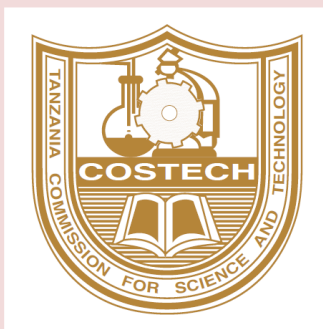


**TANZANIA COMMISSION FOR SCIENCE AND TECHNOLOGY
(COSTECH)**



ROLLING STRATEGIC PLAN: 2016/17 – 2020/2021

JANUARY, 2018

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LIST OF ABBREVIATIONS

ATPS	African Technology Policy Studies Network
ASTII	African Science, Technology and Innovation Indicator
AU	African Union
BRIC	Brazil, Russia, India and China
BRN	Big Results Now
BRELA	Business Registration and Licensing Authority
BPO	Business Process Outsourcing
CoET	College of Engineering and Technology
COSTECH	Tanzania Commission for Science and Technology
CSIR	Centre for Scientific and Industrial Research
DFA	Director of Finance and Administration
DIEC	Director of Innovation, Entrepreneurship and Competitiveness
DKM	Director of Knowledge
DLS	Director of Life Sciences
DPS	Director of Physical Sciences
DSS	Director of Social Sciences
DFID	Department of International Development
DIT	Dar es Salaam Institute for Technology
DPs	Development Partners
DST	Department of Science and Technology
EAC	East Africa Community
EMA	Environmental Management Act
EPZA	Export Processing Zones Authority
ESRF	Economic and Social Research Foundation
FDI	Foreign Domestic Investment
GERD	Gross Domestic Expenditure on R&D
GDP	Gross Domestic Product
GNP	Gross National Product
HEIs	Higher Education Institutions
HCD	Human Capital Development
HELSB	Higher Education Student Loan Board
HEMIS	Higher Education Management Information System
HR	Human Resources
ICT	Information Communication and Technology
IHI	Ifakara Health Institute
IMS	Institute of Management Sciences
ILO	International Labour Organisation
KEI	Knowledge Economy Index
KPIs	Key Performance Indicators
MCST	Ministry of Communication, Science and Technology
MDAs	Ministries, Department and Agencies
MDGs	Millennium Development Goals
M&E	Monitoring and Evaluation
MoEVT	Ministry of Education and Vocational Training
MoU	Memorandum of Understanding
MSI	Millennium Science Initiative

MTEF	Medium Term Expenditure Framework
MUHAS	Muhimbili University of Health and Allied Sciences
NBS	National Bureau of Statistics
NEPAD	New Partnership for Africa's Development
NIMRI	National Institute for Medical Research
NRCM	National Research Council of Malawi
NSRC	National Scientific Research Council
NREN	National Research and Education Network
NFAST	National Fund for Advancement of Science and Technology
NORAD	Norwegian Agency for Development Cooperation
NSGRP	National Strategy for Growth and Reduction of Poverty (MKUKUTA)
OECD	Organization for Economic Cooperation and Development
QM	Quality Management
RDT	Rapid Diagnostic Tools
RE	Renewable Energy
R&D	Research and Development
R&Ds	Research and Development Institutions
REPOA	Research for Poverty Alleviation
RFM	Result Framework Matrix
SADC	Southern African Development Community
SET	Science, Engineering and Technology
SIDA	Swedish International Development Agency
SIDP	Sustainable Industries Development Policy
SMEs	Small and Medium Enterprises
S&T	Science and Technology
STI	Science Technology Innovation
STHEP	Science, Technology and Higher Education Project
SUA	University of Agriculture
SWAAT	Society for Women and Aids in Africa -Tanzania
SWOCs	Strengths, Weaknesses, Opportunities and Challenges
TAAS	Tanzania Academy of Sciences
TaCRI	Tanzania Coffee Research Institute
TAFIRI	Tanzania Fisheries Research Institute
TAFORI	Tanzania Forestry Research Institute
TaTEDO	Tanzania Technology Development Organization
TASTA	Tanzania Advancement of Science and Technology Award
TAWIRI	Tanzania Wildlife Research Institute
TFDA	Tanzania Food and Drug Authority
TGNP	Tanzania Gender Networking Programme
TIPASIC	IP Advisory Service and Information Centre
TIRDO	Tanzania Industrial Research and Development Organization
TRIT	Tea Research Institute of Tanzania
TM	Traditional Medicines
UNCST	Ugandan National Council for Science and Technology
UNIDO	United Nations Industrial Development Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
VETA	Vocational Education and Training Authority
WIPO	World Intellectual Property Organization

DEFINITION OF TERMS

Science: any area of knowledge obtained using or arranged according to formal principals, applied skills or technique as opposed to natural ability.

Technology: is the application of tools, skills and knowledge to transform resources such as technical hardware into new products or results for sustainable development.

Research: is the systematic investigation into some subjects or area of study with the aim of discovering and applying new facts or information.

Innovation: is the use of knowledge – ideas, technologies and processes into products, procedures and services that bring added value and are new in a specific context.

Innovation intermediary: is an organization or body that acts as an agent or a broker between two or more parties in any aspect of the innovation process. (Howells, 2006). Intermediary activities include helping to provide information about potential collaborators; acting as a mediator and brokering a transaction between two or more parties.

Technology transfer: is the process of sharing of or acquiring, providing, licensing of skills, knowledge, technologies, intellectual property, technology development personnel or entire teams between parties to enable the accessibility of scientific and technological developments to a wider range of users who can then further develop and exploit the technology into new products, processes, applications, materials or services.

Commercialization: is a stage in product development process where the decision to order full-scale production and launch is made.

Spin-off enterprise/company: is an enterprise established through licensing of a technology between a research institute/university and an entrepreneur/inventor to run a new company.

Emerging technology: is a new technology that is currently being developed, or will be developed within the next five to ten years.

PREFACE

EXECUTIVE SUMMARY

Introduction

The Tanzania Commission for Science and Technology (COSTECH) presents its Five - Year Strategic Plan for 2016/17 – 2020/21 which comprises of the Commission's critical strategic issues, vision, mission, core functions, core values, strategic objectives, strategies, targets and a five-year implementation plan.

Critical Strategic Issues

In line with the national aspiration to rapidly move towards an industrial economy, the plan is designed to address the following critical strategic issues:

1. Evidence-based decision making
2. Industrialization through wider application of technologies
3. Strategic research with national impact
4. Science, Technology and Innovation culture
5. COSTECH Institutional Capacity

Vision

The Plan is inspired by the following vision of the Commission:

To be the prime driver of science, technology and innovation for sustainable development in Tanzania

Mission

Within the framework of Tanzania's STI policy, the Commission has as its principal mission:

To build and support a strong system of sciences, technology and innovation for sustainable socio-economic development

Strategic Objectives

In pursuit of the stated institutional vision, the Commission will be guided by five strategic objectives, which are based on the above-prioritised critical strategic issues for the period 2016/17 – 2020/21:

Strategic Objective 1:	Evidence-based decision-making culture strengthened
Strategic Objective 2:	Industrialization through wider application of technologies promoted
Strategic Objective 3:	Strategic research with national impact increased
Strategic Objective 4:	Science, Technology and Innovation culture strengthened
Strategic Objective 5:	COSTECH Institutional Capacity strengthened

1 INTRODUCTION

1.1 Background and context

Tanzania Commission for Science and Technology (COSTECH) is a public institution established by an Act of Parliament No. 7 of 1986 as successor of the National Research Council (UTAFITI) that was established in 1972. 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, technology development and transfer.

COSTECH collaborates and acts as a national focal point for cooperation with various regional and international scientific institutions and agencies. The strength of COSTECH lies on its legal establishment and autonomy status that avoids government procedural bureaucracy. The Act that established COSTECH provides for the R&D institutions most of which operate under the respective sectoral ministries to be affiliated to COSTECH as the apex body of R&D.

Therefore, COSTECH plays a greater role in making sure that the industrialization agenda of the country is achieved. The role of STI in fostering improved products, processes and services is vital for attaining quality goods and services as this is the ultimate goal of the National Vision 2025 where exports will be realized and hence the middle – income economy.

1.2 Mandates, Roles and Functions

The principal roles and responsibilities of the Commission *inter-alia* are as provided by the COSTECH Act No 7 of 1986 (Cap 226 rev 2002), which include:

- (i) To prepare and review national science, technology and innovation programmes, including dissemination and transfer of technology;
- (ii) To monitor and co-ordinate the activities relating to scientific research, technology development and innovation of all persons or body concerned with such activities;
- (iii) To acquire, store and disseminate scientific and technology information, and may, for that purpose hold or sponsor conferences, symposia, meetings, seminars or workshops, or publish any news – paper, journal or periodical or do any other act or thing designed to promote interest in science, technology and innovation;
- (iv) To register scientific research institutions operating in the United Republic of Tanzania; and
- (v) To advise the Government on matters such as: priority areas for scientific research; the allocation and utilization of research and innovation funds according to priorities scientific research and regional and international co-operation in scientific research, innovation and technology development and transfer; matters relating to the training and recruitment of research personnel.

1.3 Governance and Administration

The organizational structure of COSTECH is a three tier, consisting of the Commission, R&D Advisory Committees and the Secretariat. The Chairperson of the Board of Commissioners is a Presidential appointee and members of the Commission are appointees of the Minister responsible for Science and Technology. Some members of the Board of Commissioners constitute an Executive Committee, which is a statutory organ of the Commission to which the Commission can delegate any of its functions. The Board of Commissioners gives broad directives and guidelines to the Secretariat or management through its various R&D Advisory Committees.

The composition of the Commission and R&D Advisory Committees embraces public and private universities, government departments and major national R&D institutions affiliated to COSTECH which make COSTECH a unique body for local R&D, regional and international linkages necessary for the development of STI in the country. The R&D Advisory Committees' general functions are to act as the Commission think-tank on various science, technology and innovation issues in its endeavor to fulfill its mission. Currently, COSTECH has registered 11 R&D Advisory committees and two technical committees. The R&D committees are ICT; Basic Sciences; Biotechnology; Natural resources; Research registry; Environment and climate change; Health; Social sciences; Industry and energy; Agriculture and livestock; and Technology transfer and development. The two technical committees are: Tanzania Advancement of Science and Technology Award (TASTA) and National Fund for Advancement of Science and Technology (NFAST). Other sub-committees of the Board of commissioners include Audit Committee; Finance, Planning and Administration Committee.

COSTECH Secretariat is made up of the Director General's Office, four (4) directorates namely: Knowledge Management; Centre for Development and Transfer of Technology; Research Coordination and Promotion; and Corporate Services. Furthermore, the Office of the Director General is made up of four (4) sections which are Procurement Management; Internal Audit; Legal; and the NFAST. The organization chart below (Figure 1.1) depicts the management structure of the Secretariat.

1.4 Purpose of the Strategic Plan

The current reviewed five years (2016/17 – 2020/21) Strategic Plan reflects the Second Five – Year Development Plan (FYDP II: 2016/17 – 2020/21) that is focused on industrialization. The performance assessment of the first year SP (2016/17) which ended on 30th June 2017, showed that issues of industrialization agenda were not well covered as stipulated in the Second National Five – Year Development Plan and the Tanzania Long-Term Perspective Plan (LTPP: 2011/12 – 2025/26). All the above documents recognize Science, Technology and Innovation (STI), as one of the major inputs for industrialization, economic transformation and human development. It was therefore important for COSTECH to review the current SP so as to reflect the national development agenda on Industrialization.

This reviewed Plan redefines COSTECH's role in the industrialization by mapping various aspects of the anticipated science, technology and innovation landscapes, including the institutional set-up and the national industrialization agenda. Thus, the review of this rolling five - year - SP was guided by the following points:

- (i) Critical examination of the current and future role of COSTECH in promotion and coordination of STI, with specific reference to the ongoing STI Reforms and related sectoral reforms;
- (ii) Identifying and prioritizing existing constraints to further development of COSTECH services, including those related to the regulatory framework, policies, socio-economic structure, research funding, and Government policies;
- (iii) Assessing the required revisions or new regulation/laws necessary for proper functioning of COSTECH;
- (iv) Examination of the objectives, organization, management and resource use of COSTECH and identification of new activities that can improve the future performance of COSTECH;
- (v) Assessing the level of competition and COSTECH ability to meet stakeholder expectation and measures to win in such competition, taking into account ongoing socioeconomic changes in the country;
- (vi) Assessing the performance of first year (2016/17) implementation of SP (2016/17-2020/21), in particular on the key aspects of industrialization in the aspects of determining the efficiency and effectiveness of COSTECH contribution toward industrialization; and
- (vii) Examining the adequacy of the resources allocated in the existing SP (2016/17-2020/21) for specific strategic objectives related to industrialization and recommending the optimal resource allocation that can improve the future COSTECH contribution toward industrialization national agenda.

