

2022

The Role And Efficiency of the Technology Innovation Agency in the Commercialisation and Development of Intellectual Property from Publicly- Funded Institutions

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Policy Summary

South Africa's Technological Innovation Agency (TIA) was launched on 29 October 2010. In terms of the TIA Act [No 26 of 2008], the object of the agency is to support the state in stimulating and intensifying technological innovation to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations.

Th is in support of the National Development Plan (NDP) that highlights that Science, Technology and Innovation (STI) is key to equitable growth, underpinning economic advances and improvement in health systems, education and infrastructure.

TIA was set up as a public entity that enhances the country's capacity to translate a greater proportion of local research and development (R&D) into commercial technology products and services. The agency is tasked with exploiting the existing body of knowledge at universities and public research institutions and channelling it effectively towards the development of technology based industries. To date, however, the effect of TIA on the innovation landscape has been muted.

While the overall rationale for TIA remains critical and there continues to be a need for a public instrument that can close the "innovation chasm" between local R&D and commercial products and services, TIA's translation and commercialisation success rate has been suboptimal, hampered both by limited funding as well as insufficient investable projects.

What is required is the development of a more robust project pipeline, leveraging private funding, as well as a more proactive partnership strategy with private funders and role players. The following interventions are proposed:

- 1) Refocus the primary mandate of TIA to be a funding agency, removing non-core activities.
- 2) Develop a revised monitoring and evaluation framework that enables TIA to effectively monitor the outcomes and impact, as well as value for money.
- 3) Refocus the TIA mandate to proactively drive commercialisation in partnership with the private sector, including leveraging public money.
- 4) Reduce TIA's reliance on annual transfers by accessing other funding sources and developing incentive mechanisms to attract private investment.

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- 5) Review the overall government funding landscape for innovation to identify an opportunity to consolidate institutions and scale funding available.

Executive summary

Despite the efforts that have been made to develop and continuously upgrade the national innovation ecosystem, South Africa's innovation ecosystem remains centralised at national government. Compared to peer countries such as Brazil, China and India, South Africa performs poorly in integrating local innovations into the national innovation ecosystems. As such, significant improvement in coordination, interaction and collaboration among the actors; targeted funding of 'grassroots' innovators especially during the commercialisation stage; access to innovation support services that are available.

While there have been significant developments in the South African innovation landscape, there is evidence that the country's return on investment from R&D has been poor owing to its inability to exploit its R&D outcomes into commercially viable technology products and services.

The funding landscape for innovation and commercialisation of technologies is predominately through government incentives, provided mainly through the DSI and several incentive schemes from the Department of Trade, Industry and Competition. The transfers are mainly towards financing technology development projects with high social and economic impact, these are usually, projects that are unable to attract commercial funding due to the inherent high risk nature associated with the technology development process. The agency's initial business case required substantial government funding to build its infrastructure and establish itself within the NSI. However, it was anticipated that that over 5 to 10 years, the Agency's main source of revenue generation would be other sources, including the private sector.

TIA is set up as a public entity that enhances the country's capacity to translate a greater proportion of local research and development (R&D) into commercial technology products and services. The agency is tasked with exploiting the existing body of knowledge at universities and public research institutions and channelling it effectively towards the development of technology based industries.

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To meet its mandate, TIA provides and mobilises financial and non-financial support across broad technology areas in various sectors of the economy through:

- appropriately structured financial and non-financial interventions for the commercialisation of R&D results;
- the development and maintenance of advanced human capacity for innovation as opposed to just R&D human capital; building a culture of innovation in the South African economy; and
- leveraging local and international partnerships to facilitate in-bound technology transfer, build local technological competencies, and encourage foreign direct investment for the commercialisation of technologies in South Africa.

The goal of TIA is to use South Africa's science and technology base to develop new industries, create sustainable jobs, and help diversify the economy away from commodity exports towards knowledge-based industries equipped to address modern global challenges.

The review reveals that TIA receives the bulk of its revenue from transfers from the DSI, while other revenue is generated from commercial activities and through leveraging from international sources. The nature of technology development falls in the high-risk category with unpredictable outcomes, thus it is difficult to forecast surplus deficit budget at the end of each financial year. TIA remains underfunded, with an average annual budget of R500 million each year, which impacts on funding availability for meaningful investments in new projects. As a PFMA Schedule 3A entity, TIA, will remain substantially funded either from the National Revenue Fund.

Based on the expenditure analysis, the following is observed:

- TIA receives some R500 million in transfers and contract income from DSI and expends on average R600 million per annum.
- The agency derives approximately 80 per cent of its revenue from the department. Other sources of income include co-funding partnerships, and interest and royalties earned.

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- Over the past five years' administrative costs have averaged some 24 per cent. While there is no immediate comparative data available, data from other sources indicates these costs are unusually high given the TIA's primary mandate as a funder.¹
- Human resources are central to the agency's operations, compensation of employees is its largest cost driver, accounting for an estimated 20 per cent of expenditure.
- Goods and services are the second largest spending area, accounting for 9% of expenditure.
- Only 20 per cent of expenditure (excluding administration) is directed at core commercialisation activities (this increases to about 70 per cent if bio-technology and innovation enablement are included).

While TIA has seen good improvements in the last 3 years in respect of attracting other funding and increasing the rate of commercialisation, there are opportunities to enhance its efficiency and effectiveness. Some of the key observations in respect of effectiveness arising from this review are as follows:

- The overall rationale for TIA remains critical, and there continues to be a need for a public instrument that can close the innovation chasm between local R&D and commercial products and services
- Overall TIA's translation and commercialisation success rate has been suboptimal, hampered both by limited funding as well as insufficient investable projects. This requires the development of a more robust project pipeline, as well as a more proactive partnership strategy with private funders and role players.
- While TIA has been able to leverage co-investment (mainly from the IDC), and follow on funding with industry and the private sector, the leveraged amount from the industry has been relatively small compared to other sources of revenue received by the entity.
- While the TIA business case focuses predominantly on sourcing innovative ideas from publicly funded R&D activities, there is a need to expand support across all sectors of

¹ For example, available data indicates that the Jobs Fund (a very high touch impact challenge Fund) averages some 8% management and administration fees. Other comparators include the Private Equity industry where management fees are typically 1-2.5% of invested funds (Private Funds CFO, Fees & Expenses Survey 2020 and StepStone (2016), Uncovering the Costs and Benefits of Private Equity.

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and to all actors in the South African economy and the NSI. There is a need for a stronger focus on the private sector.

- There needs to be better integration of functions and an improvement in coordination between institutions with similar/ complementary roles as TIA. These are functions for instance in DTIC: Support Programme for Industrial Innovation (SPII); SEDA: Technology Support Programme; NRF; CSIR; IDC and Technology Human Resource for Industry Programme.

To enhance the efficiency and effectiveness, and ultimately impact, of TIA, the following interventions are proposed:

- 1) **Refocus the primary mandate of TIA to be a funding agency.** This will require that all other programmes that are not its core mandate (i.e., funding) be removed (for example the Technology Station Programme). TIA must develop and agree a performance improvement plan that addresses key operational areas including the following: turnaround times for enquiries and applications, drawdown of project funding, overhead costs, and communication with stakeholders. Critically TIA management must table a plan to reduce the administrative / management cost to 10% over the next 3 years.
- 2) **Develop a revised monitoring and evaluation framework that enables TIA to effectively** monitor the outcomes and impact, as well as value for money. This must be underpinned by a robust theory of change that reflects TIA's mandate and clearly articulates the role of its funding interventions.
- 3) **Refocus the TIA mandate to proactively drive commercialisation in partnership with the private sector.** There is a need for TIA to become more proactive in driving a pipeline of fundable projects – preferably aligned to key DSI / national objectives. TIA's role must be to utilise public funding to de-risk and crowd in other funding. More critically TIA should increase funding to entrepreneurs and firms (currently only some 35% of funds) as opposed to science councils and universities. Furthermore, the TIA should be given a clear target to leverage its funding from private sources (such as venture capital funds). The proposal is to reach 5 times its own funding within the next 3 years.

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- 4) **Reduce reliance on annual transfers.** While it is critical that TIA retain a mandate to fund higher-risk project and the early stages of products, services and firms (and must therefore **not** be incentivised to undertake low risk investments), the organisation must be encouraged generate more of its own income. The proviso is that this revenue must come from core funding operations and not non-core activities (such as programme management). This funding model must incentivise TIA to find, fund and promote commercialisation opportunities. This should include reconsideration of the corporate form of TIA (currently a 3A Public Entity) to assess if a change is required (for instance to a 3B Government Business Enterprise). Such a change could support TIA accessing other funding sources and develop incentive mechanisms to attract private investment.
- 5) **Review the overall government funding landscape for innovation to identify an opportunity to consolidate institutions and scale funding available.** Currently funding for commercialisation is being provided mainly through the DSI and several incentive schemes of the Department of Trade, Industry and Competition, including the Technology and Human Resources for Industry Programme; the Support Programme for Industrial Innovation; and the Industrial Development Corporation's Technology Venture. The overall system is fragmented and does not operate at sufficient scale. There is an opportunity to build a more substantial fund with appropriate capability and capacity. This should include consideration of the possible incorporation of NIPMO.

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Abbreviations and Acronyms

4IR	Fourth Industrial Revolution
BERD	Business Expenditure on Research and Development
DFFE	Department of Forestry, Fisheries and the Environment

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DPME	Department of Planning, Monitoring and Evaluation
DSBD	Department of Small Business Development
DSI	Department of Science and Innovation
DTIC	Department of Trade, Industry and Competition
ENE	Estimates of National Expenditure
ExCo	Executive Committee
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on Research and Development
GII	Global Innovation Index
HEI	Higher Education Institutions
IDC	Industrial Development Corporation
IP	Intellectual Property
IPR	Intellectual Property Rights
MTEF	Medium -Term Expenditure Framework
NDP	National Development Plan
NGOs	Non-Governmental Organisations
NIPMO	National Intellectual Property Management Office
NRF	National Research Foundation
NSI	National System of Innovation
PFMA	Public Finance Management Act
PIC	Public Investment Corporation
R&D	Research and Development
RDP	Reconstruction and Development Programme
SEDA	Small Enterprise Development Agency
SET	Science, Engineering and Technology
SETI	Science Engineering and Technology Institution
SMME	Small, Micro and Medium Enterprises
STI	Science Technology Innovation
THRIP	Technology and Human Resources for Industry Programme
TIA	Technology Innovation Agency
TPP	Technology Platforms Programme
TRL	Technology Readiness Levels
UNDP	United Nations Development Programme
WRC	Water Research Commission

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1 Introduction

1.1 Problem Statement

South Africa's innovation ecosystem performs poorly. Concerns are poor coordination, interaction and collaboration among actors and limited targeted funding of innovators especially during the commercialisation stage.

