Manufacturing Development Organization, 1980	The Board shall, within six months after the close of the financial year, cause to be prepared and submitted to the Minister a report dealing generally with the activities and operations of the Organization during that year

Name of Institution	Line Ministry	Legal Framework (Name/Section)	Statement Regarding Coordination of Research Activities
		Section 26 of the Tanzania Engineering and Manufacturing Development Organization, 1980	The Minister shall, as soon as practicable after receiving them, lay before the National Assembly the audited accounts of the Organization together with the auditors' report on the accounts and the annual report of the Organization.
Sokoine University of Agriculture (SUA)	Ministry of Education Science and Technology. (MoEST)	Section 68 of the Sokoine University of Agriculture Charter, 2007	The Vice Chancellor shall at the end of each financial year prepare a report on the activities of the University during that financial year and submit such report to the Chancellor and the Minister.
		Section 21 subsection 2g of the Sokoine University of Agriculture Charter, 2007	The senate shall direct, regulate and promote research within the University through relevant organs of the University and require reports from time to time on such research;
Nelson Mandela the African Institute of Science and Technology (NM-AIST)	Ministry of Education Science and Technology. (MoEST)	Section 3 subsection 2 of the Nelson Mandela the African Institute of Science and Technology,2013	The university shall be a research-based institution of science, engineering and technology where all academicians engage in rigorous responsible and responsive research and innovation that focus on the needs and problems of society and industry.
		Section 7 of the Nelson Mandela the African Institute of Science and Technology,2013	The university shall be a teaching, research and innovation consultancy.

Appendix 7: List of Institutions that Have Been Connected to the COSTECH Repository

This part provides the list of institutions that have been connected to the COSTECH Repository

SN	Name of Institution
1	College of African Wildlife Management
2	Catholic University of Health and Allied Sciences
3	Dar es Salaam Institute of Technology
4	Dar es Salaam University College of Education
5	Institute of Adult Education
6	Institute of Rural Development and Planning
7	Law School of Tanzania
8	Mkwawa University College of Education
9	Mwenge Catholic University
10	National Institute of Transportation
11	Ruaha Catholic University
12	St. Augustine University in Tanzania
13	St Francis University College of Health and Allied Sciences
14	Small Industries Development Organization
15	St. John's University in Tanzania
16	Stefano Moshi Memorial University College
17	Tanzania Bureau of standard
18	Teofilo Kisanji University
19	Tanzania Industrial Research and Development Organization
20	Tumaini University Makumira
21	Tumaini University Dar Es Salaam College
22	University of Arusha
23	University of Iringa
24	State University of Zanzibar
25	Zanzibar University
26	Nelson Mandela-African Institute of Science and Technology
27	Institute of Finance Management
28	University of Dodoma
29	University of Dar es Salaam
30	Mzumbe University
31	Open University Tanzania
32	Sokoine University of Agriculture
33	College of Business Education
34	Kilimanjaro Christian Medical University College
35	The Muhimbili University of Health and Allied Sciences
36	Mbeya University of Science and Technology

Appendix 8: Key Performance Indicators that are used during the monitoring

This part provides a list of relevant Key Performance Indicators that are used during the monitoring of research results with regard to the National Research Agenda.

Planned Target/Output	Expected Outcomes	Outcome Indicators	Relevance of Key Performance Indicators (KPIs)	Reason for Relevance/Non-relevance of Key Performance Indicators (KPIs)
National postdoctoral research framework established	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of postdoctoral candidates supported	Not relevant	Although the expected outcomes want increased quality and number of researches through the use of the established National Postdoctoral Research Framework the Key Performance Indicator does not mention the same and it counts the number of candidates supported instead. It does not mention the quality and quantity of research that can be translated into companies. Therefore, the KPI is not directly linked to the planned target and the expected outcome

Planned Target/Output	Expected Outcomes	Outcome Indicators	Relevance of Key Performance Indicators (KPIs)	Reason for Relevance/Non-relevance of Key Performance Indicators (KPIs)
R&D outputs of high-quality products, processes, and services (Publications, Patents, Licenses, Policy briefs) from postdoctoral research increased continuously	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of postdoctoral projects leading to spin-off companies	Not relevant	It can be seen that the expected outcome links to the planned target. However, the set KPI does not mention the quality and quantity of research that translated into companies and hence industrialization. Therefore, the set KPI does not reflect the expected outcome of the planned target
Five (5) Commissioned research projects geared towards industrialization supported continuously	Increased quality and quantity of research that can be translated into companies and hence industrialization	Number of companies established from R&D results	Not relevant	The target was to continuously support the commissioned research projects geared towards industrialization. However, the KPI mentions the number of companies established from R&D results which are against the expected outcome of increased quality and quantity of research that can be translated

Planned Target/Output	Expected Outcomes	Outcome Indicators	Relevance of Key Performance Indicators (KPIs)	Reason for Relevance/Non-relevance of Key Performance Indicators (KPIs)
				into companies and hence industrialization.
Capacity building of all 76 R&D Institutions Review Boards (IRBs) conducted	Improved research quality and ethics adherence	Number of quality research in line with ethics Number of functioning IRBs	Relevant	The set KPI reflects the planned target and the expected outcome since it mentions the number of quality research in line with ethics. Further, it mentions the number of functioning IRBs which is the aim of capacitating them.
Twenty (20) multi-disciplinary research teams established and supported	Improved quality and relevance of research for socio-economic development	Number of research carried out by multi-disciplinary research teams	Not relevant	The KPI mentions the number of research carried out by Multi-disciplinary research teams without mentioning the quality and relevance of research for socio-economic development which is the expected outcome
Twenty (20) R&D institutions equipped with relevant laboratory facilities	Improved quality and relevance of research for socio-economic development	Number of research results translated into products, processes	Not relevant	The set KPI does not measure the quality and relevance of research for socio-economic development.

Planned Target/Output	Expected Outcomes	Outcome Indicators	Relevance of Key Performance Indicators (KPIs)	Reason for Relevance/Non-relevance of Key Performance Indicators (KPIs)
		and services		Instead, it counts the number of research results translated into products, processes and services, which is against the expected outcome