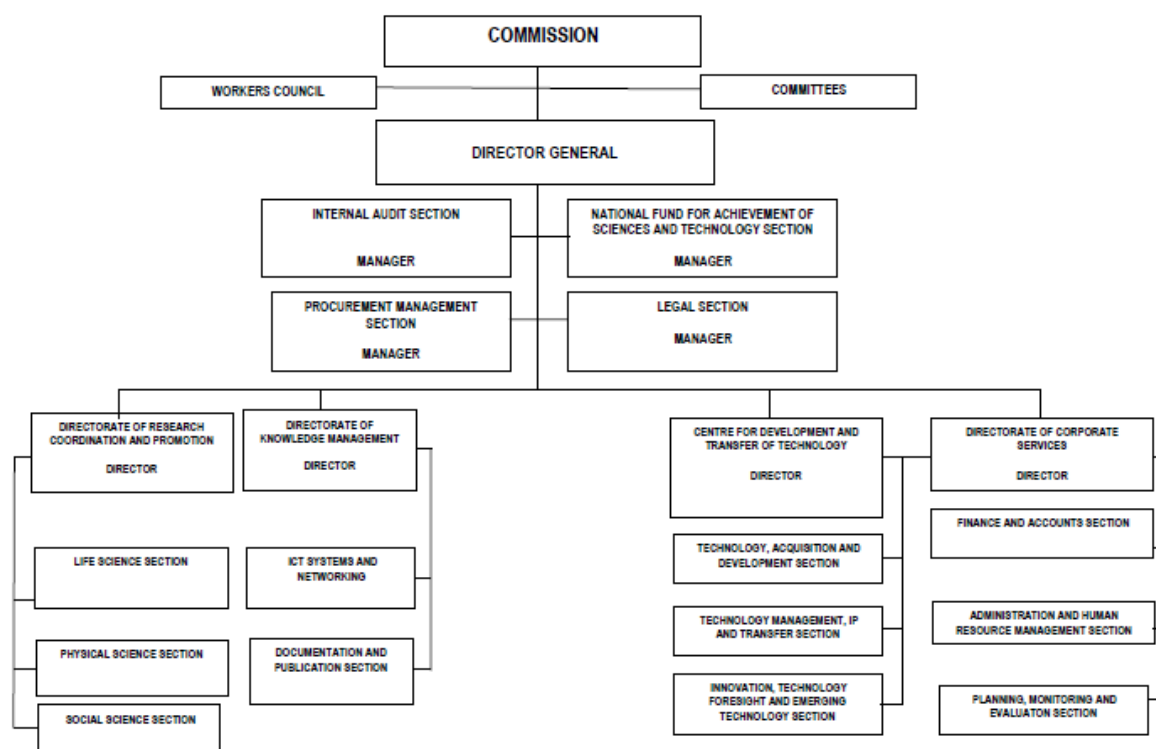


Figure 1.1: Organization Structure of COSTECH

1.5 The Planning Process

The development of COSTECH Strategic Plan 2016/17 –2020/21 was mainly based on documentary reviews and field surveys that entailed sending questionnaires to key targeted stakeholders followed by meetings, consultations and interviews with various key stakeholders. These included key policy makers such as the Chief Secretaries from Tanzania Mainland and Zanzibar, individuals, academia, centres of excellence, R&D institutions, public sectors, and internal and external development partners. At the strategic level, BICO consultants were guided by the Top Management as well as the Internal Planning Team (IPT) whose members were selected by the Commission.

After rolling for one year, there was need to review this SP to meet the needs of the second phase of the development vision 2025 where industrialization agenda is being pursued by implementing the FYDP II. Therefore, the review team of the COSTECH Strategic Plan 2016/17 – 2020/21 made consultations with key stakeholders relevant to issues of industrialization and institutional set up. Key stakeholders consulted included MDAs and institutions.

1.6 Layout of the Document

This Strategic Plan is organized in six chapters. The first chapter gives a general background, the rationale and methodology for developing and reviewing the strategic plan. Chapter Two reviews the international, regional and national contexts to establish COSTECH's Opportunities and Challenges. Chapter Three presents the internal analysis of COSTECH, highlighting the main achievements, strengths and weaknesses as well as the one-year performance review of this plan. Chapter Four presents the essence of the COSTECH Plan for 2016/17- 2020/21 (i.e. the vision, mission, core functions, core values, strategic objectives and key targets). Chapter Five assesses financing performance and projections. Chapter Six presents an overview of the monitoring and evaluation arrangement for the strategic plan.

2 SITUATION ANALYSIS

This chapter thoroughly reviews experiences and practices of mainstreaming STI for national social-economic development at regional and international contexts that could inform the development of this current plan's strategic issues. In this reviewed COSTECH Strategic Plan 2016/17 – 2020/21, the Chapter analyzes policies at global, regional and national levels related to industrialization challenges and opportunities with a strong bearing to priority areas within our country that can promote sustainable industrialization. The Chapter goes further to discuss practices of management and coordination of STI, research funding as well as linkages between the Government, industry and Academia responsible for STI development and hence socio-economic development of the country. The Chapter also goes further to capture challenges faced by the Country in creating an enabling environment for STI mediated socio-economic development.

2.1 International Context

2.1.1 Industrialization Policies

The implementation of MDGs came to an end in 2015; the new 17 Sustainable Development Goals, SDGs (UN 2016) with 169 targets have been introduced and adopted by UN member countries in September 2015 to guide the development process till 2030. The newly proposed population policy now incorporates 17 SDGs including specific goal No. 9 aimed at promoting inclusive and sustainable industrialization and fostering innovation and some of the spelt targets such as Goal No 6, 7, 8, and 13 which have already been enshrined in our national strategies including the Long-Term Perspective Plan, LTPP (2011/12 – 2025/26) and the new Five – Year Development Plan FYDP II (URT. 2016).

The central issue in goal 9 is building sustainable industrialization, while resilient infrastructure and innovation are to a large extent instrumental in this. The Goal is therefore somehow connected to and a continuation of Goal 8 which is promoting sustained inclusive and sustainable economic growth, full and productive employment and decent work for all through the industrial sector. It should be noted that the industrial sector includes the subsectors of manufacturing, construction and mining. Apart from its own huge potential for employment generation, the development of the manufacturing sector stimulates demand for more and better services including banking, insurance, communication and transport, which leads to further job creation, resulting in poverty reduction.

2.1.2 Management and Coordination of STI

Most countries that have succeeded in expanding their economies have done so through STI by giving science and technology significant prominence in their government structures. Such countries include China, India, Korea, India, Malaysia, Vietnam, and others. These countries apart from having separate ministries dealing with science and technology they have also established S&T advisory committees at their highest level of government either at the President's or Prime Minister's Offices.

For example, the evolution of Malaysia's Advisory System is linked to its national decisions that have transformed the country's economy. Once a producer of raw materials, Malaysia is now a diversified economy that exports electronic products and associated ICT services. This transformation was guided by a set of advisory institutions that include the Science Advisor's Office to the Prime Minister established in 1984 (Juma and Cheong 2005). Similarly, Canadian National Science Advisory is under the Prime Minister's office and is tasked with a number of key public policy challenges including development of framework for the commercialization of research in partnership with the private sector, exploring priority setting within government research, development of framework for decision-making on major science investments, etc.

2.1.3 Research Funding

UNESCO data show that global investment in R&D is positively and strongly correlated with total GDP growth of a given country. For instance, the recently developed economies, such as South Korea which spends about 2.0% GDP on STI research and development as well as Argentina, Brazil, Chile, Cuba, India, Kuwait and Mexico and South Africa, which spend between 0.5 to 0.9% GDP on STI research and development have made considerable socio-economic development of their countries (Osama 2007). This is because in order to industrialize, the country must invest more on R&D in STI especially in the manufacturing sector (OECD, 2007).

2.1.4 Research capacity

The number of researchers in Tanzania is 60 per million populations while Kenya and South Africa are 100 and 800 researchers per million populations, respectively (IFAH 2013). In European countries the number of researchers is over 10,000 per million populations (OECD 2007). Given the low number researchers in Tanzania, it will be difficult to acquire tangible research results aimed at creating new products, processes and services. All in all, with few researchers in place, experiences have shown that researchers in these countries are under-utilized; with most the otherwise competent research staff being engaged in administrative responsibilities in their institutions. Moreover, most researchers suffer from having insufficient strategic and international exposure (Osama 2007).

2.1.5 Government, Academia and Industrial Linkages

(a) Investment in STI

In developed countries, the proportion of investment in R&D by the private sector is more than two-thirds of the total or greater than by the government (OECD, 2007). For example, South Korea has had spectacular industrial development largely due to its continuous and strong investments in STI and working closely with its R&D institutions. The country is now rich technologically advanced and has an impressive record of innovation. The foundations of this success are linked to a number of factors including having an educated population, effective institutions for private sector led innovation, promotion of domestic savings, opening up the economy to international trade and

science and technology flows.

In Tanzania, the private sector investment in STI is almost not there as there are no incentive existing for the private sector to invest on R&D. This is because the risks are high as the expected returns from R&D may expectedly be low. In this regard, it is important for the Government to invest in R&D especially during the initial stages with a view of creating success stories for the private sector to emulate. Also, there is a need therefore to have a ring-fenced budget for R&D activities in all higher learning and R&D institutions. There should also be a prioritized and state-led focus on certain industries especially in the manufacturing industries to create the necessary employment and wealth.

(b) Foreign Direct Investments (FDIs)

For BRICS countries (Brazil, Russia, India, China and Singapore), Foreign Direct Investment has been an important strategy for promoting STI and hence industrial development. Taking China as another learning point, (Holz, 2008)¹, two factors were crucial in its social economic development leveraged on STI. These were: (a) Structural changes: China shifted from being an agricultural country into a highly productive industrial country and a significant exporter; (b) Catching up: meaning that technological innovation developed abroad were acquired through the importation of industrial equipment through foreign investment in the economy. It is thus important to note that lessons from the Asian Tigers suggest that a sequential investment and development of key industries over time is necessary.

According to UNCTAD (2011), developing countries such as South Korea, Taiwan and Singapore have used FDIs to promote industrial development under Government conditions that the Multi-national corporations (MNCs) must: (a) promote local sourcing and subcontracting; (b) follow up local content rules; and (c) introduce the obligation for foreign firms to transfer skills and technology to subcontractors, with the objective to raise the technological capabilities of domestic firms. These examples of South Korea, Singapore and BRICS countries clearly underscore the role of purposive government action to create an enabling environment for STI mediated socio-economic development.

(c) Technology Incubators

Experiences from other countries such as UK, India, USA and the Far Eastern economies have shown that transfer of technology or R&D results from higher learning institutions to industry using incubators supported by Governments. (Armstrong, 2002). Incubators are, by their very nature, designed to act as bridges between academic institutions and the industry and these allow transfer of R&D results between the academic and the commercial world under protected Intellectual Property Rights (IPR) environment. Incubators have potential to increase firms' spin-off (new industries) and employment opportunities in the country.

(d) Export Processing Zones (EPZ)

¹ HOLZ, Carsten A. China's Economic Growth 1978–2025: What We Know Today About China's Economic Growth Tomorrow. World Development Vol. 36, No. 10, pp. 1665–1691, 2008.

Export Processing Zones (EPZ) are areas in developing countries that permit participating firms to acquire their imported inputs duty free as long as they export 100 percent of their products. This scheme works when selling manufactured goods as world prices is profitable given a country's low wages. The concept has been most widely used in Asia. EPZs are important mechanisms for acquiring technology and diffusing it in the local economy. But strategies to promote the establishment of such zones must be designed with long term technological development in mind.

The Republic of Korea and Taiwan (China) have been most successful users of EPZs. Their rapid growth was a result of their export orientation. EPZs were the starting point of export-oriented performance standards. EPZs and exports by participating firms were tied to subsidies. In the Republic of Korea large exporters were given access to cheaper and long-term investment capital and tariff protection for their sales in the domestic market. Taiwan (China) granted large exporters permission to sell products in several industries in a highly protected domestic market.

2.2 Regional Context

2.2.1 Industrialization Policies

Tanzania is a member of the East African Community (EAC) and hence its national context is shaped by regional policies such as the East African Community Industrialization Policy, 2012 – 2032 (EAC 2012) and the East African Community Development Strategy 2012 – 2032 (EAC, 2012). The thematic focuses of EAC policies are on the structural transformation of manufacturing through value addition and product diversification. Important to note is that the poor performance of the private sector and the resulting low industrial capacity which is common across the member countries was explicitly recognized in the 2011 EAC Development Strategy, 2011/12 – 2015/16 document (p.38) which states that: “Industrial capability in EAC is weak and faced by various challenges that have slowed its transformation. The manufacturing sector in the region contributes less than 10% of GDP, and is characterized by limited value addition which is highly concentrated in agro-processing activities.” (EAC 2012). The EAC industrialization policy calls upon Partner States to take measures to promote the development of strategic regional industries/value chains such as Agro-processing; Iron-ore and other mineral processing; Fertilizers and agrochemicals; Pharmaceuticals; Petro-chemicals and gas processing; and Energy and Bio-fuels.

2.2.2 Management and Coordination of STI

A number of African countries have emulated similar structures in management and coordination of STI just like those in the developed countries. In strengthening of STI, South Africa, Rwanda and Uganda, have separate ministries of Science and technology with advisory bodies at the highest levels of their respective governments. For example, in South Africa, all Science, Engineering and Technology (SET) institutions are governed by the Department of Science and Technology (DST) so as to ensure better coordination of Science, Engineering and Technology (SET) activities (RSA. 2002).

Under DST there also exists the Centre for Scientific and Industrial Research (CSIR) similar to COSTECH which is involved in setting priorities for technology development

Similarly, in Rwanda, the Ministry of Science is placed under the President's direct supervision in an effort to accelerate the integration of science and technology into all sectors of the economy (Rwanda Republic, 2005). The government's commitment and the choice to focus on capacity building has been driven by two major identified needs namely: (a) improving the lives of the rural poor, reducing poverty, and achieving the Millennium Development Goals (MDGs) and (b) generating wealth, diversifying the economy, and supporting private sector initiatives to produce and sell value-added, natural resource (mostly agricultural) exports (SADC, 2011; World Bank, 2008).

Also, as for Uganda, the science and technology development affairs are vested upon the Ugandan National Council for Science and Technology (UNCST), which was established in 1990 by Act of Parliament (CAP 209 of the Law of Uganda) as a semi-autonomous government agency to advice, develop, implement policies and strategies for integrating Science, Technology and Research Development in Uganda. The line Ministry for the UNCST is the Ministry of Finance, Planning and Economic Development. The Council Governing Board Comprises of 32 eminent scientists appointed by the Minister responsible for Science and Technology in Uganda. It is the supreme policy organ and is responsible for implementing the UNCST functions. Although UNCST not directly under the President's Office, the placement under Finance, Planning and Economic Development elevates it above the Sector Ministries and gives it power to execute and command its functions within sectoral Ministries. It also gives it direct access to financial and technical resources.

2.2.3 Research Funding

Inadequate funding remains a major constraint to education and training in STI as well as STI research in Africa. The Gross expenditure on R&D which is derived from the African Science, Technology and Innovation Indicator (ASTII) survey carried out by NEPAD in 2009 shows that except for Malawi, Uganda and South Africa, most of the African countries spend between 0.2 to 0.45 % of GDP on R&D activities. The survey further revealed that most of the R&D expenditure comes from Government and donors. It should be noted that as for South Africa, ASTII survey did not include the business sector. Otherwise, South Africa spends most of its resources on R&D and amounts to almost 0.8 % of GDP (Osama 2007).

2.2.4 Government, Academia and Industrial Linkages

(a) Academia and Industry Linkages

A key feature of the Region's institutional landscape is the weak links and poor feedback between and among institutions, including the higher education and research institutes and the private sector (Bamiro, 2004; Nyichomba, 2010). More importantly, there are no incentives for different institutions to work together. Also, there exist few mechanisms to encourage communication and collaboration. This could also be the reason for the poor up-take of research outputs from the higher education institutions

or even support to research and innovation uptake by the private sector (Nyichomba et.al, 2012; MCST, 2012).