This Spending Review asks how the role of the Technology Innovation Agency (TIA) - as government's key agency to support commercialisation in the National System of Innovation (NSI) - can be enhanced and optimised to support the innovation ecosystem.

1.2 Background

The Technology Innovation Agency (TIA) was established in 2008 to promote the development and exploitation, in the public interest, of discoveries, inventions, innovations and improvements. TIA's objective is to support the state in stimulating and intensifying technological innovation to improve economic growth and quality of life for all South Africans by developing and exploiting technological innovations.

In term of its mandate, TIA is tasked to translate a greater proportion of publicly-funded research into commercial technology products and services. This implies exploiting the existing body of knowledge at universities and public research organisations and channelling it towards the development of technology-based industries. This is done with an overarching intention of creating sustainable jobs and transforming the economy from one that is reliant on commodity exports to one that is knowledge-based and equipped to address modern local and global challenges.

To carry out its mandate, TIA requires both formalised partnerships with universities and public research institutions and other government instruments such as those of the Department of Trade, Industry and Competition. This ensures connectedness and interdependency along the innovation value chain, which is critical to allow for the nurturing of technologies from laboratory to market. The aim is to use South Africa's science and technology base to develop new industries, create sustainable jobs and help diversify the economy away from commodity exports towards knowledge-based industries equipped to address modern global challenges. This positions TIA as one of the pillar institutions of the South African government to strengthen the innovation ecosystem post democracy.

South Africa's innovation policy as set forth in the *White Paper on Science and Technology* of 1996 introduced a new paradigm and set the national system of innovation (NSI) as a conceptual framework for reform and redressing some of the legacies of the past. The White

Paper requires a system that is responsive, inclusive and supports all forms of innovation, including effective grassroots innovation programmes for the country. South Africa's National Development Plan (NDP) also entrenches the importance of a capable developmental state for the country's social and economic development. The imperatives set in the White Paper facilitated the process for creation of new processes to strategically redefine the country's NSI while signalling strong intentions to address challenges including, inter alia, inadequate human capital, a lack of appreciation of Intellectual Property Rights (IPRs) as tools for wealth creation, and intellectual property management practices across universities, public research institutions and science councils that differ considerably in terms of their composition and effectiveness.

Since then, South Africa, has made significant strides to strengthen its NSI and such endeavours are encapsulated in various policy instruments such as the National Research and Technology Strategy, Ten Year Innovation Plan, Bioeconomy Strategy, IPR Act and the Technology Innovation Agency Act as part of actions to ensure that government R&D spending benefits all citizens, including through the establishment of commercialisation frameworks that further this goal.

As a result, South Africa's innovation ecosystem is relatively matured and has the key elements and components such as an innovative business sector and world class research organisations. Despite this, the efforts that have been made to develop and continuously upgrade the national innovation ecosystem, there are major gaps, South Africa has been ranked the 63rd most innovative economy in the world in 2019 by the Global Innovation Index (GII), declining by five places from 2018.

South Africa performs poorly when compared to peer countries such as Brazil, China and India, especially in the integration of local innovations into the national innovation ecosystems. Key areas of improvement worth highlighting are better coordination, interaction and collaboration among the actors; targeted funding of 'grassroots' innovators especially during the commercialisation stage; making information about innovation support services more available to potential innovators throughout the country.

A recent assessment by the UNDP, not only affirmed these concerns but revealed an uneven geographic distribution and that there are still many communities that are not even aware of the existence of support organisations, let alone the funding sources and opportunities. The information asymmetries on funding support, the absence or limited collaboration among key actors in the ecosystem entrench fragmentation and promotes functional overlaps that could otherwise be addressed with better coordination.

This points to a need to improve the functionality and effectiveness and the impact of the ecosystem, through effective linkage between local, regional and national innovation mechanisms, in the quest to accelerate the implementation of the country's stated development objectives.

2019 White Paper on Science, Technology and Innovation recognises these challenges, including the critical issue of increased commercialisation funding and the need to leverage co-investment by the public and private sectors. TIA, as a one of the lead institutions presents a good opportunity through which the spending review could assess the efficacy of the ecosystem in translating and commercialising publicly-funded research as well as evaluate the extent to which there may be functional overlaps with other institutions.

TIA's strategy among others, supports the achievement of the 2019 White Paper on Science, Technology and Innovation and the National Development Plan. For this purpose, TIA's fiveyear strategy is predicated on three pillars:

- 1) Intensifying efforts to accelerate the translation and commercialisation of publiclyfunded research.
- 2) Harnessing the opportunities presented by the bioeconomy as an important area for future growth.
- 3) Increasing and expanding access for innovators to convert their ideas into products and services through TIA's Technology Stations infrastructure.

1.3 Challenges in commercialisation of promising ideas that emerge in South Africa

There are varying barriers identified in the technology transfer process that hinder the commercialisation process of new ideas in South Africa. These are elaborated on below:

- **Inadequate funding levels towards STI:** there exists a direct correlation between the amount of investment towards R&D and the innovation results of a country. Spending on R&D in South Africa continues to increase, although at a slower rate than before. Government continues to be the largest source of funding; further private sector investment is required to stimulate growth of STI.
- **Inactive higher education institution Innovators:** the lack of active involvement from the inventor in the technology transfer process, makes commercialisation of research products difficult. There is minimal focus on research-focused mandates intended for commercialisation at HEIs. A major cause of inadequate innovative initiatives and production of inventive outputs at HEIs is the absence of support for

accumulated innovation/invention efforts and the presence of multiple factors that undermine innovation, such as the long process of obtaining funding and academic staff's multiple training and administrative tasks, which undermine innovative.

- **Lack of higher education institution collaboration:** collaboration between science and industry is important for the success of innovation activities and ultimately for economic growth. The active collaboration between the two stimulates the technology push and pull between industry and researcher.
- **Marketing Access:** often SMME's fail to obtain sufficient and relevant market information, failure to utilise it efficiently, insufficient knowledge about the international market and the business growth, and an inability to establish both local and international sales and distributions.

2 Defining and mapping of the national innovation ecosystem

2.1 Defining the innovation ecosystem

South Africa is among the first developing countries to adopt and embrace the National System of Innovation (NSI) framework as an organising principle for innovation policy formulation. The country aims to generate productivity gains through innovation and demand by domestic consumption. This is the context in which South Africa's innovation ecosystem is evolving as a dynamic and complex system.

The innovation ecosystem describes a set of producers and users around a focal organisation which contributes to its performance. An innovation ecosystem is generally defined as a "the complex relationships that are formed between actors or entities whose functional goal is to enable technology development and innovation". An innovation ecosystem is made up of different actors, relationships and resources that play a role in taking a great idea to transformative impact at scale. The effectiveness of each part within the innovation ecosystem is moderated by other parts of the system (e.g., entrepreneurs depend on being able to access financing).

A change to one part of the innovation ecosystem leads to changes in other parts of the innovation ecosystem (e.g., an increase in internet connectivity will accelerate the design and testing of new technologies). Innovation ecosystems are important for facilitating sustainable socio-economic growth and stakeholder cooperation. Grassroots innovations ecosystems are location based and supports the efforts of the innovators who have used their ingenuity and knowledge to create products at the individual and collective level. The ecosystem approach

produces a consistent set of benefits for local innovators, entrepreneurs, and localities, including:

- Common assets, including physical assets such as workshop and co-working spaces and financial assets like new savings and loan funds for innovators;
- Shared infrastructure, including communication infrastructure and “relationship infrastructure,” such as new networks and linkages between members of the system;
- New resources, including information, new know-how, and a workforce with enhanced skills specific to certain industry and innovation niches;
- Favourable operating conditions for local innovation, including changes in norms, rules, and policies to create a more-level playing field; and
- New capacities within the system- such as large-scale production, distribution, and collective action capacities that enable coalitions to achieve results that no single member of the ecosystem could have achieved on its own.

In summary, national system of innovation denotes the arrangement of the relationships among all organisations that are involved in the entire range of innovation activities from enablement through creative processes to the implementation stage. This relatively broad definition includes the functions, their enabling structures, including policy and regulatory frameworks, standards and resources that enable the production of innovative products, methods, approaches or processes, but excludes economic framework conditions and related downstream components of the innovation value chain, such as manufacturing capacity and marketing structures.

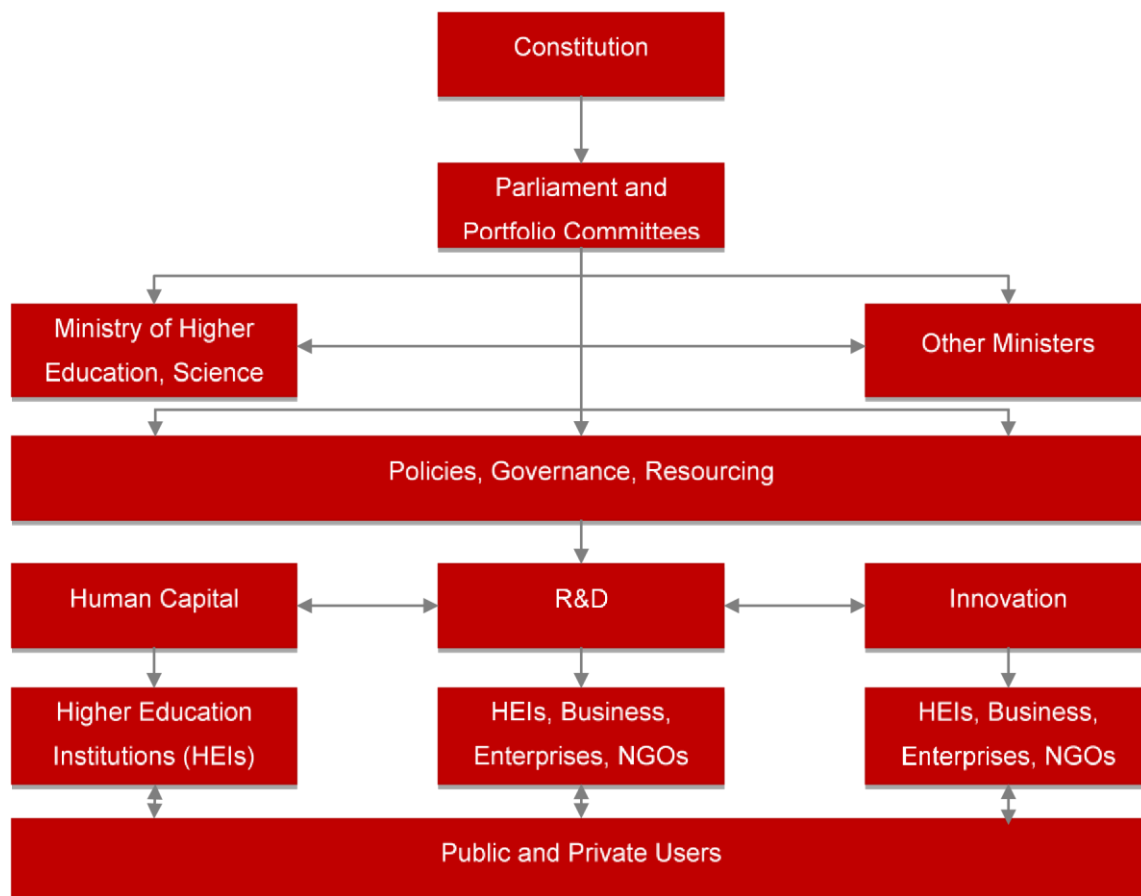
2.2 Mapping of the national innovation ecosystem

This section of the report provides an outline of key actors and organisations that are relevant for supporting innovation in South Africa. It is worth noting that South Africa’s innovation ecosystem is strongly centralised at national government level. Public research organisations such as universities and science councils play a key role. While there has been a disconnect between academic and industrial research, universities are increasingly pursuing innovative joint projects with the private sector. Public funding instruments such as the Technology and Human Resources for Industry Programme (THRIP) were formed to supply human capital that is needed by industry. Other departments such as the Department of Trade, Industry and Competition (DTIC) and Department of Small Business Development (DSBD) are also key supporters of technology development and innovation.

In recent years, government, through the introduction of various legislation (notably the Intellectual Property Rights from Publicly Financed Research and Development Act No. 51 of 2008) obligates recipients of public research funds to identify, protect, manage and commercialise their research outputs and provided an impetus for these activities at publicly funded institutions. Support and development of skills in intellectual property protection has been provided to universities to develop commercialisation capacity. As a result, universities are now no longer focused only on teaching and research but are paying increasing attention on commercialisation of the products, services and offerings. They are also setting up their own technology enterprises and university-based incubators and increasingly entrepreneurial. Universities along with the science councils provide a crucial body of research work into precommercial and commercialisation support done by institutions such as TIA, in partnership with the National Intellectual Property Management Office (NIPMO).

Policies and regulations on creation, registration and exploitation of IP rights together with policies addressing public and social interests lack coherence and create constraints for startups. Some policies serve as a catalyst that enhances the commercialisation process where others directly constrain all such efforts.

Figure 1: Overall structure



Source: TIA Annual Report, 2020

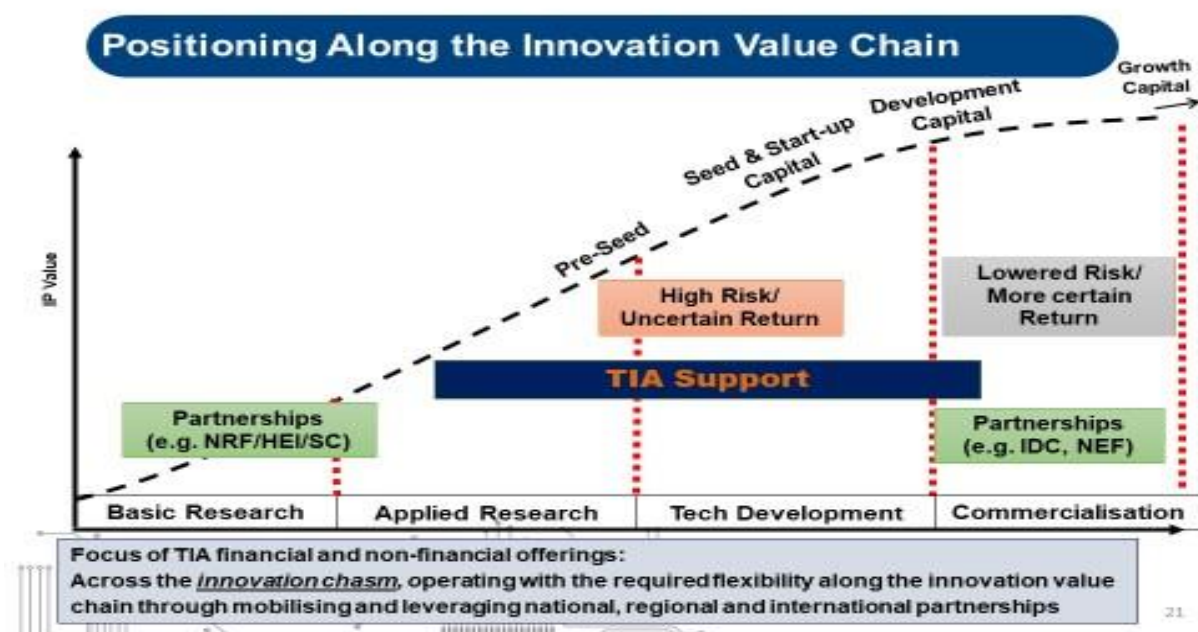
The NSI consists of at least five intersecting national sectors (each comprising a set of institutions with a common objective) and four interdependent functions (see Figure 1), all of which operate within an important international context.

Coordination within government takes place through clusters, each of which focuses on a national sector. At an executive level, strategic science and technology issues are addressed through the agenda of the Ministerial Cluster for Economics, while operational and implementation issues are discussed at meetings of the Directors-General Cluster for Economics and Investment. In broad terms, these clusters are coordination bodies for science and technology, with the role of ensuring the effective implementation of government policy (through agencies of state) and preventing the development of contradictory or disjointed policy. The Ministerial Cluster functions as a forum at which new draft policies, strategies and high-level initiatives are discussed and agreed upon with other departments in that cluster.

2.3 The relevance of TIA in the Innovation Ecosystem

TIA is a vital component of the innovation ecosystem as a mandated institution to support the development and exploitation of technology innovation towards economic growth, alleviation of poverty, unemployment and inequality towards an inclusive development trajectory.

Figure 2: TIA's position in the innovation value chain



Source: TIA Annual Report, 2020

The advances in technology have placed unprecedented opportunities in the hands of ordinary people. The development of what is commonly referred to as the Fourth Industrial Revolution

(4IR) is characterised by the merging of technologies in the physical, digital and biological domains. The presence of big data, artificial intelligence, algorithms, virtual and augmented reality exists within an interconnected world of computers, robots and machines that are capable of predictive analytics, automation and deep learning. The societal impact is as yet is unknown as new business models emerge. The future world of work and jobs presents challenges of human irrelevance, but also opportunities previously unimaginable.

2.4 Differentiation of functions and offerings by public funders in the innovation and commercialisation space

There is a diverse array of funding agencies within the NSI as well as those that provide technical expertise, including non-governmental organisations, many private companies, institutions in government and international agencies. The table below focuses mainly on public support of R&D and commercialisation.

The central government uses two primary modalities for funding performing institutions in the NSI:

- Firstly, there is **performance-based block funding**, which comes directly from government departments (such as the Department of Higher Education and Training and the DSI); and
- Secondly, there are **funding agencies** such as the National Research Foundation and the South African Medical Research Council (the latter of which also performs R&D).

In addition, public funding for R&D and commercialisation is also delivered through several sector or industry bodies that raise funds from levies within a particular sector, such as the Safety in Mines Research Advisory Committee, the Water Research Commission and the Maize Trust of South Africa.

At present, there are some noteworthy overlaps but not competing functions between TIA and some state entities, for example:

- **Industrial Development Corporation (IDC) and Public Investment Corporation (PIC)** - overlap with pre-commercialisation fund and support for start-up businesses, also for expansionary purposes of upscaling technologies/innovations, TRL 8 prepare innovators for follow-on funding through part funding with other funders and limited support for market testing and validation.
- **Small Enterprise Development Agency (SEDA)** - financial and non-financial technology transfer, business incubation and for small enterprises.

- **THRIP and other DTIC Technology funding instruments** – these are largely characterised by mandate overlap with TIA.

The figure below sets out the key relevant funding agencies including TIA.

Figure 3: TIA and related institutions in SA NSI

	Requirements	Instruments	Beneficiary	Shareholder
THRIP	Partnership with research entity including at least one 4 th year student within project	2:1 funding ratio or 1:1 funding ratio based on size of industry partner Up to R8m over 3 years	Industry working with academia	 the dtic Department of Trade and Industry REPUBLIC OF SOUTH AFRICA
SPII	Must be commercially viable	Process scheme – Max R2m Matching scheme – R5m for qualifying costs Partnership – max R10m Repayment – max R10m	Private sector SMME	 the dtic Department of Trade and Industry Managed by IDC REPUBLIC OF SOUTH AFRICA
TVF	Funding for commercialization IP must be owned, must be globally unique	Min R1m Max R40m Equity instruments	SA SMME's	 the dtic Department of Trade and Industry REPUBLIC OF SOUTH AFRICA
TIA	Risk funding at various levels where commercialization not essential (e.g. proof of concept funding) – provides risk funding not funded by other entities Funding across spectrum including to projects hosted by HEIs. Funding of development of IP including development of know-how	Varied funding instruments including grant, conditional grant, loan and Equity Interventions to address systemic issues within NSI Funding amounts vary with no minimums / maximums. Investment above R50m require Minister approval.	Publicly Funded IP	 science & innovation Technology Innovation Agency REPUBLIC OF SOUTH AFRICA

Source: TIA Annual Report, 2020

The table below summarises the overall budgets (not just funding for investment/commercialisation) of the key public entities in the commercialisation space in South Africa

Table 1: Annual budgets and associated staff size for the entities in the commercialisation space

Public institution	Annual Budget (R'000)			Staff Size
	2021/22	2022/23	2023/24	As of 2021/22
Technology Innovation Agency	572 203	582 870	584 631	147
National Research Foundation	2 807 200	2 719 800	2 682 500	1 386
Small Enterprise Development Agency	232 000	237 600	239 100	750
The Technology and Human Resources for Industry Programme	76 200	80 400	83 400	
Industrial Development Cooperation	50 000			
TOTAL	3 737 603	3 620 670	3 589 631	2 283

Source: Annual Report: TIA, NRF, SEDA and IDC, 2020

The table below provides a summary of the mandates and functions of the key funding agencies.