A study on innovation systems in selected African countries (NEPAD, 2009) including Uganda and Tanzania has shown that there is low number of qualified technical personnel to carry out innovation activities in industries. Also, low interactions, in knowledge generation, utilization and diffusion as well as low STI human capacity coupled with low knowledge economy index contribute to weak innovation trend and hence low level of industrialization in EAC industries (World Bank, 2006). It was also further observed that the level of technologies available in EAC is that of low tech and most of it based at processing agricultural produce as raw materials for export. For rapid industrialization however, EAC needs to develop engineers, technologists that support high value-added industry (i.e. factory automation, design and IT applications) as well as industries that add value to agricultural produce, gemstones and other products like gas and oil (EAC 2012).

(b) Government and Academia Linkages

The strengthening of linkages between the Government and academia for STI development initiated in Africa is currently being carried out through establishment of incubators aimed at assisting graduates from higher learning institutions and SMEs establish their start-up businesses. For example, the Innovation Hub from South Africa was established by the South African Government with a view of providing a strong linkage between the University and Industry and hence to connecting research and commercialization of technology by linking and directing R&D to business sectors especially SMEs (UDSM 2005). Thus, the location of the Innovation Hub in South Africa at Gauteng province is in such a way that the Hub can serve a number of universities and SMEs close to it.

2.3 National Context

2.3.1 Industrialization Policies

Industrialization agenda is well embedded in multiple major national policies such as Five-Year Development Plans II (URT 2016); the Integrated Industrial Development Strategy (IIDP) of 2011 (URT 2011); Sustainable Industrial Development Policy (SIDP), 1996-2020 (URT 1996) as well as SME Policy of 2003 (URT 2003). While Vision 2025 outlines a path for Tanzania to become a semi-industrialized nation with a middle-income status by 2025, the Tanzania Sustainable Industrial Development Policy (1996-2020) places emphasis on the promotion of local industries. In SIDP (1996-2020), the Government recognizes the role of the private sector as the principle vehicle in carrying out direct investment in industry. The SME policy (URT 2003) accords specific emphasis on the promotion of local industries including SMEs, encouraging informal sector businesses to grow and formalize, and indigenous entrepreneurs including women, youth and other disadvantaged groups to take part in economic activities. To

achieve the Vision 2025, the manufacturing sector has to grow annually by around 12% to 15% and manufacturing has to double its share in GDP from around 8% to 18%.

The investment policy allows incentives to enterprises investing in Tanzania's lead or priority sectors (Tanzania Mainland). Incentives are prioritized in agriculture, natural resources, manufacturing, construction and health. Tanzania has moderate tax rates such as 30% corporate, 10% and 0% on loan interest in both lead and priority areas. Further to that, the country has PPP policy in place which aims at promoting private sector participation in the provision of resources for PPPs in terms of investment capital, managerial skills and technology. COSTECH plays a vital role in ensuring there is linkage between R&D and business ventures for enhancement of technology transfer and commercialization of research results.

2.3.2 Management and Coordination of STI

COSTECH is the principal advisory organ to the Government on all matters pertaining to Science, Technology and Innovation (STI) and their application for socio-economic development of the country. COSTECH's key roles include advising the Government on all matters relating to STI. The functions of COSTECH spelt out in the enabling Act are to advise in the formulation of policies relating to STI; coordinate, monitor and evaluate scientific research and technological development; acquire, store and disseminate scientific and technological information; and examine and promote R&D Programmes. Others are: mobilize, manage and disbursement of funds for R&D; foster regional and international cooperation; facilitate commercialization of research results; and initiate formulation and implementation of research priorities and Programmes.

COSTECH collaborates with, and acts as a national focal point for cooperation with various regional and international scientific institutions and agencies. The organizational structure of COSTECH is a three tier, consisting of the Commission, R&D Advisory Committees and the Secretariat. Chaired by a Presidential appointee, members of the Commission are appointees of the Minister responsible for Science and Technology. The composition of the Commission and R&D Advisory Committees that embraces both, public and private universities, government departments and major national R&D institutions affiliated to COSTECH makes COSTECH a unique body for local R&D, regional and international linkages necessary for the development of STI in the country.

The strength of COSTECH lies on its legal establishment and autonomy status that avoids government procedural bureaucracy. The Act that established COSTECH provides for the R&D institutions which operate under their respective sectoral ministries to be affiliated to COSTECH as the apex body of R&D. However, as from 2013 the Ministry in collaboration with key stakeholders has embarked on the formulation of the STI Policy and Act. The proposed STI Act shall give COSTECH the mandate to register and accredit all R&D institutions in the country be it public or private. In this case, the Commission shall be the principal advisory organ of Government on all matters relating to scientific research, innovation, technology development, and transfer and commercialization. In addition, COSTECH shall also coordinate and monitor the activities relating to scientific research, technology development and innovation in the country. The Commission shall therefore establish National Science, Technology and Innovation Councils in 10 STI areas as well as facilitate to establish

technology transfer centres in R&D institutions as well establish science, technology and innovation units in different levels of government administration.

In order to ensure that COSTECH facilitates matters related to the transfer, adaptation and development of technology including choice and assessment of technology the Commission has in place the National Centre for the Development and Transfer of Technology (NCDTT). The Centre was established by the passing of the COSTECH Act of 1986 and came into operation in the year 1992. The Centre has a number of targets to achieve such as establishing the status of technology capacity and capability in agro-processing, pharmaceutical, energy, construction, iron and steel; improving start-up companies and transfer of technology; support for digital skill development, innovation and creation of conducive environment and development of mechanisms for effective transfer of technology through FDIs. However due to constraint of resources, the Centre has only been able to achieve part of the stipulated objectives. This has obviously plagued the national efforts to implement the national industrialization agenda as stipulated in the Vision 2015 and the second Five Years Development Plan (FYDP II) 2016/17 to 2021/22.

2.3.3 Research Funding

Data gathered from institutions that gave responses to the survey questionnaires indicated that gross domestic expenditure on R&D for the year 2007/2008 was about Tshs 56.1 billion. When this amount was computed as a percentage of GDP for that year, the amount of expenditure was found to be 0.22 % of GDP. This amount is in agreement with the one that was obtained in 2004, amounting to 0.24% of GDP (COSTECH Report, 2005). Such a scenario notwithstanding, remains almost the same as of to-date despite the Government commitment towards allocation of 1% of GDP into research.

There is need to sensitize the private sector, including individuals, business entities, trade unions and community organizations to effectively participate in S&T development and in sponsoring research programmes. In addition, the Government needs to put in place incentives for the private sector to fund research in general and STI in particular.

2.3.4 Government, Industry and Academic Linkages

(a) The Business Sector-Academic Linkages

Like at regional level, Tanzania's institutional landscape is the weak linkages between R&D institutions and industries accompanied by poor communications between the higher education and research institutes and the private sector (Diyamett et al. 2011). The Private Sector which is composed by 88% of SMEs is less export oriented and has low level of competitiveness and is rather resistant to invest in R&D initiatives. Further to that, most of the larger industries are owned by foreign firms while small and medium industries are owned by the indigenous, which have unfortunately failed to

establish linkage with the large industries as their suppliers or subcontractors for supply of inputs such as of raw materials and spare-parts. An example of these phenomena is presented by the breweries, pharmaceuticals and mining companies which import more than 90% of their inputs.

(b) Government-Business Sector Linkages

Policies aimed at attracting Foreign Direct Investments (FDIs) were established as from 1980s. Through the Government reforms in the financial institutions, civil service and other areas, in this case, the Tanzania Government managed to attract FDI inflows. FDIs entry mode options in Tanzania included mergers and acquisition of local companies and investments in new enterprises, in the form of green field investment (Diyamet et al. 2011). However, except for mining, beers, cement and fishing industries, FDI inflows were insignificant and the country as of now still has a long way to go to approach the levels of leading emerging economies. Some of the factors hampering an increase in inward FDIs, include skill shortages and infrastructure-related shortcomings as well as energy capacity. So far foreign investment in Tanzania has played a marginal role in enhancing industrialization. This is due to the following:

- (i) Large enterprises such as TBL and Kahama Mining Company still rely on foreign research institutes/universities. This is a major limitation, as enterprises need to work with local institutions in developing R&D activities, thereby strengthening local capacity and capability.
- (ii) The presence of multinational corporations (MNCs) in Tanzania has not played a profound role in shaping the structure of markets, and the pace and direction of technological change.
- (iii) MNCs have not provided an opportunity for learning, transfer of skills and knowledge through supplier networks and spill-over effects.

2.3.5 Academia-Industry Linkages

(a) Technology Incubators

The previous efforts of establishing incubators in the country were spear headed by the College of Engineering and Technology (CoET) and University of Dar es Salaam Entrepreneurship Centre (UDEC) in collaboration with the Small Industries Development Organization (SIDO), and the Ministry of Industry and Trade as from 2001. The main aim was to provide technical and business support to assist SMEs to add value to their products (Kimambo *et al*, 2005; Nyichomba 2010). The programme was funded by Tanzania Gatsby Trust (TGT) which received funding from the Gatsby Charitable Foundation and the Ashden Trust of the United Kingdom and the Carnegie Corporation of New York. The programme was intended to assist students from higher learning institutions in their start-up business. However, the programme ended in 2010 with the first phase support to Small and Medium Enterprises (SMEs) when the Carnegie Corporation and TGT support to several University research and training programmes ended. The scarcity of financial resources, lack of expertise and experience in developing and managing the sustainable incubators established in

Tanzania by donor - funded projects is the main cause of failure for a number of incubators.

In 2013, COSTECH facilitated the establishment of the Dar Technology Business Incubator (DTBi) Programme that has created an innovation corridor that nurtures the innovation spirits of young entrepreneurs including start-up ICT companies. This incubator has attracted a number of young people from Colleges and Universities who had business ideas and who need assistance in developing them into business start-ups. Some of these young people have been able to establish spin-off firms from their ideas especially in the areas of ICT. The whole idea of COSTECH intervention is to change the mentality of students as well as researchers to consider a business venture in their research works and subsequently establish channels to formally allow researchers and research institutions to create spin off companies. This has in turn created awareness to a number of R&D institutions such as Mzinga Corporation Limited, TEMDO, TATC and CAMARTEC on how they can commercialize their research results. There are also other projects such as The Information Society and ICT Sector Development Project (TANZICT), Tanzania Education and Research Network (TERNET), and Mobile Mathematic which are ongoing and are being coordinated by COSTECH.

However, given the fact that COSTECH has other mandates of overseeing Science Technology and Innovation (STI) and hence its contribution to economic growth of the country, it is important that it is assisted by higher learning institutions and other R&D institutions to effectively run the incubators in the country (URT 2013).

(b) Cluster Systems

The University of Dar es Salaam was the first, in the country, to establish clusters in 2003 focusing on growing indigenous innovations and SMEs. The main objectives of ISCP-Tz were to develop the change of mindset towards appreciating and striving for enhanced quality and competitiveness in innovations; and to enable the clusters to work out and implement strategies for improved productivity, and in accessing reliable markets. Through the programme 126 cluster facilitators were trained. The programme established 19 clusters in total; 8 in 2006 and 11 in 2008. The clusters have a total of about 4,000 enterprises and farmers. However, the scarcity of financial resources, lack of expertise and experience in developing and managing the clusters along with all the technical business support including financial services hindered the sustainability of the said initiatives.

2.3.6 Summary on the Case Studies Reviewed and Lessons for Tanzania

The important lessons for Tanzania's efforts to develop a strong and effective STI system include the following:

- (i) Industrialization agenda is well embedded in multiple major global, regional and national policies Thus, COSTECH should take a lead in facilitating and supporting the establishment of spin-off industries from research results, national flagship projects as well as in other earmarked areas that are aimed at promoting

- industrialization.
- (ii) Establishment of a nationally-owned and led mechanism/s to foster science and technology development including funding.
 - (iii) The importance of developing critical masses of STI human resources and wide STI culture.
 - (iv) The importance of promoting the capacity for private-sector lead STI investments.
 - (v) Strategies to make use of regional and international opportunities to support R&D activities in the country should be developed.
 - (vi) The success of any industrialization programme requires the creation of an enabling business climate that enhances domestic capacity and capability, in terms of physical and social infrastructure, human capital, financial systems, technology and governance.
 - (vii) R & D institutions must strengthen their partnerships with industry and Government, develop more transparent protocols for treatment of intellectual property issues, and support more research programs with practical application to the technical and business facing the industry.
 - (viii) The University incubators in the UK and India are supported in the form of grant by the Government, Trusts or some other organizations to put up the workspaces. The management of incubators is therefore through private contracted companies by the Government or the University enterprise.

3 INTERNAL SITUATION ANALYSIS

3.1 Review of the Previous Strategic Plan's Performance

3.1.1 Objective 1: To enhance capacity for evidence-informed decision among policy makers and other stakeholders

One of the major achievements with regard to enhancement of evidence-informed decisions is the ability of COSTECH to organize and participate in scientists-policy makers interactions events. For example, the Commission participated in both national and *Global 2013 Smart Partnership Dialogues*. Smart Partnership Dialogue is a brainchild of the *Commonwealth Partnership for Technology Management*. The dialogues seek to promote creative cooperation between the government and other sectors contributing to socio-economic activities and build upon the positive ethos of 'prospering thy neighbor' for 'a win-win' situation.

In terms of use of research output for decision making, a number of achievements were registered by the Commission. One of these is the recommended review of Regulations of the Environment Acts based on the current research evidence on the use of genetic modified organisms. The outcome of this is the order from the Government to revise the regulations to enable cotton growers in the country to benefit from bio-technology.

Other outcomes related to this objective include the inclusion of science, technology and innovation in the MKUKUTA II and Five years Development Plan and Long-term Plan perspectives. With the advice from COSTECH, in Zanzibar, the Directorate of Policy, Planning and Research has been established and this has facilitated research outputs being used for policy making decisions and hence contribution to socio-economic developments. Also, the commission has been able to organize a number of scientific meetings, exhibitions and international collaborations all of which with the aim of sharing STI knowledge among the stakeholders.