Table 2: Mandates and services offered by intellectual property funders

Public Funder	Mandate	Services Offered
Technology Innovation Agency (TIA)	TIA is a national public entity that serves as the key institutional intervention to bridge the innovation chasm between research and development from higher education institutions, science councils, public entities, and private sector, and commercialisation.	Financial: • Source investments and provide funding for technology innovative opportunities • Drive commercialisation and exploitation of technology innovative opportunities • Promote national and local technology innovation agenda through thought leadership initiatives • Participate, coordinate and contribute to building the Nation System of Innovation and seek alignment with key stakeholders Non-Financial: The Youth Technology Innovation Programme was created to accommodate young innovators who may not necessarily be directly linked to any Science Council, High Education Institution, and Small Micro Medium Enterprise. This programme is designed to assist young innovators to access risk funding, mentorship and business skills support.
The Technology and Human Resources for Industry Programme (THRIP)	The Technology and Human Resources for Industry Programme (THRIP) is a programme that is co-funded and managed by the DTIC. THRIP supports Science, Engineering and Technology (SET) research collaboration on a cost-sharing basis with industry (working with academia) and is focused on addressing the technology needs of the participating firms. The mission of THRIP is to improve the competitiveness of the South African industry by supporting research and technology development activities and enhancing the quality and quantity of appropriately skilled people.	THRIP funding is matched with the “THRIPable” industry contribution by applying a funding ratio that depends on the size of the industry partner or the size of an association of partners, the B-BBEE contribution status of the industry partner and possible partnering with a previously disadvantaged university. The industry partner is the applicant and must be a registered legal entity in South Africa in terms of the legislation for companies, close corporations or co-operatives, and is required to have a partnership with at least one South African research institution which can be a Higher Education Institution (HEI), a Science Engineering and Technology Institution (SETI) or a National Research Facility.
National Research Foundation (NRF)	THRIP is funded by the DTIC and administered by the NRF. An advisory Board of representatives from industry, Government, higher education, labour and the science councils, guides its activities and monitors its performance. The programme’s activities are aligned with those of the DTIC and NRF to support job creation, Small, Medium and Micro Enterprise (SMME) development and the emergence of black entrepreneurs, and to identify the synergies that will increase South Africa’s	THRIP’s strategic goals through the NRF is to: • Support technological research to develop a competitive South African industry, • Support research that develops skilled human resources for industry, • Support research that contributes to socio-economic development and upliftment for all South Africans, and • Facilitate collaboration in applied research between industry and academia

	competitiveness in the global knowledge economy. On a cost sharing basis with industry,	
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Public Funder	Mandate	Services Offered
Studies in Poverty and Inequality Institute (SPII)	SPii is an independent research think tank which focuses on generating new knowledge, information and analysis in the field of poverty and inequality studies. Through facilitating collaborative partnerships with and between institutions of democracy academia and civil society organisations, the organisation will be able to develop innovative and promoting sustainable development. It will work to support the development of a tradition of effective public participation in policy making and implementation.	• To create more meaningful participation in the health budget policy environment and contribute to the creation of better participatory processes at the local, provincial and national levels. • To ensure, through ongoing advocacy support, that those most immediately impacted • by budgeting decisions are enabled to inform and engage with relevant processes, call for accountability, and generate relevant learnings. • To positively contribute to the health budgeting sector through the continuous upskilling • and development of the staff engaged in this project, as well as with other young researchers who directly interface with affected communities.
Water Research Commission (WRC)	The mission of the Water Research Commission (WRC) is to be a global water knowledge node and South Africa's premier water knowledge hub active across the Innovation Value Chain that: informs policy and decision-making; creates new products, innovation and services for socio-economic development; develops human capital in the water science sector; empowers communities and reduces poverty; supports the national transformation and redress project; and develops sustainable solutions and deepens water research and development in South Africa, Africa and the developing world.	The Commission promotes coordination, cooperation and communication in water research and development; establishing water research needs and priorities; stimulating and funding water research according to priority; promoting effective transfer of information and technology; and enhancing knowledge and capacity building within the water sector.

South African Medical Research Foundation (SAMRC)	The South African Medical Research Council (SAMRC) was established in 1969 with a mandate to improve the health of the country's population, through research, development and technology transfer, so that people can enjoy a better quality of life. The scope of the organisation's research projects includes tuberculosis, HIV/AIDS, cardiovascular and noncommunicable diseases, gender and health, and alcohol and other drug abuse. With a strategic objective to help strengthen the health systems of the country – in line with that of the Department of Health, the SAMRC constantly identifies the main causes of death in South Africa.	The SAMRC's innovation divisions drive the organisation's primary purpose – to promote better health for all South Africans and improve their overall quality of life with a focus on introducing new knowledge, techniques and products to improve health policies and practices to prevent and treat disease.
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The funding landscape for innovation in South Africa has matured over the past decade, with many actors in the National System of Innovation establishing various types of funds and funding instruments to support the innovation and commercialisation of technologies emanating from publicly funded research institutions, small, medium and micro enterprises, and entrepreneurs in general. Within government, there are five lead institution with products and services offering in the commercialisation value chain.

As indicates in the tables above, the NRF generally receives a higher transfer from the state for its research activities, this is followed by TIA. This correlates to the staff with the NRF currently with 1,386 employees whilst TIA only has 147. It must be noted that this includes the entire establishment for both entities as it has been a limitation to isolate the number of employees directly related to the commercialisation function. Nonetheless, it clearly suffices that the TIA receives less amount of government transfers for their role in innovation commercialisation as their primary mandate.

The funding landscape for innovation continues to be dominated by government incentives. These are provided mainly through the DSI and several incentive schemes of the Department of Trade, Industry and Competition, including the Technology and Human Resources for Industry Programme; the Support Programme for Industrial Innovation; and the Industrial Development Corporation's Technology Venture. Through the IDC, TIA has been able to leverage co-investment and follow-on funding secured with industry and the private sector. Currently, the Programme has attracted and has the following partners:

- **SA SME Fund:** The SA SME Fund is a private sector led initiative born out of the 'CEO Initiative', a partnership between the SA Government and CEOs to stimulate the economy and create jobs. The shareholders of the Fund are 50 of South Africa's largest corporates with a further 25 per cent being dedicated to Indian and Coloured owned and managed businesses, with the remaining 25 per cent being at the discretion of the fund manager. The Fund has R1.2 billion of investable capital, which it invests via partnerships with fund managers. The primary focus areas are venture capital and growth capital. The CEO Circle exists alongside the Fund as a platform to leverage the SA SME Fund shareholders' resources to help scale 5 to 10 black founded and managed high growth, medium sized companies into significant businesses of +R500 million in value in 3 to 5 years.
- **Venture Fund:** One of the key enablers for TIA to deliver on its mandate and its 5year strategy to support technology-based enterprises, is Strategic partnerships and fundraising: In equally executing this, TIA partnered with the SA SME Fund on the Savant Venture Fund, which is a Venture Capital/Private Equity Fund to support

precommercialisation and commercialisation of early stage technologies through enterprises. The SA SME Fund has contributed R110 million, and TIA has contributed R1.5 million.

- **Biotech Fund:** Concerning TIA's support of the Bio-economy, specifically incubation and commercialisation of TIA's biotechnology investments, TIA has selected OneBIO as the implementing vehicle for the Biotechnology Partnership Fund of TIA and the SA SME Fund partnership. Below is a snapshot of media comments from the SA SME Fund on this partnership Fund.
- **University Technology Fund:** In also executing this first pillar, which is intensifying its current efforts to accelerate the translation and commercialisation of publicly-funded research, primarily from Universities and Science, TIA has partnered with the SA SME Fund to establish a University Technology Fund with a contribution of R150 million from SA SME Fund and R5 million from TIA. This first of its kind partnership with Private sector also executes the TIA Funding investment capacity for key areas of its mandate and provides market access opportunities and platform through the corporates in the SA SME Fund.
- **Industrial Development Corporation - The Natural Indigenous Products Fund:** Concerning TIA's support of the Bio-economy, specifically incubation and commercialization of TIA's biotechnology investments, TIA partnered with the IDC, DSI, DFFE, DTIC to establish a Natural Indigenous Products Fund to primarily support IK-Based Innovation TIA and IDC are establishing a fund The Natural Indigenous Products Fund. The Fund will enable the South African Natural Product Sector to become more competitive. This industry is based on the development and production of finished products or ingredients for the nutritional, pharmaceutical and cosmetic markets. These products and ingredients are derived from South African indigenous plants and herbs. The objectives of the fund are to provide funding for commercialisation and technical assistance for enterprises in the indigenous natural products sector.
- **Business Angels and WZ Capital:** TIA has partnered with Dazzle Angels, a female owned Angel Fund that exclusively supports women owned or co-owned start-ups and Jozi Angels. This partnership is based on a 1:1 co-investment ratio into deals. TIA also has now partnered with WZ Capital, a black owned boutique to co-invest in small deals together with TIA existing funding instruments.

3 Policy and Institutional framework

3.1 Key policies, legislation and regulations governing technology development and commercialisation

3.1.1 *National Development Plan 2030*

The National Development Plan recognises that developments in science, technology and innovation fundamentally alters the way people live, communicate and transact. TIA's vital role is supporting the achievement of the NDP's vision through investing in and re-risking technological innovation and encouraging the commercialisation of mature technologies. In addition, TIA should provide SET support to SMMEs, particularly to women, youth and people with disabilities.

3.1.2 *2019-2024 Medium-Term Strategic Framework" Government's*

2019-2024 Medium-Term Strategic Framework" serves as the implementation plan for the second phase of the National Development Plan. The DSI has committed to priority 2 (Economic transformation and job creation) and priority 3 (Education, skills and health).

Through its mandate, TIA will contribute to these priorities through the commercialisation of intellectual property from publicly funded research institutions and support the creation of technology enterprises that will contribute to job creation with a specific emphasis on historically disadvantaged individuals and communities.

3.1.3 *White Paper on Science, Technology and Innovation*

The 1996 White Paper on Science and Technology (S&T) presented government's vision for S&T within the overall framework of the Reconstruction and Development Programme (RDP). This was a precursor to the 2019 White Paper on Science, Technology and Innovation.

The core vision of the 1996 White Paper was the conceptualisation of a national system of innovation which seeks to harness the diverse aspects of S&T through the various institutions where they are developed, practised or utilised. More widely, the White Paper addresses another of the strategic pillars in stressing the role of technology in meeting basic needs as set out in the White Paper on Urban Strategy, and that on Rural Strategy. In essence, this document sought to highlight the relationships between the different mechanisms of delivery of services through DSI entities and the department itself.

In March 2019 Cabinet adopted the revised White Paper on Science, Technology and Innovation which led to material policy shifts for activities related to science, technology and innovation to address aspects such as transformation and inclusivity, and strong linkages within the National System of Innovation. These include strengthening the culture of innovation within government and society; improving policy coherence and more effective budget and programme coordination within the National System of Innovation; implementing monitoring

and evaluation systems; creating a more enabling environment that advances innovation; developing local innovation ecosystems; and increasing investment in technology-based small, medium and micro enterprises and support to grassroots and social innovation projects.

The 2019 White Paper on Science, Technology and Innovation directed the shift for STI to address transformation and inclusivity and the need for stronger partnerships, linkages and coordination within the national system of innovation (NSI). These include strengthening the culture of innovation within government and society; developing human capabilities; improving policy coherence and more effective budget and programme coordination within the NSI; implementing monitoring and evaluation systems; creating a more enabling environment that improves innovation performance; developing local innovation ecosystems; and increasing investment in technology-based SMMEs and support to grassroots and social innovation projects. The role is to support inclusive economic growth through commercialising innovation, delivering on the bio-economy strategy and improving the competitiveness by supporting SMME's through technology stations.

The 2019 White Paper informs the medium- to long-term policy direction for the NSI. The implementation of the White Paper is directed through successive decadal plans. To ensure policy coherence and maximum responsiveness to the needs of society, the decadal plans will be reviewed every five years, in collaboration with the relevant NSI stakeholders. Currently, the intention of the draft STI Decadal Plan is to optimise synergies among STI intensive government departments and the rest of government through joint programming and co-funding for STI priorities. offers guidance on; (a). thematic focus areas and priorities initiatives, (b). institutional arrangements, implementation partnerships, (c). proposed resources for funding, prioritisation and scheduling of initiatives and (d). measures to track progress and impact.

As a result, the paper encourages a closer interface of development finance institutions with TIA and to scale up the overall level of government support for RDI. This will serve to close a critical gap in funding for large-scale projects that require government funding commitments to catalyse large-scale private sector action.

In South Africa, STI contributes towards addressing the complex social challenges as indicated in the South African White Paper on Science, Technology and Innovation, which requires a system that is responsive, inclusive and supports all forms of innovation, including effective grassroots innovation programmes for the country. South Africa's National Development Plan (NDP) also entrenches the importance of a capable developmental state for the country's social and economic development (UNDP).

The launch of the UNDP Accelerator Lab in South Africa, in partnership with the Department of Higher Education, Science and Innovation, is to ensure local and non-laboratory based innovators are not left behind in the country's innovation ecosystem engagements and opportunities. Integrating local innovators into the national innovation ecosystem therefore remains critical.

3.1.4 Alignment with DSI research and development roadmaps

The DSI has over the years developed several research, development and innovation roadmaps. These serve as key national frameworks to guide and direct investment decisions for research and development, and collaboration among various stakeholders in the National System of Innovation.

TIA will continue to be informed by these roadmaps, which include advanced manufacturing, information and communications technology, human settlements, water and waste management, and research infrastructure.

3.1.5 Bio-economy Strategy

The Bio-economy Strategy seeks to use South Africa's bio-based resources to become a significant contributor to the country's economy by 2030 through the creation and growth of biotechnology-based industries. These new industries will generate and develop bio-based services, products and innovations in which new and existing companies will provide and use such solutions.

Effective implementation of the Bio-economy Strategy forms one of the four strategic outcomes for TIA. In addition, TIA intends to place a renewed and deliberate emphasis on indigenous knowledge systems as a key basis for promoting economic inclusion and transformation with great potential to lead to the creation of new industries.

3.1.6 DSI Decadal Plan

The process to compile the new DSI Decadal Plan, which will serve as the implementation plan for the White Paper on Science, Technology and Innovation, is ongoing. TIA will align itself with the plan once its finalised.

3.1.7 United Nations Sustainable Development Goals

The United Nations have developed 17 Sustainable Development Goals (SDGs) which aims to end poverty and hunger globally; combat inequality within and among countries; build peaceful, just and inclusive societies; protect human rights; promote gender equality and the empowerment of women and girls; and ensure the lasting protection of the planet and its natural resources.

TIA plans to contribute to the realisation of many of these goals by stimulating industry and the broader economy through the directed funding of innovation and commercialisation. This will entail a focus on accelerating the translation of indigenous knowledge outputs into products and services that contribute to redressing socioeconomic vulnerabilities in marginalised communities in South Africa while ensuring increased inclusivity to encourage the participation of women, youth and people with disabilities.

3.1.8 African Union Agenda 2063

A 10-year Science, Technology and Innovation Strategy for Africa was adopted at the 23rd Ordinary Session of African Union Heads of State and Government in 2014. The strategy, which promotes competitiveness through human capital development, innovation and value addition, is part of the African Union's long-term, people-centred Agenda 2063, a strategic framework for the socioeconomic transformation of Africa over the next 50 years.

3.2 Legislative Establishment and Mandate

3.2.1 Technology Innovation Act (Act 26 of 2008)

TIA was established as a schedule 3A public entity in terms of the Public Finance Management Act (Act 29 of 1999, as amended). The mandate of TIA is derived from the provisions of the Technology Innovation Act (Act 26 of 2008) and sections 19-23 of the Science and Technology Laws Amendment Act (Act 7 of 2014) which establishes which establishes TIA as an Agency to promote the development and exploitation, in the public interest, of discoveries, inventions, innovations and improvements. TIA's objective is to support the state in stimulating and intensifying technological innovation to improve economic growth and quality of life for all South Africans by developing and exploiting technological innovations.

3.3 Strategic Objectives

Through its initiatives and programmes, TIA has the following strategic objectives:

- Promoting bilateral collaborative research, development and innovation initiatives;
- Promoting market access and international networking for promising local technologies;
- Facilitate focused capacity-building partnerships for skills transfer into the NSI and Africa;
- Attracting investments into the STI for technology innovation and commercialisation;
- Support regional and continental Science, Technology and Innovation initiatives as contained the AU and SADC Ministerial Declarations and Action Plans, and

- Positioning the TIA brand as the thought leader in innovation in Africa and beyond through the hosting of and participation in carefully selected international platforms, events and conferences.

3.4 Current structure and staffing

Financial support towards innovation, whether related to products, process, organizational methods, or marketing, is a complex, multidisciplinary activity that involves several areas (such as marketing, R&D, financial, etc.), its clients, and its suppliers. For this system to function effectively, effective coordination of the different activities it entails is required through a wellstructured organisational structure.

The TIA current structure and staffing as illustrated in the figure below ensures that there are enough human resources with the right skills to accomplish the entity's goals and ensures that responsibilities are clearly defined per sector. Each division focuses on a specific sector ensuring that the right set of expertise are applied for each project undertaken by the entity.

Figure 4: TIA current structure and staffing

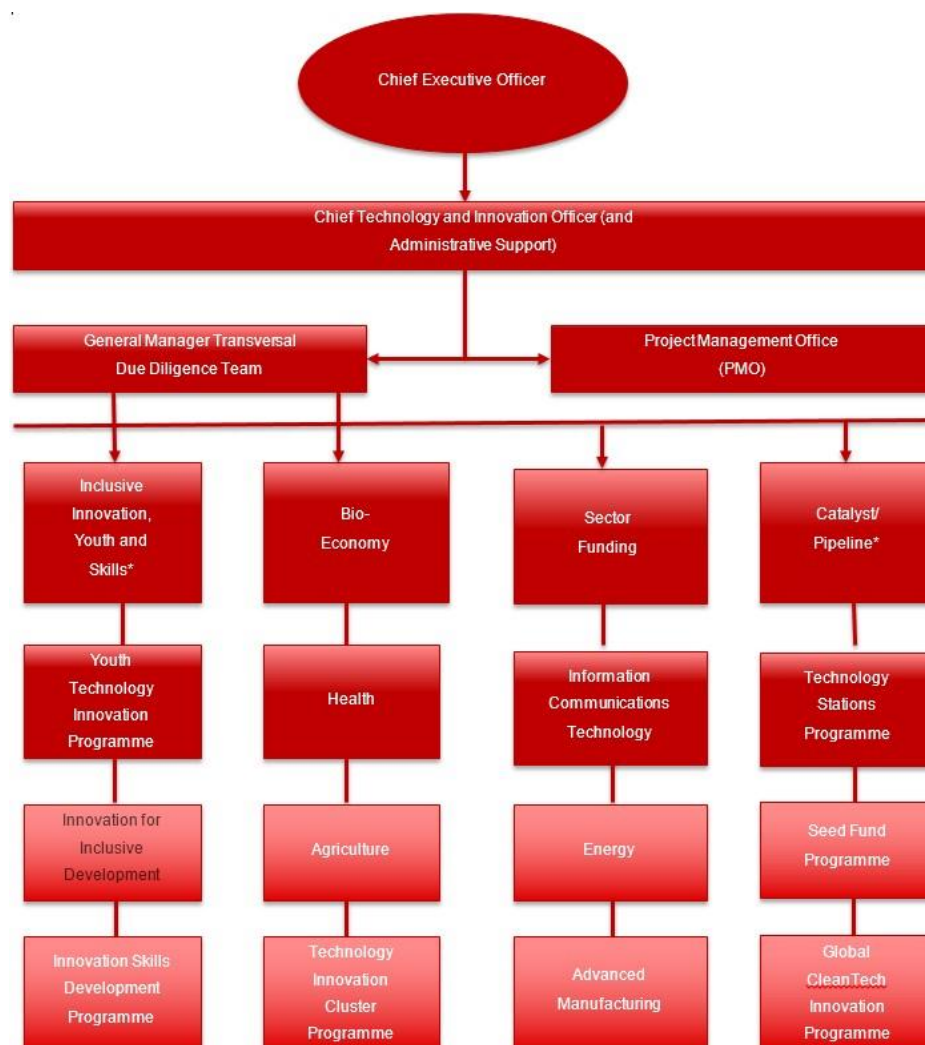
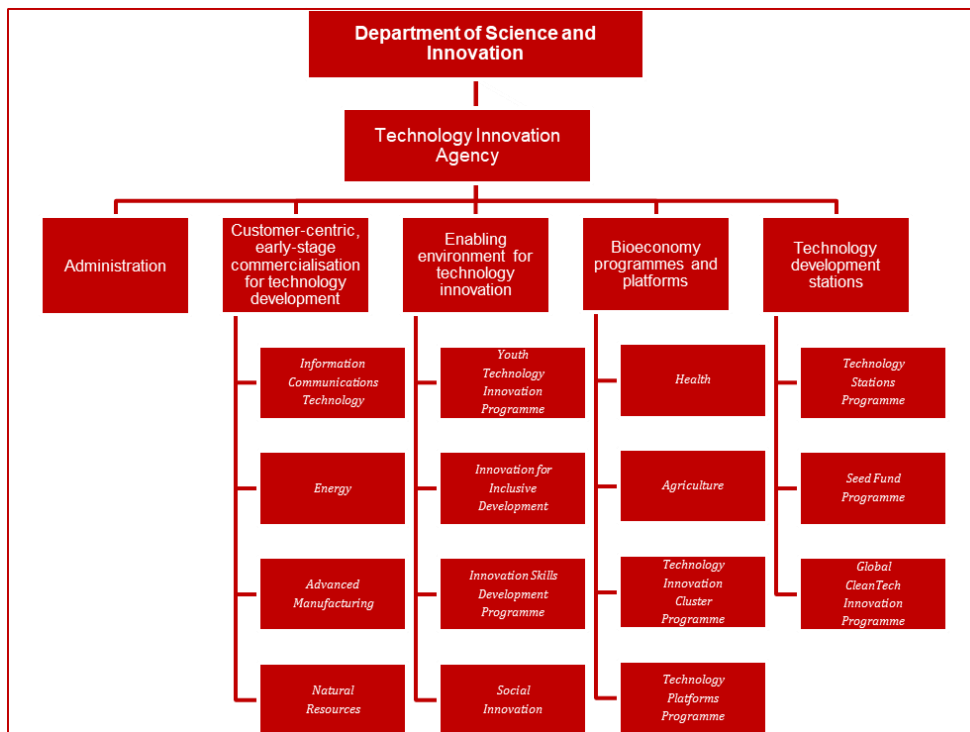