3.1.2 Objective 2: To increase knowledge generation and innovation that address national priorities in research and academic institutions

There are a number of achievements which COSTECH registered with regard to increase in knowledge generation and innovation in the country. COSTECH was able to play its role of research coordination by approving various research projects from local and international settings and various sectors. All approved projects are in line with National Research Priorities (1998) and completed Zanzibar Research Agenda (2015). Also, the National Research Agenda (NRA) for the Tanzania mainland which set research priority will be completed in May 2016. These NRAs will ensure that the generated knowledge addresses national priorities.

The Commission managed well the National Fund for Advancement of Science and Technology (NFAST) by supporting human resource development, research infrastructures and R&D Institutions. For HR resource development, the fund supported 517 researchers (343 MSc and 174 PhD) from various R&D institutions studying at MSc

and PhD in various universities in the country. Plans are underway to build capacity in areas of oil and gas sector in partnership with other stakeholders. Support for R&D institution and research infrastructures were also extended to 22 R&D institutions including NIMR, Tabora, Kizimbani Research Institute, Zanzibar, Naliendele Agriculture Research Lab, Tanzania Fisheries Institute (TAFIRI) and so many others.

At least 59 research projects were also funded and some of which had a very positive outcome to the society. Some of these projects are:

- (i) Development of thermo-stable trivalent vaccine for control of major respiratory poultry diseases;
- (ii) Locally developed Newcastle Disease (ND) vaccines (MG 1003), which will soon be validated;
- (iii) Screening of 262 wheat accessions and two varieties –to be released in two year from now;
- (iv) Four QDS of maize namely, Staha, TMV1, Kilima and Stuka were produced by 14 engaged contact farmers in Kongwa district;
- (v) Cassava varieties tolerant to Cassava Brown Streak Disease (CBSD) and Cassava Mosaic Disease (CMD) have been developed resulting to increased productivity and food security in the study areas.
- (vi) Selection of local chicken lines have shown that Kishingo and Horasi perform better in terms of age at first laying, egg number, body, hatchability and survival rate. The two promising ecotypes need to be produced and commercialized.
- (vii) Stable crabs hatchery system, environmentally friendly and efficient has been developed in Zanzibar and can be further used for research and training in marine sciences and mari-culture.
- (viii) Development of five varieties including Salama M57, M19, Samala M55, IITA 235, Salama M35 of rice resistant to Rice Yellow Mottle Virus (RYMV).
- (ix) Development of three lines high yield orange fleshed Sweet Potatoes Zanzibar (SPZ07/900, SPZ07/629 and SPZ07/951).
- (x) System of Rice Intensification (SRI) technology proved the highest yield of 7.5 tons/ha in comparison with 2 tons/ha under normal farmer's condition.
- (xi) The application of weaver ant biological control in the project sites was observed to be effective similar to application of full Integrated Pest Management (IPM) technologies.

Other developments were recorded in the undertaking of the commissioned research, establishment of the Joint Funding scheme of TASENE (by COSTECH, SIDA AND NOW/WOTRO) and launching of a Booklet for research funding opportunities.

3.1.3 Objective 4: To increase access of information and use of knowledge and technologies

During the period of implementing the expiring plan, the Commission managed to achieve a number of milestones. These include: (i) New cluster development initiatives (ii) DTBi Innovation Program Promotion (iii) Commercialization of projects for sustainable socio-economic development and (iv) Establishment of TanzICT.

With regard to new cluster initiative, so far 26 new clusters have received seed funds from COSTECH and they are engaged in oil seed value addition, ICT, fish, livestock keeping etc. DTBi Programme has created an innovation corridor that nature the innovation spirits of young entrepreneurs, including startup of ICT companies. On the commercialization of project, a number of institutions have benefited and these include Mzinga Corporation Limited, TEMDO, Tanzania Automotive Technology Centre (TATC), and CARMATEC. The establishment of TanzICT has been instrumental in steering efforts for creation of Tanzanian innovation program, strengthening the institutional capacity of MCST, and supporting the revision of the national ICT policy and start of the implementation.

3.1.4 Objective 5: To enhance public engagements in science technology and innovation

One of the functions of the COSTECH is to acquire, store and disseminate scientific information to the public. As such, the Commission has been accomplishing this function through engaging the public in various ways such as participation in Radio and TV programmes, using of training workshops, newsletters, and improvement of COSTECH website. Also, efforts to establish management and e-library for higher education and research institutions are in good process and once these are completed, this will provide a very good avenue for sharing STI ideas, especially among higher education and research institutions.

3.1.5 Objective 6: To meet the expectations of internal and external stakeholders on corporate services

In order to meet the expectations of internal and external stakeholders, the Commission implemented various measures to improve its service capacity. These included, among others, reforms of its organisational structure and recruitment of competent staff in vacant positions. Furthermore, COSTECH adopted Performance Management System using a Balanced Score Card which was formalized in June, 2013 and operationalized in July, 2013.

Rehabilitation of COSTECH office building along with landscaping of the area has been completed, enabling a good working environment. Furnishing of the conference hall is being finalized. In addition, a new Scheme of Service, Job description and Salary structure was prepared and approved by treasury registrar. Implementation of Salary structure has begun in July 2012.

3.1.6 Conclusions on the previous strategic Plan Performance Review

Based on the planned activities for the year 2009-2012, the Commission has managed to achieve some of its targets. However, there were several challenges that caused the Commission not to meet some of its targets. The challenges include, among others:

- (a) Government budgetary constraints;
- (b) Inconsistent cash in some years, especially during the financial year 2012/13,
- (c) Inadequate number of competent scientists in the R&D institutions and Universities to undertake competitive research; and

- (d) Lack of modern research facilities and conducive research environment has failed to attract and retain eminent scientists because others competitors are offering much better terms.

However, the Commission is committed to address these challenges so as to meet the national development objectives as related to STI. This new strategic plan has therefore considered the important need to address the unfinished business from the outgoing strategic plan.

3.2 Review of the First Year of the 2015/16 to 2020/21 (2016/17) Strategic Plan's Performance

The first year of SP (2016/17) implementation ended on 30th June 2017. The following are the achievements during the stated period. These achievements are based on each strategic objective as summarized below:

Objective 1: To strengthen evidence – based decision-making culture

One of the major achievements with regard to strengthening evidence – based decision-making culture is that the Zanzibar Cabinet Secretariat has introduced a new format of preparing and presenting Cabinet papers which includes elements of evidence decision making. COSTECH has successfully advised the government and coordinated the preparation of the guideline on the use of drones. In this regard, the Ministry of Works, Communication and Transport through the Tanzania Civil Aviation Authority (TCAA), in collaboration with the Ministry of Defence and National Service have issued the guideline that guide the flying of drones in Tanzania.

Objective 2: To promote industrialization through a wide application of technologies

COSTECH was able to play its role by convening the first STI forum to key stakeholders on manufacturing focusing on leather, diary, edible oil and textile sub sectors. This forum established technology needs and gaps, with regard to scientific cooperation, innovation and capacity – building. However, due to the budget constraints there was no implementation with regard to agreed resolutions. Further to that, COSTECH was able to establish the status of technology capacity on the unpacking technologies from the FYDP 2016 – 2021 national flagship projects on an integrated Liganga V-Ti Magnetite ore and Mchuchuma coal project. The study also established recommendations on skills requirements based on the basis of the unpacking of technologies. The above however needs to be disseminated to key stakeholders so as to support the industrialization agenda.

Also, COSTECH supported digital skill development, innovation and creation of a conducive environment by establishing and facilitating a Mechatronics lab at DIT and therefore enabling DIT students and industry workers to receive mechatronic training. Also, COSTECH supported TIRDO to renovate and refurbish its coal laboratory. The laboratory experiment was able to assess the quality of coal mined at Kiwila and hence enabled the Dangote Company to utilize them to run the cement plant in Mtwara.

In terms of improving startup companies and transfer of technology, COSTECH developed and transferred emerging technologies of 3D Printing and unmanned aerial

vehicles (drones). Through the innovation space (BUNI hub), COSTECH was able assembled three (3) 3D Printers using the electronic wastes. The 3D printing products are used as teaching aids in various schools (including Kijitonyama Primary School). In addition, through the BUNI hub, three (3) drones were assembled. The assembled drones were tested during various COSTECH operations including mapping of areas of Songwe region, Zanzibar and Kilimanjaro International Airport (KIA).

Objective 3: To increase strategic research with national impact

During the first year of implementing the plan, the Commission managed to achieve a number of milestones such as: (i) Development of the National Research Integrity Framework (ii) Establishment of National Postdoctoral Research Framework (iii) Review of the Grant Manual to include an innovation granting component. Also, COSTECH funded a number of various research projects in the country including supporting 25 projects. In terms of research capacity building, the Commission was able to support 21 technical personnel in cyber and network security from the Tanzania Peoples Defense Forces. In addition, the Commission supported research infrastructure development at the Tanzania Livestock Research Institute (TALIRI – Tanga) and Tanzania Fisheries Research Institute (TAFIRI) – Sota Centre in Mara.

Objective 4: To strengthen science, technology and innovation culture

One of the functions of the COSTECH is to acquire, store and disseminate scientific information to the public. In order to reach a wide range of stakeholders, the COSTECH disseminates scientific and technological information through newspapers, social media networks, radio, and TV programs as well as through producing promotional materials such as banners, brochures, flyers and posters. During the reporting period, COSTECH performed the following: (i) participated in the 5th Annual National Science, Technology and Innovation Conference that took place from 23rd – 25th August 2016, (ii). organized and conducted a live broadcasting of a two-day event organized by Kavazi la Mwalimu to commemorate 50 years of Arusha declaration, (iii) prepared six STI programs (3 TV/Social media programs and 3 Radio programs), and (iv) published 105 articles in both Kiswahili and English newspapers.

Objective 5: To strengthen COSTECH institutional capacity

In order to meet the expectations of internal and external stakeholders, the Commission implemented various measures to improve its service capacity. These included, among others, (i) conducting statutory Commission, Workers Council and R&D meetings, (ii) increasing the use of ICT as an enabler/tool of COSTECH core and support operations, (iii) integrating information and decision management systems by introducing Human Resource Management Information System (HRMIS), Accounting system (EPICOR), Electronic Document Management (EDMS) system, (iv) building capacity to forty-nine (49) employees on short term training and 4 employees on long term.

3.3 Summary and conclusions on the first year of the 2015/16 to 2020/21 that is 2016/17, Strategic Plan Performance Review

Apart from having a number of achievements, during the first year of implementing, COSTECH encountered the following challenges:

- (i) Inadequate sustainable and well allocated research funding;
- (ii) Delayed or non-disbursement of government subvention;
- (iii) Weak linkage between productive sectors and R&D institutions for transformative technology development and commercialization;
- (iv) Inadequate human capability development in Science, Technology and more importantly on Innovation;
- (v) Dilapidated research infrastructure and facilities;
- (vi) Lack of coordination between the various research centres and the stakeholders;
- (vii) Reduction and/or non-disbursement of Other Charge budget funds;
- (viii) Non- approval of staff recruitments and promotions permits, and
- (ix) Institution weak revenue base.

Despite the above achievements of the first year of the 2015/16 to 2020/21 that is 2016/17, there is a number of activities were left out due to the budget constraint and inadequate human resource. Such activities include creating of database for technology for driving rapid industrialization, build capacity for enhanced innovation and increased R&D outputs for high quality products, processes and services.

Of more importance, there were no activities which were planned for COSTECH to support the industrialization agenda especially in the areas of manufacturing which is currently recording less than 10 % of the country's GDP. In order for any country to industrialize, the manufacturing sector must contribute more than 30% of GDP (URT (2012a). Thus, the Commission is committed to address the issue of industrialization from the outgoing Strategic Plan.

3.4 External Stakeholders Needs and Expected Value from COSTECH

This Section assesses various stakeholders' value expectations from COSTECH and includes both external stakeholders that comprise policy makers and the private sector as well as external stakeholders Ministry of Education, Science, Technology and Vocational Training, higher learning and R&D institutions. The Chapter goes further carrying out SWOT analysis for the Commission.

3.4.1 Policy Makers

(a) The Government of Zanzibar

Government of Zanzibar expects from COSTECH research funding, STI capacity building, support for strengthening research infrastructure and tools and support for strengthening STI culture and evidence-based capacity building². Also, COSTECH needs to have a sharp focus on promoting technologies, which would have substantial and rapid national impact. Further to that, it needs to ensure that research results and innovations readily reach and transform the grassroots by addressing the challenges people face in agriculture, fishing, markets and tourism.

Moreover, COSTECH needs to assist the Government in promoting evidence-based policy making and planning by creating awareness amongst politicians, planners and officers; capacitating the Planning Commission in evidence-based decision making and establishing a research evidence database. Finally, the Commission needs to have a noble role of helping the country learn from the international community especially with respect to the emerging technologies and high impact medical technologies, mobile technologies and others that can support such initiatives as e-government technologies, e-health, e-tax, e-education and e-connectivity.

(b) Government of Tanzania ³

Likewise, the Government of the United Republic is increasingly putting emphasis on evidence-based decision-making. In this case, The Government thus expects COSTECH to assist the MDAs in to build their capacities for evidence-based decision making (policy making and planning). Furthermore, COSTECH needs to accord greater priority in assisting the country to leverage on new technologies to support the business of government through promoting STI culture and promoting greater and permissive use of ICTs.

COSTECH is also expected to support the Government in its policy-making roles in furtherance of innovation and techno-entrepreneurship in all sectors of the economy. COSTECH needs also to research and advice on the policy levels that Government (MDAs) can use to encourage innovation and entrepreneurship. Likewise, COSTECH is expected to

² Interviews with the Chief Secretary – Dr. Abdulhamid Y. Mzee – on the 27th February, 2015 & of Mr Amour Hamil Bakari – Director of Planning, Policy & Research- President's Office, Zanzibar

³ Based on Interview with Chief Secretary – Mr. Ombeni Sifue – at the State House- March 6th, 2015

work together with MDAs on e-Government in order to transform the way the Government delivers its services, that is, to be able to deliver services anywhere and in anytime. Equally important, COSTECH is expected to promote emerging technologies in the country – principally through establishing linkages between academia and industry. COSTECH is further expected to advise the government on the ways that it can have stronger policy and institutional frameworks that support rapid developments and use of STI in the country. The Government strongly desires that innovation becomes part and parcel of each institution in the country.