Figure 5: TIA's Board-approved organisational structure



Source: TIA Annual Report, 2020

4 Programme Chain of Delivery

The Funding Application Process consists of a Pre-investment or Pre-Approval Process, which offers support to potential applicants with funding application writing, which aims to minimise the administrative burden during the application process. There are three phases to TIA's application process:

1. **Phase 1: Submission of the Statement of Interest by applicant.** The Statement of Interest describes the intellectual property, commercial, team, proposed technology innovation and budget. This is followed by a submission of a detailed full application.
2. **Phase 2: Full Assessment. Once the full application has been submitted, a full assessment** involves opportunity evaluation in commercialisation, intellectual property, technical and legal. The deal structuring and project execution plan will also be developed at this stage.
3. **Phase 3: Approval of applications. This is always subject to the availability of funding.** Applications that preceded the full assessment stage are approved by TIA approving body.

The investment governance is embedded in the organisation's delegation of authority based on the funding requirements. Executive approval is required funding below or equal to R1 million; the Investment Assessment Committee approves funding below or equal to R5 million;

ExCo funding approval is required for funding below or equal to R15 million; and the IFC funding is for approvals below or equal to R30 million.

4.1 Funding Instruments

The funding schemes available seek to respond to the innovation needs of the NSI. The programmes are aimed at creating and supporting an enabling technology innovation environment to support the progression of innovation towards commercialisation. TIA fills the funding “gap” for technology development projects with high social and economic impact, usually these are projects that are unable to attract commercial funding due to the inherent high risk nature associated with the technology development process. TIA’s funding focuses on de-risking technologies that are going through the technology development phases. Technology projects are evaluated against the parameters of each technology level and is then assigned a TRL rating based on the projects progress. The majority of TIA project that make it to market are largely from the Seed Fund, for sourcing promising projects from the research community and small, medium and micro enterprises. The table below illustrates the three funding instruments available to applicants.

Table 3: Funding Instrument Schemes

	Purpose	Target Market	Technology Readiness Level*	Qualifying Criteria
SEED FUND	To bridge financing requirements to translate research outputs into fundable ideas for commercialisation.	- High Education Institutions - Science Councils - Small Micro Medium Enterprises - Start-up companies	3 - 8	All project beyond basic research
TECHNOLOGY DEVELOPMENT FUND	To assist innovators to advance technologies along the innovation value chain, from proof of concept to technology demonstration. The fund is designed to make early stage technology development more attractive and less risky to the market.		4 - 7	Proof of concept established
PRE-COMMERCIALISATION FUND	To prepare innovators for followon funding through part funding with other funders and limited support for market testing and validation. TIA’s main role at this stage is facilitation.		8	Endeavour to have an off-take agreement or third-party follow-on funding commitment

*Technology Readiness Level: Level 1 Basic Research; Level 2 Concept formulation; Level 3 Critical function or proof of concept established; Level 4 Technology development: Validation in the laboratory environment; Level 5 Technology development: Laboratory scale, validation in relevant environment; Level 6: Integrated prototype system verified in operational environment; Level 7: Integrated pilot system demonstrated in operational environment; and Level 8: System incorporated in commercial design.

4.2 Programmes design, product and services and targeted beneficiaries

Table 3: Products, services and target markets of TIA services

PROGRAMME	OBJECTIVE	FOCUS AREAS
Agriculture	Aims to contribute to the development of high-growth and high-impact technologies, products and services that will result in a competitive, broad-based, inclusive and sustainably growing agriculture sector in South Africa, Africa and globally.	- Breeding and productive technologies in livestock and field crops. - Animal and plant health and nutrition. - Agro-processing and post-harvest technologies.
Health	Aims to develop healthcare technological innovations that prevent, diagnose and treat priority diseases in the country, which will assist in improving public health and the quality of life. Through improved technology healthcare products and services, the unit intends to contribute to SA's social and economic development through translation of knowledge resources and research and development (R&D) to products that contribute to better health outcomes for South African citizens and advance the country's global competitiveness in health-related areas.	- Medical devices and diagnostics. - Pharmaceuticals and bio-pharmaceuticals. - Indigenous Knowledge System and complimentary medicines. - Priority diseases include HIV/AIDS, tuberculosis, malaria and noncommunicable diseases such as cardiovascular disease, cancer and diabetes.
Technology Platforms Programme	The TPP aims to facilitate access to cutting-edge technological capabilities by investing in and supporting entities to acquire appropriate technologies and expertise that in turn lowers the barriers for others to innovate. The Programme supports the development of technologies with commercialisation potential and contributes to the creation of a vibrant bio-economy.	- The Programme enables the provision of technology development services, from proof of concept stage up to commercialisation, specialised training and capacity development opportunities for role-players in multiple value chains. - The programme is a critical element of TIA's implementation of the Bio-economy Strategy.
Technology Innovation Cluster Programme	Technology innovation clusters are collaborative programmes, aimed at leveraging the strengths of multiple partners to drive a technology solution and alleviate common industry challenges, thereby lowering the barriers to innovation in the sector.	- Cluster interventions entail the provision of support from the proof of concept stage, focusing on projects that are likely to be commercialised by the industry. - This is enabled through the provision of funding, technical support and business enabling services, including the development of human and intellectual capital.

Contracted BioEconomy Programmes	The Bio-economy Division manages three contracted programmes on behalf of the DSI. They are the Strategic Industrial Bioinnovation Programme, which is aligned to the Industrial Biotechnology portfolio; SABDI, which is a cross-cutting programme supporting health, agriculture and industrial biotechnology; and ABIPP, a multidisciplinary programme supporting various agriculture industries such as aquaculture and grain production.	• The bio-economy focus areas within the contracted programmes are the agriculture sector (82%), followed by environment (15%) and health (3%). • The projects predominantly involve small enterprises (54%), followed by universities (35%) and science councils (11%).
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Source: TIA Strategic Plan, 2020

- **Bio-economy:** As this is a key programme, all funds received from the DSI are allocated to it. Total allocations from the department accounting for 46 per cent of the investment budget. Of the total, a significant portion is for technology development, where focus was placed on indigenous knowledge systems, industrial biotech, and partnering with other funders in the National System of Innovation with the aim of supporting the development of commercially viable products. Over the period ahead, TIA will continue to be a knowledge leader in the bio-economy space and partner with higher education institutions, science councils, and small, medium and micro enterprises to fund early-stage innovation.
- **Technology Stations:** TIA support innovation through its Technology Stations Programme, which aims to translate ideas into prototypes and marketable products. Funding for the programme is received through the ring-fenced grant allocation and specific contracts from the DSI.
- **Sector Funding (commercialisation):** The commercialisation unit focuses on development and commercialisation for product-funded projects. Funds are administered within the programme and are deliberately aligned with key strategic focus areas in the various sectors. Greater emphases are placed on leverage funding and partnerships to manage the funding demand.
- **Innovation Enabling:** The programme focusses on rural development, partnerships and enterprise development. It is mostly funded through partnerships and specifically contracted funds received from the DSI and other partners. As the initiative is crosscutting, further funding is made available from other supported areas.

5 Monitoring and evaluation

5.1 TIA monitoring and evaluation

According to the Evaluation of Government Business Incentives Report by the Department of Planning, Monitoring and Evaluation on TIA, responses from both fund coordinators and individuals representing the technology innovation and commercialisation indicate that monitoring and evaluation processes within TIA are currently weak. The existing framework places a significant level of responsibility for evaluation and reporting on the administrative units at each implementing partner as well as the oversight department being the DSI. Some partners have undertaken efforts to modify reporting templates, for example by transferring the templates into MS Excel for ease of use. Another point of concern is that the role and governance of the seed funding is not particularly well-defined, particularly when it comes to delegation of authority. As noted in the previous sections, TIA has endeavoured to implement new systems and performance monitoring frameworks to address these concerns, this is to improve on monitoring.

TIA implemented pre- and post-investment processes to improve client management, turnaround times and post-approval support to existing and new technology projects within the TIA portfolio. The agency reports progress to the DSI and the National Treasury through the Annual Performance Reports and Quarterly SCOA reports. The table below outlines the overall oversight arrangement and key reporting channels regarding TIA as an entity of the DSI

Table 4: Oversight arrangements, key reporting channels and accountability mapping

Institution	Roles and responsibilities
Parliament	Parliament exercise oversight over TIA through the Portfolio Committee on Higher Education, Science and Technology. The Constitution of the Republic of South Africa, 1996 and the Rules of Parliament mandates the Portfolio Committee on Higher Education, Science and Technology to oversee the activities and performance of the Department of Science and Innovation and the entities that report to it. Hence, the Committee annually reviews whether the Department and entities' performance plans are aligned to national strategic objectives and the appropriated budget.
Department of Science and Innovation	The Minister of Science and Innovation is responsible for overseeing and providing strategic guidance to TIA in terms of the Technology Innovation Agency Act No 26 of 2008. The Minister is also responsible for appointment of Board and approving of annual budget for the public entity in terms of section 53 of the Public Finance Management Act (PFMA).
National Treasury	As a schedule 3A listed public entity in terms of the PFMA, the public entity is regulated in terms of the Act. The National Treasury is responsible for ensuring transparency, accountability and sound financial controls in the management of South Africa's public finances, this is achieved through periodic budget and expenditure monitoring and reporting and NT regulations approvals

The National Council on Innovation	The National Council on Innovation Act, 1997 (Act No. 55 of 1997), provides the mandate for NACI (2015). The Act mandates NACI to advise the Minister for Science and Technology and, through the Minister, Cabinet, on the role and contribution of science, mathematics, innovation and technology, including indigenous technologies, in promoting and achieving national objectives, namely, to improve and sustain the quality of life of all South Africans, develop human resources for science and technology, build the economy, and strengthen the country's competitiveness in the international arena. NACI continuously prepares reports on the South African National System of Innovation including the performance of TIA.
NIPMO	An initiative of the Department of Science and Technology, responsible for implementing the Intellectual Property Rights from Publicly Financed Research and Development Act (No. 51 of 2008) which makes provision that intellectual property emanating from publicly financed research and development is identified, protected, utilized and commercialized.

Stakeholders, according to the Evaluation of Government Business Incentives report indicate that the breadth of fundable activities makes performance monitoring of beneficiaries challenging, as it demands varied expertise. This again highlights the need for well-resourced and capacitated implementing partners if monitoring and evaluation is to take place effectively. Programme coordinators suggest that continued engagement with the NIPMO to provide resources will be key to achieving this objective. In the interim, the Seed Fund Unit within TIA is attempting to increase compliance in performance monitoring by taking a more hands-on approach to their implementing partners' quarterly reporting processes. Programme coordinators state that they are attempting to flag non-performing projects at earlier stages.

TIA has also initiated its own effort to support the programme with guidance frameworks to enable better performance monitoring, tracking of key indicators, and data management. The Seed Fund Unit is working in partnership with the Technology Stations Programme, which established a Theory of Change and Logical Framework for its own programme, to develop a systemic monitoring and evaluation framework. This work is a component of a broader programme-level review to more fully understand SFP performance and impact.

5.2 Setting of Performance Standards

The entity's method of calculation or assessment of outcomes and indicators is conducted annually, by means of simple counting of the projects received in the programme database. The table below illustrates various activities undertaken by the entity as well as associated indicators.

Table 5: Various activities undertaken by the entity as well as associated indicators.

OUTCOME	INDICATOR	DEFINITION
Commercialised innovations	Number of technologies commercialised	Number of technological innovations that have been introduced into the market for social benefit or commercial gain, directly or indirectly (products, processes or services)

Delivering on the Bio-economy Strategy	Number of bio-based technologies commercialised	Number of bio-based technological innovations that have been introduced into the market for social benefit or commercial gain, directly or indirectly (products, processes or services)
	Number of bio-based entrepreneurs and organisations accessing high-end science, engineering and technical services	Bio-based entrepreneurs and organisations accessing highend science, engineering and technical support for the purposes of developing innovative, bio-based products or services through the financial or non-financial support of the Technology Platforms network
Small, medium and micro enterprises supported through strategically informed and regionally distributed Technology Stations	Number of small, medium and micro enterprises accessing science, engineering and technical services	Small, medium and micro enterprises that access science, engineering and technical support for the purposes of developing innovative products or services through the financial or non-financial support of the Technology Stations network

5.3 Historical Performance

TIA has had a direct impact on the innovative companies and entrepreneurs supported through the transfer of technology development and knowledge over the years. Over the past five years approximately 202 technologies have been supported, which involves the de-risking of early stage ideas from Technology Readiness Level 3 to higher levels such as level 6 and 7. The Agency has recorded several innovation product successes over the year, with 226 out of a targeted 102 innovation outputs taken up to the market. Over the years, Particular successes include, Kapa Biosystems, wherein an investment of R42 million was made by TIA and AgriProtein, an investment of R15 million.

Table 6: Six-year actual performance

Description		2015-2020	2015/16	2016/17	2017/18	2018/19	2019/20
No. of technologies, processes and services advancing by one or more TRL	<i>Target</i>	102	6	12	26	28	30
	<i>Actual</i>	202	27	31	34	30	80
No of innovation project outputs taken up in the market	<i>Target</i>	51	4	14	10	11	12
	<i>Actual</i>	113	9	31	19	14	40
Amount of additional funding attracted into TIA's portfolio	<i>target</i>	R551m	R75m	R59m	R113m	R147m	R157m
	<i>Actual</i>	R1.11bn	R97.9m	R182m	R117m	R379.3	R331.9m

Amount of external income raised	Target	R222.0	R98	R124m			
	Actual	R264.8	R153.8	R111m			
Amount of income recognised	Target	R395.3m	-	-	R142m	R108.3m	R145m
	Actual	R339.5m	-	-	R67m	R127.4m	R145.1m
Number of Small, Medium, and Micro Enterprises (SMMEs) receiving technology support	Target		2000	2200	2800	3360	3840
	Actual		2197	2261	2800	3272	3269

Source: TIA Data, 2020

As at the end of 2018/19 financial year, TIA achieved an average performance on its strategic objectives of 88 per cent. An amount of R1.4 billion was allocated towards the development of new technologies which led to over 266 knowledge products, processes and services being developed. For the 2019/20 financial year, the Seed Funding contributed towards the advancing 10 technologies advanced by 1 or more TRLs, 4 innovation project outputs were taken into market; 24 knowledge innovation products produced; and 4 technology innovation initiatives undertaken. A total of 17 innovations have been commercialised in various sectors including health, safety, agriculture (agro-processing), energy (solar) and mining. A total of 3,269 SMEs/SMMEs were supported. A total of R14.9 million of additional investment was attracted.

Table 7: Number of Small, Medium, and Micro Enterprises (SMMEs) receiving technology support

Period	Targeted number of SMMEs for support	Actual number of SMMEs supported
2015-2016	2 000	2 197
2016-2017	2 200	2 261
2017-2018	2 800	2 800
2018-2019	3 360	3 272
2019-2020	3 840	3 269
2020-2021	No target	1 990

Source: TIA Annual Report, 2020

The 2019/20 Technology Innovation Agency Economic Impact Assessment 2019/20 revealed that TIA's services are relevant and meets the needs of its beneficiaries. While each project

requires individual attention and has specific needs, most respondents experienced the following:

- Funding requirements were critical in the development of the projects. TIA played a critical role in this regard and incorporated the right approaches in monitoring and evaluation practices
- In certain projects, access to skills was a necessity. TIA played a role as an enabler to ensure projects were equipped with the necessary skills to meet the projects' development needs
- Several respondents required funding and security to progress projects to commercialisation. In most instances, TIA was effective in linking beneficiaries to other potential funders and institutions. This remains a significant task that TIA must ensure is met as it is often found that high economic and social impacts materialise only after projects are commercialised

5.4 Additional Performance Information

Table 8: TIA's contribution to the DSI's Outcomes

Outcome	Goal statement	Proxy indicator aspects	TIA's contribution
A transformed, inclusive, responsive and coherent National System of Innovation	Expand, transform and enhance the responsiveness of the National System of Innovation over the next five years	Formalised partnerships between constituent parts of the National System of Innovation	Collaborate with other National System of Innovation stakeholders in developing technological innovations through leveraged funds and other resources. This includes
		Gross expenditure on research and development as a	
Outcome	Goal statement	Proxy indicator aspects	TIA's contribution
		proportion of GDP of 1.1%	partnerships with higher education institutions (including technical and vocational education and training colleges) and science councils
Knowledge utilisation for economic development in revitalising existing industries and spurring research and development-led industrial development	Improve the sustainability and competitiveness of traditional sectors and emerging sectors over the next five years	Sectoral master plans with science, technology and innovation components developed and implemented	Implement sector master plans by investing in emerging and advanced technologies to enhance the competitiveness of TIA-funded innovations
		Improve the performance of small, medium and micro enterprises and opportunity gains through technology interventions	Provide financial and non-financial support to small, medium and micro enterprises to take advantage of market opportunities

Human capabilities and skills for the economy and for development	Improve the representability of highend skills, and increase the development of technical and vocational skills for the economy over the next five years	Innovation engagement and awareness	Promote and encourage participation in the technology innovation value chain by historically disadvantaged institutions Support small, medium and micro enterprises
Increased knowledge generation and innovation output	Increase the relative contribution of South African researchers and science, technology and innovation institutions to global scientific and innovation output over the next five years	Prototypes	Increase the number of prototypes developed through TIA interventions
The use of knowledge for inclusive development	Expand the use of scientific knowledge (as evidence) in support of innovation for societal benefit and public good over the next five years	Locally developed technology deployment across the three spheres of government.	Number of technology demonstrations and locally developed technology deployment to districts and local municipalities

Source: TIA annual Reports

To carry out its mandate, TIA requires both formalised partnerships with universities and public research institutions and other government instruments such as those of the Department of Trade, Industry and Competition. This ensures connectedness along the innovation value chain, which is critical to allow for the nurturing of technologies from laboratory to market. The goal is to use South Africa's science and technology base to develop new industries, create sustainable jobs and help diversify the economy away from commodity exports towards knowledge-based industries equipped to address modern global challenges.

The DSI undertook an assessment of TIA's performance against its mandate and positioning within the National System of Innovation. Based on this, the Ministerial Review Report highlighted several key areas that require attention if TIA is to fulfil its mandate effectively and contribute to building a productive ecosystem.

Key among these is that TIA:

- Serves as a "hub" where entities such as publicly funded research institutions, large and small commercial and industrial businesses, innovative private individuals, nongovernmental organisations and community-based organisations, and technological innovation support instruments funded by government departments and public and private entities would interface with the objective of converting ideas into commercial activities.