(c) Ministry of Education, Science and Technology⁴

The Ministry expects COSTECH to play bigger role in advising the Government especially on STI policy issues, to promote greater and wider sharing of research outputs and to expand its outreach in the country so as to be closer to more Tanzanians, including the rural areas where there is a lot of potential innovators. The Ministry has the opinion that COSTECH can also play a more active role in supporting MDAs in building their capacity to use evidence. Notably, for example, the Ministry's usage of evidence-based decision-making is rather limited for a number of reasons including limited research outputs. The Ministry further anticipates COSTECH will continue to accord greater attention to assisting the country to adopt and adapt new and emerging technologies with rapid and high socio-economic impacts especially in bio-technologies/Bio economy and local production of information technologies.

3.4.2 Private Sector

Most of the R&D activities in the country place undue emphasis on theoretical basic research rather than helping the private sector utilize and apply scientific and technological knowledge so that even the so-called “low tech” activities become more competitive and generate more domestic value added with a strong emphasis on applied research and engineering. Also, there are insufficient efforts to attract the private sector into contributing significantly to the national R&D by way of sharing in sponsoring research programmes, whether thematic or otherwise. Quality of research results in the country is an issue that discourages the private sector from using local research outputs and prompts them to seek research findings from international agencies. There exists neither institutional nor national mechanism for assessing research performance by stakeholders in the country.

Through various arrangements, COSTECH could help to strengthen academia-industry linkage as to encourage up-taking of research results by the private sector. Further to that, COSTECH could advocate for incentives for the private sector to invest in research including the provision of tax exemptions and rebates, creating endowments by which private industries, commercial companies and private groups could inject a significant proportion of starter-capital, jerking-capital or else supplementary funds into well-defined research ventures of positive. For effectiveness in research to be realized,

⁴ Based on Interview with the Director of Science and Technology, Evelyne Mbede & with the Assistant Director – Science and Technology – Ms Margareth M. Komba, both of the Ministry – on the 24th of February, 2015.

COSTECH must also ensure that, performance monitoring and quality assurance system has to be in place

In advanced industrial economies⁵, small and medium-size enterprises have developed much of the innovative and cutting-edge technology (Andreas, 2003; Gibb and Li, 2003). For that to happen, first, SMEs need to be provided with holistic enterprise development support, including incubation and financial support. Second, SMEs need support in respect of assessment of market demand and potential so as to ensure that they develop products and services that the market needs. COSTECH therefore can help foster the growth of SMEs by creating business and technology incubators, supporting clusters, and establishing export-process zones. Further to that, COSTECH should also advocate for SME policy (2003) to be supported by an Act so as to enhance SME participation in development ventures through both the government and private sector tendering.

3.4.3 Higher Learning Institutions

Universities have different roles to play especially in influencing developmental issues. The core roles of the universities include teaching, research and community service (consultancy). Also, capacity development and enhancement, innovation, and Policy review. However challenges and constraints are there such as poor coordination including prioritization. Universities can therefore overcome these constraints by setting national priorities, engaging competent personnel with national vision and focusing on promotion of science and technology for the betterment of the whole nation.

Despite the massive Government efforts through COSTECH to invest in capacity building in STI, the available evidence shows that there is low interest by academic staff to fully invest their time on research and development work. This is due to the failure of researchers to realize the potential returns from research (Nyichomba, 2005). Furthermore, there is no conducive environment for researchers to undertake innovative work such as an attractive working environment, performance-based incentives and improved conditions of service in order to encourage creativity and inventiveness. In addition, investment in equipment features hardly at all across most of the higher education and R&D institutions. Similarly, the deterioration of physical research facilities and the decline in the operational funding per scientist both contribute to poor research outputs and quality in the country

There are also inadequate mechanisms for research results to be incubated prior to full scale application or transfer. This needs to be complementing the existing Tanzania Awards for Scientific and Technological Achievements (TASTA) and that of National Award for Research in Science and Technology (NARST) to researchers. For the purposes of promoting professionalism among young professional scientists in the various sectors of the economy, it will be necessary by COSTECH to put up a more pro-

⁵ Andreassi T. (2003) "Innovation in Small and Medium Sized Enterprises". *International Journal of Entrepreneurship and innovation management*. 3(1/2). 99 - 106

Gibb, A and J. Li (2003) "Organizing for Enterprise in China: What can we do to learn from the Chinese Micro, Small and medium Enterprise development Experience" *Futures* 35(4): 403 -21

active plan than the one which was envisaged to lead to establishment of a fund for professional development in the 1996 national S&T policy through participation in the new national and international scientific and technological fora.

To a large extent, industrial innovation depends on aligning the flow of knowledge to knowledge-supply chains aimed at enhancing customer-service. It is important that industry and R&D institutions form key links in those chains. COSTECH will ensure that a focus on demand-driven research and on encouraging researcher interaction with economic situations and problem-solving alternatives rather than the current practice of the academia conducting research for only scientific curiosity. This needs to be guided by the national research agenda which is inclusive.

There is need also to strengthen partnership between R&D institutions and the private sector (industry) in the development of joint research and development programmes for practical application to the technical and business problems facing the nation/industry/private sector. This also should in line with sharing of equipment and machinery between industries and higher learning^{and} R&D institutions. Further to that, there is a need for the Government to assist higher learning institutions to establish incubators with a view of accelerating commercialization of research results and technologies developed the researchers. Also, researchers should be trained to write fundable proposals so as to ensure that their research works are funded.

3.4.4 R&D Institutions⁶

R&D institutions have major roles, which include research, developing technologies towards commercialization as well as to engage with industries to address social economic problems that require STI interventions. R&D institutions therefore expect COSTECH to continue to support them in capacity building, research funding, setting the national research agenda and facilitating the linkage between R&D, academia and industry. Further they expect COSTECH to create forums for bringing academia, R&D, industry and policy makers together to exchange on STI issues (e.g., space for displaying of technologies available in the country and supporting STI conferences as well as new and emerging technologies exhibitions. COSTECH needs to assist R&D institutions address capacity weaknesses in promoting and generating innovations based on the research they do.

In the view of strengthening R&D institutions, COSTECH needs to create an effective link between policy makers and R&D results by supporting existing journals, supporting the production and dissemination of policy briefs based on R&D results and by supporting shared online database of research results and innovations that is accessible to all stakeholders. The R&D institutions consider the priorities for COSTECH to be knowledge translation (e.g., policy briefs), knowledge repackaging, policy dialogues, and periodic identification policy priorities. Additionally, the attention needs to be on building national capacity for STI policy analysis and supporting R&D institutions to

⁶ Based on interviews with Dr. Ludovick C. Manega Director of Industrial Research – TIRDO and with Dr Leonard E. G. Mboera, Chief Research Scientist/Director of Information Technology & Communication, National Institute for Medical Research

establish linkages with international R&D institutions and focus on internal and external collaborations.

3.5 SWOCs Analysis of COSTECH

Error! Reference source not found. presents the most significant COSTECH Strengths, Weaknesses, Opportunities and Challenges which need to be addressed and discussed in the previous sections. In this reviewed COSTECH's Strategic Plan 2016/17- 2020/21 consideration has been made in respect to industrialization issues.

Table 3.1: COSTECH Strengths, Weaknesses, Opportunities and Challenges

Strengths	<ul style="list-style-type: none"> (i) Most of the directorates have functional organizational structure where the directorate roles and responsibilities which are clearly elaborated (ii) Strong brand & reputation with government, public, and private stakeholders; well respected talent (iii) Ability to coordinate and evaluate research (iv) Ability to coordinate and convene stakeholders and ecosystems to solve problems (v) Ability to solicit and structure funds from donors (vi) Emerging focus on technology entrepreneurship & grassroots innovation (vii) Emerging ability to be the “broker” of choice between international and local institutions, as well as between intra-country institutions (viii) Existence of mechanisms that allow academics and researchers to establish spin-off firms based on their research findings (ix) Well-documented procedural manuals for financial management and HR management; (x) Strong financial supervision and budgetary control and good surplus cash investment strategy (xi) Strengthened and supported technology brokerage systems that could facilitate identification, acquisition, adaptation and diffusion of feasible technologies from within and elsewhere (xii) Ownership of 500 acres of land for broad public and private use (xiii) Presence of basic management structure, facilities and staffing (xiv) Established large variety of networks and collaborations (xv) Established framework for the development and transfer of technology through the National Centre for the Development and Transfer of Technology as per the COSTECH's Act (xvi) Establishment of the NFAST Innovation Fund Window (xvii) Existence of the EPICOR financial management system (xviii) Collaborative work with Technology and Innovation Agency (TIA) of South Africa in issues of Up-scaling and Commercialization.
Weaknesses	<ul style="list-style-type: none"> (i) Inadequacy of highly trained specialists and other experts who are adequately educated and suitably trained to handle broader responsibilities (ii) There exist resource constraints by way of budgets and discretionary spending as well as low motivation among staff to establish links (iii) Inadequate sustainable and well allocated funding for research and innovation (iv) Weak linkage between Productive Sectors and R&D institutions for transformative technology development and commercialization (v) Lack of effective communication strategy and the presence of event management system which can help the organization arrange the events/meetings in a scientific manner and publicizing COSTECH through the e-newsletter and website (vi) Ineffective monitoring and coordinating research (vii) Low understanding of stakeholders' needs (viii) Inadequate technology transfer, diffusion, and commercialization (ix) Spread too thin, little strategic focus, resource allocation is not optimized for

	<p>biggest impact e.g. IT, Manufacturing, Nanotechnology, Material sciences and Biotechnology</p> <p>(x) Portfolio heavily skewed towards “sustaining” innovations with incremental impact; insufficient focus on borrowing & replicating technologies</p> <p>(xi) Resource constraints by way of budgets and discretionary spending</p>
Opportunities	<p>(i) Enabling economic transition into strategic industries e.g. x-processing, manufacturing, services, BPO, & ICT enablement (e.g. tech parks)</p> <p>(ii) Bridging the large gap between academia and industry, between research & commercialization</p> <p>(iii) Effectively attracting/ brokering FDI, talent, capabilities, and knowledge</p> <p>(iv) The Internet has made it possible to share scientific knowledge that is relevant to local developmental needs more widely than ever before.</p> <p>(v) It has been able to supervise many ICT projects such as Ternet, STHEP, mobile mathematic, etc.</p> <p>(vi) There are possibilities for COSTECH to make use of prominent development partners such as the World Bank, Tigo, Vodacom, TechnoBrain, Microsoft, etc. to sponsor ICT projects.</p> <p>(vii) Effective utilization of the established programmes by COSTECH such as DTBi, TANZICT, TERNET, Mobile Mathematic, and other projects which could publicize COSTECH.</p> <p>(viii) Promoting grassroots innovation and entrepreneurship (incubators, capital, skills, access to IP, etc.), and enabling the SME segment through research, tech transfer, and commercialization</p> <p>(ix) Play a transformative role in agriculture, largest employment sector in the country</p> <p>(x) Becoming the defector experts at technology forecasting, evaluation, and sourcing</p> <p>(xi) Capacity building in the use of technical and scientific information to develop appropriate technologies to address societal development challenges of the country</p>
Challenges	<p>(i) Limited institutional powers to influence R&D institutions and others</p> <p>(ii) Despite tremendous efforts in agricultural research, the impact has been limited and there has been no significant increase in agricultural produce.</p> <p>(iii) Existence of competition between COSTECH and other private entities in the country in attracting research funds.</p> <p>(iv) Little impact in some sectors such as energy, forestry, mining, manufacturing and transport.</p> <p>(v) Misplaced focus on basic and applied research and incremental improvements to the national STI ecosystem</p> <p>(vi) Inadequate sustainable and well allocated funding for Tanzania’s research system and technology development and commercialization</p> <p>(vii) Ineffective intellectual property rights management</p> <p>(viii) Weak linkage between Productive Sectors and R&D institutions for transformative technology development and commercialization</p> <p>(ix) Inability in building “absorptive capacity”</p> <p>(x) Limited R&D and innovative capacity at the enterprise Level</p> <p>(xi) Unregulated Informal sector – limited systematic STI approaches</p> <p>(xii) Inadequate human capability development in Science, Technology and more importantly on innovation</p>

4 THE PLAN: 2016/17 – 2020/21

4.1. Introduction

The core of COSTECH Strategic Plan for 2016/17 – 2020/21 comprises of the Commission’s critical strategic issues, vision, mission, core functions, core values, strategic objectives, strategies, targets and a five-year implementation plan. These are described in this Chapter.

4.2. Critical Strategic Issues

The situation analysis as presented in Chapters Two and Three suggests that COSTECH has an exciting opportunity to make significant contribution to the country’s social-economic development through greater and strategic promotion of science, technology and innovation. In order to make such a contribution, during the period 2016/17 – 2020/21, the Commission will focus on the following critical strategic issues:

1. Evidence-based decision making
2. Industrialization through wider application of technologies
3. Strategic research with national impact
4. Science, Technology and Innovation culture
5. COSTECH Institutional Capacity

4.3. Vision

The Commission is inspired by the vision:

To be the prime driver of science, technology and innovation for sustainable development in Tanzania

4.4. Mission

With the framework of Tanzania’s STI policy, the Commission has as its principal mission:

To build and support a strong system of sciences, technology and innovation for sustainable socio-economic development

4.5. Core Operational Functions

In pursuit of its mission and vision, the Commission will embrace and undertake five (5) core operational functions:

- (a) **Driving Technology Advancement:** Knowledge & technology generation & technology transfers, dissemination and brokering.
- (b) **Driving Large Scale Innovation & Entrepreneurship:** Leadership & facilitation of early stage ventures, incubators, & SME commercialization.
- (c) **Enabling High Value Research:** Market/Industry-driven research and answering critical questions of national/ public priority.

- (d) **Informing Stakeholder Decisions:** Enabling evidence-based decision-making & informing public and stakeholder opinion in related to STI issues.
- (e) **Enabling Sustainable Economic Development:** Promotion and supporting conservation of biodiversity and natural ecosystems and balancing growth & industry development with environmental objectives.

4.6. Core Values

To support and enable the delivery of the strategic objectives, the Commission is committed to the following set of core values:

- (a) Excellence and pursuit of best results;
- (b) Commitment and institutional pride;
- (c) Collaboration, partnerships and cooperation;
- (d) Team work and spirit of service;
- (e) Responsibility and sense of urgency;
- (f) Creativity, innovation and entrepreneurship; and
- (g) Learning and transfer of ideas.

4.7. Strategic Objectives

In pursuit of the stated institutional vision, the Commission will be guided by the following strategic objectives, which are based on the above-prioritised critical strategic issues for the period 2016/17 – 2020/21:

Strategic Objective 1:	Evidence-based decision-making culture strengthened
Strategic Objective 2:	Industrialization through wider application of technologies promoted
Strategic Objective 3:	Strategic research with national impact increased
Strategic Objective 4:	Science, Technology and Innovation culture strengthened
Strategic Objective 5:	COSTECH Institutional Capacity strengthened

For each strategic objective, the Plan presents its key rationale, strategies, targets to be realised, outcome indicators and expected positive outcomes.

4.1.1 Strategic Objective 1: Evidence - based decision-making culture strengthened

Rationale

From the country's R&D institutions and universities and indeed globally, the output of research and development has been increasing substantially. This is happening while individuals and institutions in the country are yet to have a strong habit of evidence-based decision making. It is rather seldom that policies, laws, programmes, projects and interventions are firmly developed based on adequate and appropriate evidence.

Consequently, there is overreliance on gut feeling and unsupported information when making serious decisions, sometimes with very serious negative consequences. COSTECH will therefore continue to accord emphasis on promoting the culture of evidence-based decision-making culture. This is surely one of the best ways of demonstrating the value for money of efforts being invested in research and development.

Targets

1. A web-based, on-line database of synthesized research results established by July, 2017;
2. A comprehensive set of guiding frameworks and tools for facilitating evidence-based decision-making (planning, funding allocations, etc.) developed and disseminated by June, 2017;
3. Fifteen (15) Policy briefs & Project briefs produced per annum as from June 2017;
4. Twenty (20) Radio and TV programmes and Documentaries produced per annum;
5. COSTECH annual report produced and disseminated;
6. Six (6) STI dialogue forum organized per annum as from June 2017; and
7. Policy makers from 100 MDAs, Regional Administration (RA) and LGAs trained in evidence-based decision making by July, 2021.

Expected Outcomes

1. Increased use of evidence-based decision making by MDAs;
2. Increased public awareness on the importance of STI utilization;
3. Increased adoption of STI;
4. Increased public awareness on technology utilization; and
5. Increased adoption and utilization of STI recommendations by MDAs.

4.1.2 Strategic Objective 2: Industrialization through wider application of technologies promoted

Rationale

While Tanzania aims to become a semi-industrialized nation with a middle – income status by 2025 it has in place supporting national policies such as Second Five – Year Development Plan (2015/16–2020/21), and Long – Term Perspective Plan (LTPP: 2011/12–2025/26), Sustainable Industrial Development Policy (SIDP), and SME Policy of 2003 (URT 2003). In this regard, COSTECH recognizes Vision 2025 that the manufacturing sector has to grow annually by around 12% to 15% and manufacturing has to double its share in GDP from around 8% to 18%. Further to that, the Commission is closely aligned to regional and global development directions including the new 2030 Agenda of the United Nations especially goal No. 9 which aimed at promoting sustainable industrialization and fostering innovation.

In order to ensure that COSTECH facilitates matters related to the transfer, adaptation and development of technology including choice and assessment of technology the Commission has a number of targets to achieve such as ensuring that there is immense contribution of manufacturing industries to industrialization; effective utilization of innovation intermediaries for socio-economic development; increased technology uptakes, jobs creation from start-ups/SMEs, spin off companies and revenues; building technology capacity and capability in agro-processing, pharmaceutical, energy, construction, iron and steel; improving start-up companies and transfer of technology, and creation of conducive environment for FDIs. As for the transfer of technology, this will include: diffusion and effective utilization of high promising technologies such as biotechnologies, Material sciences/Nanotechnology; mobile technologies; big data (BD), ICT systems; digital technology, manufacturing and energy technologies through industrialization.

Targets

1. An innovation window within the National Fund for Advancement of Science and Technology established by December 2017;
2. Special revolving commercialization fund created under NFAST by June 2018;
3. The missing expertise for special industries such as material engineering, extractive industry, industrial minerals, industrial engineering, in five (5) manufacturing sub-sectors supported by June 2019;
4. Framework for transfer of technology through FDIs developed, coordinated and facilitated by December 2019;
5. Database for (multinationals, the locals, private sector and R&Ds) technology driving rapid industrialization developed and maintained continuously as from June 2018;
6. Twenty (20) SMEs based on grassroots innovation and Traditional Knowledge practices established and supported by 2020;
7. Extension services coordinated and supported through forging strong link with the local government to facilitate STI interventions in fifty (50) LGAs by June 2020;
8. Innovation intermediaries: (technology stations (1), Technology Transfer Offices (10), incubators (3), innovation spaces (10), clusters (15) and technology parks (1)) facilitated and promoted by June 2021;
9. Fifty (50) new products from various sectors through intermediaries supported and introduced into the market by June 2021;
10. Two (2) Pilot factories/Industries (Viwanda Darasa) for R&D outputs coordinated and facilitated by June 2021;

11. Ten (10) non-producing and less competitive industries revitalized in terms of technology by June 2021;
12. Capacity building (10 training programs) for enhanced innovation in provision of services in public sector conducted by June 2021;
13. Fifteen (15) R&D institutions and SMEs utilizing IPR particularly use of patent and non- patent information to develop appropriate technologies supported by June 2021; and
14. The status of technology capacity and capability in agro-processing, pharmaceutical, energy, construction, iron and steel and emerging technologies such as biotechnology, Material sciences/Nanotech; mobile technologies; big data (BD), ICT systems; digital technologies; established by 2021.

Expected Outcomes

1. Increased contribution of manufacturing industries in the GDP and hence industrialization;
2. Increased technology uptakes, jobs creation from start-ups/SMEs, spin off companies and revenues;
3. Increased effective utilization of innovation intermediaries for socio-economic development; and
4. Increased efficiency, effectiveness and resource utilization in public service delivery through innovation.

4.1.3 Strategic Objective 3: Strategic research with national impact increased

Rationale

In order to fulfill the objectives of increasing strategic research with national impact, a need for greater promoting of strategic research is quite important. The Commission in realizing this spearheaded the development of National Research Agenda (NRA) to guide the research work in the country. The research agenda should inform national development priorities as guided by Vision 2025, and implemented through other national frameworks such as MKUKUTA, MKUZA, Second Five – Year Development Plan (2015/16–2020/21), and Long-Term Perspective Plan (LTPP: 2011/12–2025/26). The Commission will therefore continue to promote and monitor the implementation of the NRA so as to achieve the desired national developmental goals including strengthening research to contribute to national industrialization agenda.

Targets

1. National postdoctoral research framework established by June 2018;
2. R&D outputs of high quality products, processes, and services (Publications, Patents, Licenses, Policy briefs) from postdoctoral research increased continuously as from June 2018;

3. National research journals supported for regional and international visibility by June 2018;
4. Research resource sharing mechanism developed by June 2018;
5. Twenty (20) multi-disciplinary research teams established and supported by June, 2018;
6. Incentive mechanism for productivity and quality research publications established by June 2018;
7. Five (5) Commissioned research projects gearing towards industrialization supported continuously as from June 2018;
8. Twenty (20) R&D institutions equipped with relevant laboratory facilities by June 2019;
9. Capacity building of all 76 R&D Institutions Review Boards (IRBs) conducted by June 2019;
10. Ten (10) Research and innovation chairs in strategic areas supported by June, 2020;
11. Research management information system including STI indicators established by June 2021;
12. Information platforms and repository linked to 76 R&D institutions by June 2021; and
13. Increased capacity of R&D institutions through HR and infrastructure development by June 2021.

Expected Outcomes

1. Improved research quality and ethics adherence;
2. Increased quality and quantity of researches that can be translated into companies and hence industrialization;
3. Increased linkages/collaboration between academia and industries;
4. Increased dissemination of knowledge from research;
5. Reduced cost of doing research, increased access to research facilities and improved human resource;
6. Improved quality and relevance of research for socio-economic development; and
7. Improved research funding, quality and capacity building.

4.1.4 Strategic Objective 4: Science, Technology and Innovation Culture strengthened

Rationale

Available evidence suggests that STI culture in the country is low. This is reflected in many facets; for example, more students, particularly women, prefer courses in social sciences and other disciplines to STI related courses. Also, the usage of STI in daily lives is quite low. Having realized this, COSTECH has been educating the general public about

the importance of science, technology and innovation for socio-economic development. The Commission through the Plan is resolved to make a major push in promoting STI culture amongst the Tanzanian general public.

Targets

1. ICT Platform for research management developed by 2017;
2. Internet bandwidth up to 4 STM - 1 (155 Mbps x 4) upgraded, supported and its contents disseminated by 2018;
3. Scientific information dissemination mechanism strengthened by 2017;
4. STI Knowledge Laboratory established by 2017;
5. Training workshops on science communications for journalists, bloggers, editors and researchers/scientists conducted by 2021;
6. 10 scientific exhibitions supported by 2021; and
7. Scientific popularization in primary and secondary school system established by 2017.

Expected Outcomes

1. Improved funding for research and timely reporting;
2. Increased access to research information and efficient communication;
3. Increased public awareness on STI;
4. Increased production of quality STI knowledge products (3-4 per annum);
5. Improved skills & knowledge on STI;
6. Improved COSTECH visibility; and
7. Increased interest of primary and secondary school students on STI.

4.1.5 Strategic Objective 5: COSTECH Institutional Capacity strengthened

Rationale

Science, Technology and Innovation (STI) have emerged as the major drivers of national development. As Tanzania aspires for faster and sustainable and inclusive growth, COSTECH being the coordinator of STI in Tanzania will need to expand its internal capacity to enable it playing a defining role in achieving Tanzania's national development priorities. In this case, the capacity of COSTECH must be strengthened to deliver the expected mandates of driving the STI agenda.

Targets

1. Fully integrated information and decision management system (Accounting, HR, procurement, intranet, repositories, EDMIS) developed by 2017;
2. Strategic capacity building conducted to at least 5% of COSTECH staff annually; and
3. Resource mobilization mechanisms for financing Strategic Plan and recurrent expenditure established by 2017.

Expected Outcomes:

1. Increased COSTECH operational efficiency and performance;
2. Enhanced informed decision making between different units within COSTECH;
and
3. Increased COSTECH's operational and STI funding.

4.2 Strategic Log Framework Matrix

Table 4.1 provides the Implementation Strategic Plan Matrix which shows the strategic objectives being pursued during 2016/17 to 2020/21 along with the planned outputs, the expected outcomes, indicators for outcome monitoring, indicative budget, time frame and the key officials responsible for coordinating implementation to achieve each planned target.

Table 4.1: Strategic Plan Matrix (Total Tshs. 162,102,983,618 indicative budget)

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
1: Evidence-based decision-making culture strengthened	1.1. A comprehensive set package of evidence-based decision & policy making frameworks, guidelines and tools for application developed and disseminated by June 2017	Increased use of evidence-based decision making by MDAs, RAs, and LGAs Increased public awareness on the importance of STI utilization	Number of MDAs, RAs, and LGAs using evidence - based decision making	634,664,000	<div><div></div></div>					DLS, DPS, DSS
	1.2. Fifteen (15) Policy briefs & Project briefs produced per annum as from June 2017	Increased adoption of STI	Number of public and policy makers aware of the importance of STI utilization	585,320,000	<div><div></div></div>					DSS & DKM
	1.3. 5 initiatives to review policies, legislations, and regulations by June 2021.	Increased number of Legal documents updated	Number of planners and budget officers competent in applying evidence-based decision making approaches and tools	300,000,000	<div><div></div></div>					DLS, DPS & DSS

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	1.4. 100 MDAs facilitated in evidence-based decision making by June 2021	Increased use of evidence based in decision making by MDAs senior officials	Number of MDAs, RAs, and LGAs officials applying evidence-based decision making by June 2021	92,934,000	<div></div>					DLS, DPS & DSS
	1.5. COSTECH website/ social media pages updated annually	COSTECH’s website regularly updated with current information	Number of hits on the COSTECH’s website per annum	294,990,000	<div></div>					DKM
	1.6. Twenty (20) Radio and TV programmes and documentaries produced per annum	COSTECH’s image enhanced through media outlets.	% of the public aware of COSTECH activities	100,000,000	<div></div>					DKM
	1.7. COSTECH annual report produced and disseminated	Increased public awareness of COSTECH’s activities	% of COSTECH stakeholders using annual reports	100,000,000	<div></div>					DKM
	1.8. Six (6) STI dialogue forums organized per annum as from June 2017	Increased public awareness on technology utilization (1 – 3 forums/dialogues per annum)	<div><div>➤</div>Number of forums held<div>➤</div>Number of technologies adopted</div>	292,934,000	<div></div>					DKM
Strategic Objective	2.1 An innovation	Increased effective	Number of	118,65,580,000						DIEC &

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
2: Industrialization through wider application of technologies promoted	window within the National Fund for Advancement of Science and Technology established by December 2017	utilization of innovations for socio-economic development	innovations based on COSTECH funding commercialised							NFAST
	2.2 Special revolving commercialization fund created under NFAST by June 2018	Increased technology uptakes, jobs creation from start-ups/SMEs, spin off companies and revenues	Number of start-ups/SMEs, spin off companies and revenues	10,000,000,000		<div></div>				DIEC & NFAST
	2.3 The missing expertise for special industries such as material engineering, extractive industry, industrial minerals, industrial	Increased contribution of manufacturing industries in the GDP and hence industrialization	Number of products and revenues collected	5,000,000,000		<div></div>				DIEC & NFAST

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	engineering, in five (5) manufacturing sub-sectors supported by June 2019.									
	2.4 Framework for transfer of technology through FDIs developed, coordinated and facilitated by December 2019	Enhanced transfer of technology through FDIs	Total volume of ongoing and finished development and commercialization projects within SMEs based on the success of the integrated manual	60,000,000						DIEC & NFAST
	2.5 Database for (multinationals, the locals, private sector and R&Ds) technology driving rapid industrialization developed and maintained continuously as from June 2018	Increased awareness/access to information on available technology on rapid industrialization	Number of district Development Plans with clusters development initiatives	200,000,000						DIEC & DKM

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
					2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
				(TZS)						
	2.6 Twenty (20) SMEs based on grassroots innovation and Traditional Knowledge practices established and supported by 2020.	Increased technology uptakes, jobs creation from start-ups/SMEs, spin off companies and revenues	Number of SMEs, % of job creation, number of startups/spin off	8,000,000,000						DIEC & NFAST
	2.7 Extension services coordinated and supported through forging strong link with the local government to facilitate STI interventions in fifty (50) LGAs by June 2020	Increased efficiency, effectiveness and resource utilization in public service delivery through innovation	% of improved service delivery in LGAs	5,000,000,000						DIEC & NFAST
	2.8 Innovation intermediaries: (technology	Increased effective utilization of innovation	Number of companies introducing	20,000,000,000						DIEC &

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	stations (1), Technology Transfer Offices (10), incubators (3), innovation spaces (10), clusters (15) and technology parks (1)) facilitated and promoted by June 2021.	intermediaries for socio-economic development	product or processes innovations in STI							NFAST
	2.9 Fifty (50) new products from various sectors through intermediaries supported and introduced into the market by June 2021	Increased effectiveness and utilization of innovation from intermediaries	Number of new products generated from innovation	2,000,000,000		<div></div>				DIEC & NFAST
	2.10 Two (2) Pilot factories/Industries (<i>Viwanda Darasa</i>) for R&D outputs	Increased contribution of manufacturing industries in the GDP and hence industrialization	Number pilot factories/industries Number of industrial products	30,000,000,000			<div></div>			

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	coordinated and facilitated by June 2021		Number of employment opportunities							
	2.11 Ten (10) non-producing and less competitive industries revitalized in terms of technology by June 2021	Increased contribution of manufacturing industries in the GDP and hence industrialization	Number revitalized industries Number of industrial products Number of employment opportunities	17,000,000,000			<div></div>			DIEC & NFAST
	2.12 Capacity building (10 training programs) for enhanced innovation in provision of services in public sector conducted by June 2021	Increased efficiency, effectiveness and resource utilization in public service delivery through innovation	Number of trainings conducted	200,000,000	<div></div>		<div></div>			DIEC & NFAST

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	2.13 Fifteen (15) R&D institutions and SMEs utilizing IPR particularly use of patent and non- patent information to develop appropriate technologies supported by June 2021	Increased contribution of manufacturing industries in the GDP and hence industrialization	Number technologies Number of products and processes Number of new economic activities	1,700,000,000	<div></div>					DIEC & NFAST
	2.14 The status of technology capacity and capability in agro-processing, pharmaceutical, energy, construction, iron and steel and emerging technologies such as biotechnology, Material	Increased technology uptakes, jobs creation from start-ups/SMEs, spin off companies and revenues	Number of companies generated Number of employment opportunities	3,000,000,000	<div></div>					DIEC & NFAST

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	sciences/Nanotechnology; mobile technologies; big data (BD), ICT systems; digital technologies; established by 2021									
Strategic Objective 3: Strategic research with national impact increased	3.1 National postdoctoral research framework established by June 2018.	Increased quality and quantity of researches that can be translated into companies and hence industrialization	Number of postdoctoral candidates supported	105,786,000	<div></div>					DLS, DPS & DSS
	3.2 R&D outputs of high quality products, processes, and services (Publications, Patents, Licenses, Policy briefs) from postdoctoral research	Increased quality and quantity of researches that can be translated into companies and hence industrialization	Number of postdoctoral projects leading to spin off companies	4,855,410,000			<div></div>			DIEC, DLS, DPS, DSS & NFAST

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	increased continuously as from June 2018.									
	3.3 National research journals supported for regional and international visibility by June 2018	Increased dissemination of knowledge from research	Number of research publications in international standard peer reviewed journals.	500,000,000						DKM
	3.4 Research resource sharing mechanism developed by June 2018	Reduced cost of doing research, increased access to research facilities and improved human resource	% of cost savings from shared research resources	100,000,000						NFAST
	3.5 Twenty (20) multi-disciplinary research teams established and supported by June, 2018	Improved quality and relevance of research for socio-economic development	Number of research carried out by Multi-disciplinary research teams	500,000,000						DLS, DSS, & DPS
	3.6 Incentive	Improved incentive		300,000,000						DKM, DLS,

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	mechanisms for productivity and quality research publications established by June 2018	mechanisms for productivity and quality research publications	Number of incentives introduced % of increased research results /publications							DSS &DPS
	3.7 Five (5) Commissioned research projects gearing towards industrialization supported continuously as from June 2018.	Increased quality and quantity of researches that can be translated into companies and hence industrialization	Number of companies established from R&D results	10,272,000,000		<div></div>				
	3.8 Capacity building of all 76 R&D Institutions Review Boards (IRBs) conducted by June 2019	Improved research quality and ethics adherence	Number of quality research in line with ethics Number of functioning IRBs	166,050,000	<div></div>		<div></div>			DLS/DPS/ DSS
	3.9 Twenty (20) R&D institutions equipped with relevant laboratory	Improved quality and relevance of research for socio-economic development	Number of research results translated into products, processes and	20,000,000,000		<div></div>				

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	facilities by June 2019		services							
	3.10 Ten (10) Research and innovation chairs in strategic areas supported by June 2020	Improved research funding, quality and capacity building	Number of research and innovation chairs in strategic areas Number of publications	150,000,000		<div></div>				DLS, DSS, DPS & NFAST
	3.11 Research Management Information system strengthened June 2021	Improved research funding, quality and capacity building	Amount of research and innovation funding administered Number of staff/researchers trained to utilize the system	418,500,000	<div></div>					DKM
	3.12 Information platforms and repository linked to 76 R&D institutions by June 2021.	Increased linkages/collaboration between academia and industries	Number / % increase of collaborations between academia and industries Number of R&D institutions	320,760,000	<div></div>					DKM

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
			linked to the repository							
	3.13 Increased capacity of R&D institutions through HR and infrastructure development by June 2021	Reduced cost of doing research, increased access to research facilities and improved human resource	Number of competent researchers Number of improved infrastructure	15,000,000,000	<div></div>					DLS, DSS, DPS & NFAST
Strategic Objective 4: Science, Technology and Innovation Culture strengthened	4.1 ICT Platform for research management developed	Improved funding for research and timely reporting	Number of R&D institutions using ICT platforms for research management	247,320,000	<div></div>					DKM
	4.2 Upgraded Internet bandwidth up to 4 STM - 1 (155 Mbps x 4) and support development and dissemination of contents through HERIN	Increased access to research information and efficient communication	Number of stakeholders (academic and research institutions) connected to internet NOC.	500,000,000	<div></div>					DKM
	4.3 Scientific information dissemination	Increased public awareness on STI	Number of the public aware of STI	613,615,500	<div></div>					DKM

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	mechanism strengthened by 2017									
	4.4 Establishment of STI Knowledge Laboratory by 2017	Increased production of quality STI knowledge products (3-4 per annum)	Number of knowledge products produced through COSTECH programmes	99,090,000	<div><div></div></div>					DKM
	4.5 Training workshops on science communications for journalists, bloggers and editors conducted by 2021	Improved skills & knowledge on STI	Number of communication products (news and feature articles, etc.) published in electronic and print media	144,585,000	<div><div></div></div>					DKM
	4.6 10 scientific exhibitions supported by 2021	Improved COSTECH visibility	Number of COSTECH stakeholders satisfied with the Commission’s visibility	509,085,000	<div><div></div></div>					DKM
	4.7 Scientific popularization in primary and secondary school	Increased interest of primary and secondary school students on STI	Number of primary and secondary school students with	200,000,000	<div><div></div></div>					DKM

Strategic Objectives	Planned Target/Output	Expected Outcomes	Outcome Indicators	Indicative Budget	Time Frame					Responsible Directorate(s)
				(TZS)	2016 /17	2017 /18	2018 /19	2019 /20	2020 /21	
	system established by 2017		keen interest in science							
Strategic Objective 5: COSTECH Institutional Capacity strengthen	5.1 Increased use of ICT as an enabler/tool of COSTECH core and support operations	Increased COSTECH operational efficiency	Number of ICT systems adopted	150,000,000	<div></div>					DKM
	5.2 Integrated information and decision management system (Accounting, HR, procurement, intranet, repositories, EDMIS)	Increased informed decision making between different units within COSTECH	Number of COSTECH decision made on scientific evidence	391,500,000	<div></div>					DAF & DKM
	5.3 Strategic capacity building of COSTECH staff	Increased efficiency and performance	Number of stakeholders satisfied with COSTECH staff delivery capacity	1,732,860,000	<div></div>					DAF
	5.4 Establish resource mobilization mechanisms	Increased operational and STI funding	Amount of resources mobilized per year	200,000,000	<div></div>					DAF

4.8. Implementation Modality

The Plan is transformational as opposed to incremental and therefore will require greater emphasis on mobilisation of resources for most of the initiatives. As such, a rolling approach shall be used with the funded targets implemented and targets without funding being rolled forward while searching for additional resources. To facilitate implementation, the following key steps will be pursued:

1. **Assignment of targets to responsible directorates:** Each target is assigned to specific department to own and drive it. Within the directorate; an individual or a team will be appointed to be responsible for planning, mobilisation of resources and implementation of the target.
2. **Development of targets into detailed implementation plans and budgets/proposals:** Each and every target will be elaborated into specific objectives, outputs, activities, resource requirements and implementation schedule. That means for some of the targets this process will lead to complete and approved proposals that can/will be sold to funding sources.
3. **Assessment and assignment of all available resources:** Every year an exercise to map-out all existing resources and assessing and redeploying them to focus on the initiatives in the Strategic Plan will be done. The idea is to implement as much as possible of the targets using the available and expected resources. In this process, targets will be prioritized by management in terms of importance and urgency.
4. **Mobilisation of Funding:** Those targets which will not be funded by the available resources will have resources actively mobilised for them. The Commission is committed to develop and implement a comprehensive and practical resources mobilization strategy. It is also committed to create a strong unit to implement the resources mobilization strategy.
5. **Implementation of Funded/Resourced targets:** On the basis of the collection of implementation schedules for all funded targets in each year of the Strategic Plan an integrated Annual Implementation Plan and Budget will be prepared. The Board of Commissioners' approved annual implementation plans and budgets will then be cascaded into directorates' action plans and budgets which will in turn be cascaded into individual performance plans.

4.9. Risk Management

The major risks expected to face implementation of the Strategic Plan are outlined in Table 4.1. They cut across all strategic objectives. The Commission will monitor and manage the risks very closely.

Table 4.1: Risk Management Strategies

	Risk	Expected Impact	Planned Mitigation Measures
1.	Inadequate leadership commitment to implementation of the Strategic Plan.	This will certainly be disastrous to the realization of COSTECH vision.	The Plan was prepared with intensive involvement of stakeholders – both internal and external. It is therefore well owned by the leadership, staff and stakeholders. The Management remains committed to spearheading the implementation of the plan. Cascading the Plan's activities to the level of inclusion in units and employee activities will be seriously pursued in order to further ensure commitment to implementation of the Plan.
2.	Failure to adequately monitor and evaluate implementation of the Strategic Plan.	It will be difficult to know conclusively whether the plan is achieving its objectives.	The Plan has included key monitoring and evaluation activities. COSTECH has prioritized enhanced monitoring and evaluation tools and processes. The Management will implore all key stakeholders for implementing the plan on the need to adhere to planned monitoring and evaluation processes.
3.	Adequate resources to implement the Strategic Plan may not be forthcoming.	It may be difficult to implement the plan fully.	The Management is committed to develop and implement an enhanced financial sustainability strategy. Building the resources mobilization capacity is a priority matter of this Strategic Plan. A Resource Mobilization Strategy will be developed with agreed targets and implementation strategies.
4.	Key stakeholders might fail to give the expected level of cooperation.	Without this cooperation many of the components will fail to achieve their desired outputs and hence desired outcomes.	The Management as part of its routine activities will seek to promote the cooperation of these stakeholders particularly through entering into clear cooperation arrangements (MoUs), improved sharing of information and active involvement in meetings and events designed to promote the development of strong partners' commitments.

5. FINANCING PERFORMANCE AND PROJECTIONS

5.1. Financial Performance

Among the challenges facing COSTECH are the budgetary constraints and inconsistency cash flows in some years. For example, recent MTEF indicates that out of Tshs 33,315 million approved by the Government for 2012/13 only Tshs 18,452.2 million which is equivalent to 55.4% was released (Table 5-1). On the other hand, the utilization of the released funds has been unsatisfactory. During the same year, the Commission spent only 56.4% of the released fund. The areas with least performance are research funds (52.4%) and development funds (42.6%). This suggests a need for the increased government commitment to finance STI on the one hand and the increased capacity of COSTECH to use allocated funds especially for the STI activities proposed in this Plan.

Table 5-1: Financial Performance 2012/2013 (Tshs Millions unless otherwise stated)

EXPENDITURE BY BUDGET CATEGORY	BUDGET	RELEASE D	Released as % of Budget	Actual expenditure	Spent as a % of released
PE	1,937.9	1,438.7	74.2	1,739.4	120.9
OC	305.1	269.5	88.3	269.5	100.0
NFAST	22.1	22.1	100.0	22.1	100.0
RESEARCH FUNDS	21,480.0	12,888.0	60.0	6,751.1	52.4
DEVELOPMENT-Local funds Tech Park	5,000.0	-	-	-	
DEVELOPMENT-Foreign	4,586.4	3,833.8	83.6	1,633.2	42.6
Total	33,331.5	18,452.2	55.4	10,415.5	56.4

Source: COSTECH MTEFs

5.2. Financial Sources & Mobilization

The COSTECH's main sources of funds are own sources (research permit fees and interest income), Government subventions and donor funds. Recent financial records from COSTECH's MTEF 2013/14 indicate that the main source of funding is Government subvention (75.5%) followed by donor funds (19.8%) and lastly internally generated funds (4.8%) as shown in Figure 5.1. However, as noted in the previous section, funding from the Government is inadequate and inconsistent thereby badly affecting the implementation of the planned activities. As such, a need to mobilize funds from internal sources and other partners is of utmost important.

Strategies will be used to achieve the same include: development of funding mobilization and negotiation skills within COSTECH; enhancement of Research impact - evidence-based advocacy for financial resources; building capacity for managing STI challenge funds –(with a COSTECH as a funding manager); mobilization of matching fund for attracting donor supported research; expanding the scope of income generation services within COSTECH and re-engineering NFAST unit to take advantage of big challenge funds.

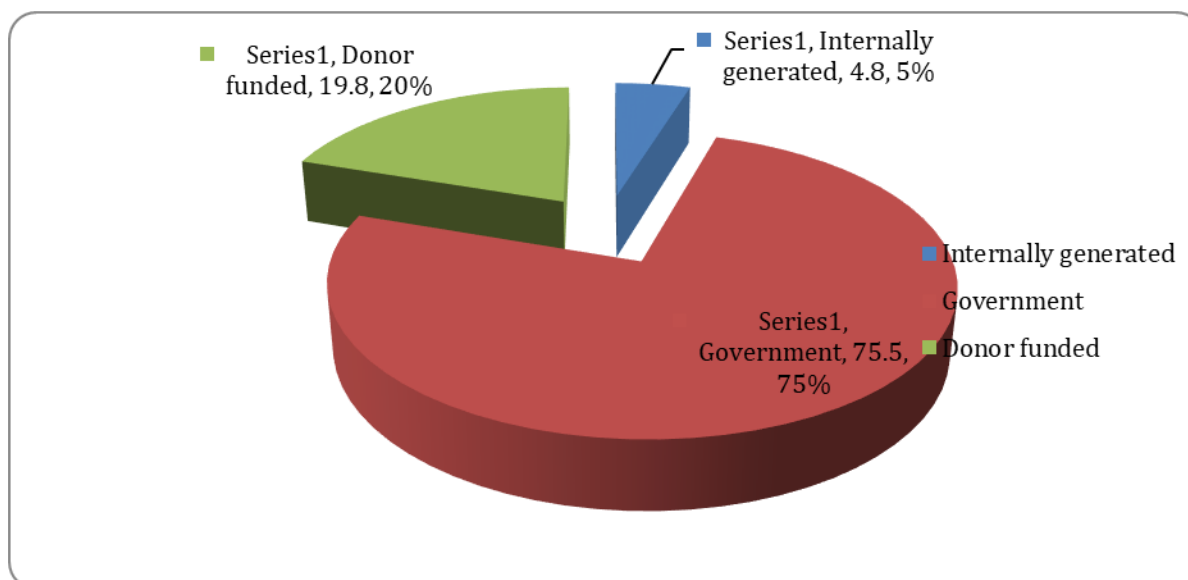


Figure 5.1: COSTECH's major Financial Sources (%)

The Commission will put in place in-built mechanisms and revenue sources that ensure sustainability and competitiveness. The revenue sources should be linked directly and indirectly with the products and services offered by the Commission including:

- (a) Royalty charges from the incubated companies as mechanisms of leveraging some contribution from successful incubated companies to the incubators that supported them.
- (b) Funds from the social innovation funds in partnership with the private sector and other collaborators such as community-based organizations (CBOs) aimed at supporting priority projects in the areas of poverty reduction and employment as well as other social innovation initiatives.

Other sources of fund mobilization include the following:

(a) Public-Private Partnership

Currently, the EPZA has offered 438 acres of land to COSTECH in Bagamoyo to establish the Tanzania Technology Park. Thus, partnerships between COSTECH and the private sector – business, trade unions, community organizations, cooperatives and others – could be an effective means to develop the infrastructure of the Tanzania Technology Park (UN 2005). Another strategy of fund mobilization includes Build Operate and Transfer (BOT) investments, where the Commission could enter into agreement with individuals or the private sector to develop STI related projects.

(b) Regional and International Collaborations

Through collaboration and networking with regional and international organizations such as SADC, NEPAD, UNESCO, SIDA, NORAD, DANIDA and UNDP. Funding opportunities from such partners could be aimed at capacity building in terms of human resources, transfer of technology, technology and materials. In such a case, it is

important that COSTECH continue to scout for partnership and making necessary contacts, as well as appealing to such regional and international organizations.

(c) Diaspora

It is estimated that there are about 405,417 Tanzanian nationals who are currently living and working outside Tanzania as the Diaspora (URT 2014). In the countries they live, many of them work as scientists, technologists and as engineers. Therefore, it could be of benefit to the country for COSTECH to liaise with relevant MDAs to maintain close ties with the Diaspora to harness knowledge, skills and collaborative projects in STI.

5.3. Projected Financial Sustainability

In order to effectively implement its activities, COSTECH estimates to use Tshs 25,754.84 million in 2013/14 which increases to 107,177.38 million in 2020/21 (Table 5-2). The big chunk of the projected amount is from the Government which, as we have seen, the Government has failed to honor the budgetary obligations in the past. On the basis of the past trends, there is no reason to believe that the situation will significantly change into better in this new strategic planning horizon. As suggested in the previous sections, exploring other sources of funding is equally important and this should include building internal capacity for funding mobilization and management. This is the only way COSTECH can be assured of its financial sustainability during this planning cycle and beyond.

Table 5-2 Financial Projections (Tshs Millions)

	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Research permit	564.422	350	350	350	350	350	392	439	491.68
Interest income	357.409	940	500	500	0	0	0	0	0
Total	921.83	1,290.00	850	850	350	350	352	439	491.68
Government	33,715.75	22,364.53	21,914.84	31,992.56	66,436.74	66,436.74	74,409	83,338	93,339
Donor Funded		2,100	2,800.00	5,671.20	9,000.00	9,000.00	10,080	11,290	12,645
GRAND TOTAL	34,637.58	25,754.53	25,564.84	38,513.77	75,786.74	75,786.74	84,841.00	95,067.00	106,475.68

Source: COSTECH's MTEF and additional computations for 2018/19 and 2020/21

Note: From 2018/19-2020/21 the increase is projected to grow by national projected inflation rate of between 6-10%

6. MONITORING & EVALUATION ARRANGEMENTS

6.1. Introduction

This Chapter presents an overview of the monitoring and evaluation arrangements that will be used to track implementation progress and results of the Strategic Plan. It consists of the development objective, beneficiaries of COSTECH services, and linkage

with Second National Five-Year Development Plan, FYDP II (2016/2017 – 2020/2021), the result chain, the results framework matrix, the monitoring plan, the planned reviews, the evaluation plan and the reporting plan.

6.2. The Development Objective

The development objective of COSTECH is to provide favorable national environment that will stimulate STI activities nation-wide for the wellbeing of the people. This will be achieved through developing strategies, capacity building and guidelines to promote STI for sustainable socio-economic development. The development objective represents the highest level of results in the COSTECH result chain, though other actors will also significantly contribute towards the achievement of this development objective.

6.3. Beneficiaries of the COSTECH Services

The main beneficiaries of COSTECH are many and varied. They include Central and Local Government Agencies; Parliament; the Judiciary; Private Sector, Civil Society Organizations, R&D institutions, Universities, the School and Training System, Media, Development Partners; Individuals and the General Public.

6.4. Linkage with the Vision 2025 and FYDP II

This Strategic Plan has five strategic objectives which contribute to Vision 2025 and FYDP II. Under Vision 2025, COSTECH contributes to objective 1.2.5 which emphasizes on building a strong and competitive economy in line with the current industrialization agenda. The Plan is also closely aligned with the FYDP II aiming at boosting industrialization for economic development. It should be noted that industrialization is conceived as one of the major strategies to help the country attain its goal of becoming a middle-income country. In this regard, science, technology and innovation are crucial bedrocks for sustainable and effective industrialization processes.

6.5. Result Matrix

COSTECH's result chain consists of the vision, strategic objectives, outcomes and outputs that broadly contribute to Vision 2025 and FYDP II as indicated above. The Results Matrix presented in Table 4.1 summarizes the core of the results chain. The basic assumption is that, there is causal linkage in the various elements of COSTECH's result chain. The inputs i.e. utilization of resources will lead to achievement of the activities, which will contribute to achievement of outputs. Achievement of outputs will lead to achievement of objectives which will lead to realization of COSTECH's vision. Realization of COSTECH's vision in the medium term will contribute to the achievement of the relevant aspirations in Vision 2025 and FYDP II.

6.6. Monitoring, Reviews and Evaluation Plan

This subsection details the Monitoring Plan, Planned Reviews and Evaluation Plan for the period covering the five years strategic planning cycle which is 2016/17-2020/21.

6.6.1. Monitoring Plan

The indicators to be monitored in order to assess the progress and outcomes of the Strategic Plan are presented in Table 4.1 (Chapter 4). During the first year of the implementation of the Plan, a comprehensive baseline study will be undertaken in order to establish the baseline values of each indicator as well as the most realistic target for the same indicator. Thereafter a monitoring plan will be put together in the form of a table/database to indicate for each indicator, the baseline value, a time series of targets to be pursued overtime, data source, data collection instruments and methods, data collection frequency, means of verification, frequency of reporting and responsibility for data collection. Implementation of data collection plan is expected to provide the required monitoring data and information for the Plan.

6.6.2. Planned Reviews

The Commission will carry out formal annual reviews during the Planning Cycle. The reviews will be tracking progress in the realization of the targets set in Chapter 4 under each Strategic Objective. The review will focus on determining whether the planned activities are moving towards achieving the annual targets and will find out whether they are on track, off track, unknown or at risk. In addition, the review will track any changes in terms of outputs realized over the period as well as assessing issues, challenges and lessons learnt over the year and to what extent the outputs delivered are contributing towards achievement of the objectives. The review findings will be used to adjust implementation strategies whenever necessary.

6.6.3. Evaluation Plan

This Evaluation Plan consists of the evaluation studies to be conducted during the Planning Cycle, description of each study, the evaluation questions, methodology, timeframe and the responsible officer. The Commission intends to conduct 3 types of evaluation studies over the period of five years as shown in Table 6.1.

Table 6.1: Evaluation Plan

SN	Evaluation Studies	Description	Evaluation Study Questions	Methodology	Timeframe	Responsible Person
1	Service Delivery Survey	This study intends to indicate the perception of external stakeholders on quality of COSTECH products and services.	<ul style="list-style-type: none">• Are our clients and stakeholders aware of the products and services provided by COSTECH?• Are our clients and stakeholders satisfied with the quality of products and services?• Are the service delivery strategies effective?• Is the mechanism for engaging stakeholders effective?• What are the areas for improvement?	<ul style="list-style-type: none">• Conducting interviews• Administering questionnaires• Documentary review	Annually	Director of Finance and Administration
2	Impact assessment	This study intends to assess the outcomes and impacts of the strategic	<ul style="list-style-type: none">• Is COSTECH having an effect on the national context especially in terms of the priority national objectives?• Has COSTECH institutional	<ul style="list-style-type: none">• Conducting interviews• Administering questionnaires• Documentary	After every three years	Director of Finance and Administration

SN	Evaluation Studies	Description	Evaluation Study Questions	Methodology	Timeframe	Responsible Person
		plan	capacity been strengthened to effectively deliver on the strategic plan? • Is COSTECH moving towards operational and financial sustainability? • Is COSTECH having a balance impact across all five operational platforms?	review		
3	Institutional Self-Assessment	This study intends to determine the perception of staff on capacity and performance of the Commission – in with the strategic direction outlined in the Plan	• How effective is COSTECH leadership and top management? • What is the management style? • How is the quality of organization policies and strategies? • How are organizational resources managed? • Are staff satisfied with HR practices? • Are the business processes effective? • Are the mechanisms for engaging staff, partners, and stakeholders effective? • What are the areas for improvement?	• Conduct interviews • Administer questionnaires • Documentary review	Annual	Director of Finance and Administration

6.7. Reporting Plan

Reporting on the implementation of the Strategic Plan will entail both internal and external reporting arrangements. The first will cater mainly to management and staff and the latter for Government and other external stakeholders.

6.7.1. Internal Reporting Plan

The Reporting Plan detailed in Table 6.2 will guide the reporting to internal stakeholders. The Director of Finance and Administration will issue standard formats for the various reports shown therein.

Table 6.2: Internal Reporting

S/N	Type of Report	Recipient	Frequency	Responsible Person
1.	Directors' Reports (supported by heads of project teams hosted in respective directorates)	Director General	Monthly	Directors.
2.	Quarterly Report	Management Committee	Quarterly	Directors
3	Annual Report	Management Committee Board	Annually	Director of Finance and Administration – with the support and inputs of other directors.
4	Mid-term and Terminal Evaluation of the	Management	For Mid-term Review (Fourth Quarter of	Director of Finance and

S/N	Type of Report	Recipient	Frequency	Responsible Person
	Strategic Plan	Committee Board	2019) For Terminal Evaluation (Second Quarter of 2021)	Administration

6.7.2. External Reporting Plan

External reporting will involve preparation of five types of reports as shown in Table 6.3. The reports will be submitted to the following stakeholders: The Government, Key Stakeholders and Development Partners. The reports will be prepared on quarterly, bi-annually or yearly basis or on demand basis from time to time. The reporting plan will be in accordance with the policies of the Commission.

Table 6.3: External Reporting

S/N	Type of Report	Recipient	Frequency	Responsible Person
1.	Quarterly Reports	MDAs, RAs, LGAs, Stakeholders and DPs	Quarterly	Director General
2	Bi-annual Reports	MDAs, RAs, LGAs, Stakeholders and DPs	Bi-annually	Director General
3	Annual Reports	MDAs, RAs, LGAs, Stakeholders and DPs	Annually	Director General
4	Financial Statements	MDAs, RAs, LGAs, Stakeholders and DPs	Annually	Director General
5	Mid-term Evaluation External evaluation	MDAs, RAs, LGAs, Stakeholders and DPs	For Mid-term Review (Fourth December 2018) For Terminal Evaluation (June 2021)	Director General

6.8. Guidance for the Mid-term/Terminal Evaluation

Both evaluations will involve external evaluation teams working with internal evaluators. Prior to the coming of the external evaluators, the internal evaluators will have to give their opinion on the progress of implementation of the plan, the basis on which the external evaluators would wish to validate.

The internal and external evaluators will have similar Terms of Reference and will focus on:

- (i) Assessing the reasons for the success or failure of specific aspects of the Strategic Plan;
- (ii) Quantifying the outcomes and impacts of the Strategic Plan;

- (iii) Assessing whether the Strategic Plan is achieving its objectives;
- (iv) Finding out whether the effects of the Strategic Plan are contributing to a better fulfilment of the Vision of the Commission;
- (v) Assessing the adequacy of resources being mobilized to implement the Strategic Plan;
- (vi) Determining whether the available resources are being utilized efficiently to achieve the strategic objectives of the plan; and
- (vii) Determining whether the process of strategic planning and implementation is facing any problems.

Both the internal and external evaluators will have the mandate to decide on additional issues to be included or evaluated to be agreed with the Director General in advance.

6.9. Plan Review

The Strategic Plan will be reviewed and updated on the basis of the mid-term evaluation. It will also undergo a major review after the five years of implementation. The latter evaluation will consider both the internal and external evaluations of the Plan in addition to other pertinent sources of information.

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