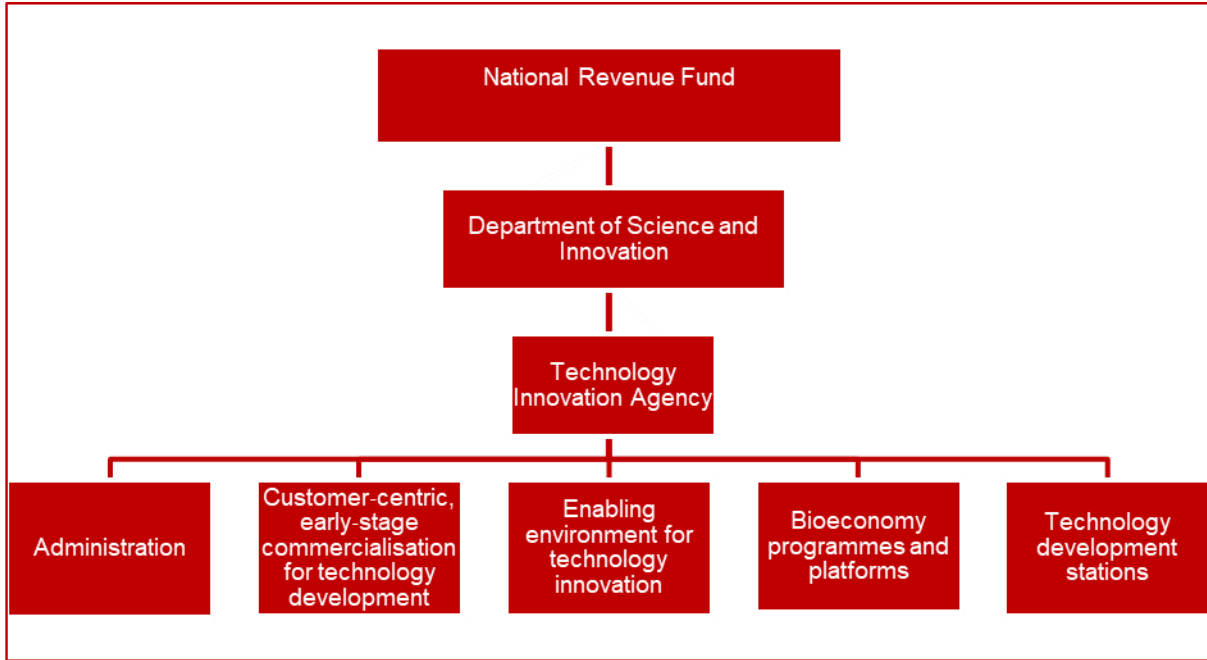
- Assumes the fundamental role of a publicly funded instrument that ensures a national innovation ecosystem functioning at maximum efficiency and effectiveness, and an interface for the conversion of ideas into commercial activities.
- Effectively plays its role as a grant-giving agency and approaches the accrual of return on investment not in terms of balance sheet, but rather benefits to the national economy from commercialised innovations (e.g., jobs).
- Enhances its ability to support small, medium and micro enterprises through an appropriately positioned and scaled-up Technology Stations Programme.
- Implements an effective regionalisation strategy.
- Improves operational efficiencies and its reputation, especially in relation to turnaround times for enquiries, applications, progress payments, overhead costs and communication with stakeholders.
- Promotes a culture of innovation that enhances the role of people as innovators through events that highlight role models and supports the integration of entrepreneurship into the education system.

6 Flow of funds

TIA is substantially funded through government transfers received from DSI. Transfers from government constitute about 80% of total revenue with the other 20% percent generated from commercial activities and through leveraging from international sources.

Since 2016, R2.1 billion has been allocated to TIA through transfers from DSI to support technology innovations and provide access to specialised technology infrastructure, through the Agency's programmes Seed Funding, Technology development Fund; and commercialisation Fund Investments priorities through Bio-economy, Technology Stations, Sector Funding (commercialisation) and Innovation Enabling programmes through funding instruments to qualifying beneficiaries.

Figure 6: Flow of funds process flow



TIA derives the bulk of its revenue from transfers from the Department of Science and Innovation. Other sources of income include co-funding partnerships, and interest and royalties earned.

Table 9: TIA annual budget allocations

Actual Revenue						Medium-Term Estimates		
	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Transfers from DSI	420,103	396,732	420,322	440,929	408,825	447,703	458,370	460,131
Baseline (Other than baseline)					194,236	196,396	197,764	198,535
Bio-Economy					176,147	206,288	213,921	214,734
Technology Stations					38,442	45,019	46,685	46,862
Specific Contracts	45,675	69,391	110,093	146,098	155,620	114,000	114,000	114,000
Additional Income Target	11,711	12,978	19,533	4,097	5,766			
Interest	14,951	10,129	15,567	12,262	6,326	10,500	10,500	10,500
Total Funding Received	492,440	489,230	565,515	603,386	576,537	572,203	582,870	584,631

Source: National Treasury: Estimates of National Expenditure, 2020

While TIA has an average annual budget of R 500 million, this largely supports the Bioeconomy Programme and Technology Stations Programme. The implication of this is that there is a relatively small amount of funding available for meaningful investments in new projects. As the tight economic conditions in South Africa suggest that there will be few prospects for new or additional funds over the medium term, TIA will have to formulate a new approach to project support that focuses on partnerships, the strategic sourcing of projects and an ecosystem with a multi-stakeholder approach to investments.

7 Expenditure Analysis and costing

7.1 Methodology, approach, data sources and limitations

The analysis provided under this section was primarily from the data sourced from the entity's general ledger accounts, trial balances, annual reports and information obtained from National Treasury's annual publications of estimates of national expenditure (ENE). Throughout the execution of its mandate, TIA has been guided in the first instance by the TIA Act, the TIA Business case and recommendations from the 2013 Ministerial review process. The TIA Business case did not intend that TIA will be substantially self-funded. The business case instead states that:

"It will initially require substantial government funding to build its infrastructure and establish itself within the NSI. However, it is envisaged that in five to ten years part of the TIA revenue stream will be derived from other sources, including private and venture capital funds, international funders, as well as value that may be derived through TIA spin out technologies and TIA supported IP portfolios, in the form of, for example, equity and royalties from license agreements. It will take 5 to 10 years to establish this base.

It is important to emphasise that the TIA is a government response to the innovation chasm or "valley of death", and it will therefore always require partial funding from public funds in order to meet its mandate of support for technology commercialization".

In addition, TIA was established as a PFMA Schedule 3A entity. The definition of a Schedule 3A entity is noted as follows:

- A board, commission, company, corporation, fund or other entity (other than a national government business enterprise) which is – (a) established in terms of national legislation;
- (b) fully or substantially funded either from the National Revenue Fund, or by way of a tax, levy or other money imposed in terms of national legislation; and

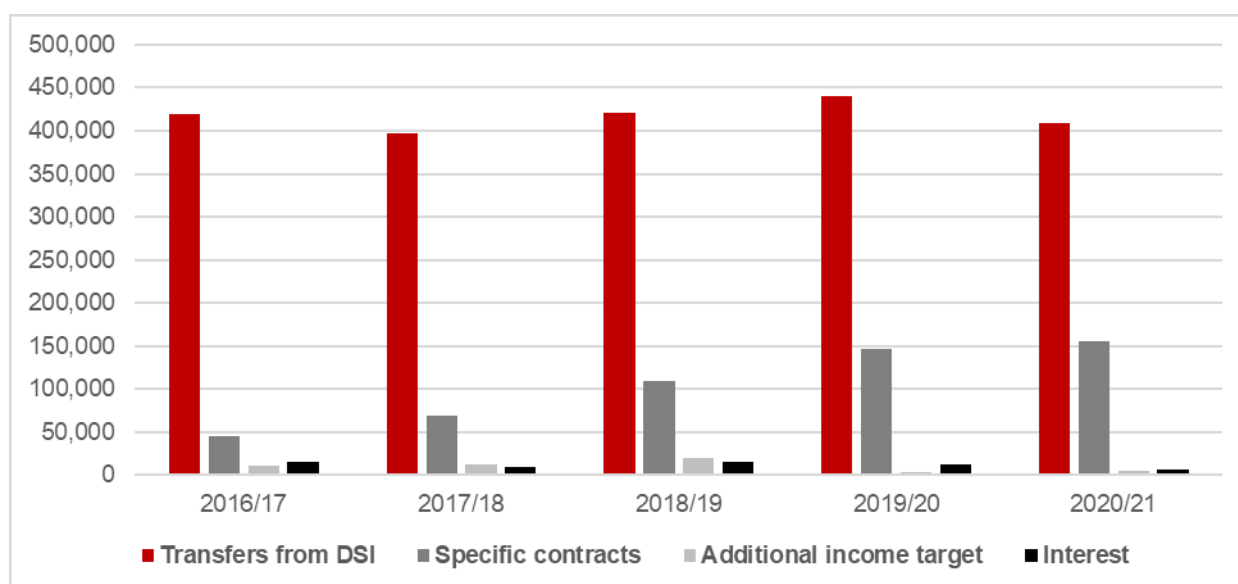
(c) accountable to Parliament

Table 10: TIA Revenue

	Actual Revenue					Medium-term estimates		
	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24
Transfers from DSI	420,103	396,732	420,322	440,929	408,825	447,703	458,370	460,131
Specific contracts	45,675	69,391	110,093	146,098	155,620	114,000	114,000	114,000
Additional income target *	11,711	12,978	19,533	4,097	5,766			
Interest	14,951	10,129	15,567	12,262	6,326	10,500	10,500	10,500
Total funding received	492,440	489,230	565,515	603,386	576,537	572,203	582,870	584,631

Notes: * Additional income target cannot be projected over the MTEF due to the uncertainty of commercialisation activities. The nature of technology development falls in a high-risk category with unpredictable outcomes.

Figure 7: TIA Revenue



The table and figure above show TIA's revenue over the last five years. The agency derives the bulk of its revenue from transfers received from the department, other sources of revenue include co-funding partnerships, and interest and royalties earned. TIA secondarily receives income in the form of royalties, disinvestment in equity stakes held in investee companies and loan repayments. These payments are, where possible, included in the forecasted spend for each financial year.

The parliamentary grant to TIA declined by an average annual growth rate of 0.7 per cent from R420.1 million in 2016/17 to R408.8 million in 2020/21. Specific contracted agreements or specific-purpose funding grant by DSI recognised as income increased by 35.9 per cent, from R45.7 million in 2016/17 to R155.6 million in 2020/21. Revenue generated from interest on loans issued decreased from R15 million in 2016/17 to R12.3 million in 2019/20 as attributed

to a declining portfolio of investment with less patented products entering the market, representing a 19.3 per cent decline over the same period.

Overall, Investment and other income decreased by 16.2 per cent, from R11.7 million in 2016/17 to R5.8 million in 2020/21. This decrease is in line with the challenging economic climate experienced from 2019/20 and relates to lower loan repayments and royalties from investee companies. To address the ever-increasing demand for TIA funding there is a need for TIA to continue to identify and secure alternative sources of funding and revenue. The additional income target from the market is relatively small compared to other revenue streams, only making up 0.7 per cent of the total revenue as at 2019/20 compared to 73.1 per cent (transfers from DSI) and 24.2 per cent (specific contracts).

The business and operating model of the agency is in innovation and technology development. The nature of technology development falls in a high-risk category with unpredictable outcomes. In such a high-risk environment, there is a concomitant high probability that milestones will not be achieved as contracted and it is therefore difficult to forecast and deliver a zero surplus/deficit budget at the end of the financial year. Hence additional income target cannot be projected for the MTEF period. Whilst mitigating the risks through re-allocation of budgets and detailed project management, there is always the high probability of roll over on 31 March each year. It was therefore included in the TIA Act that TIA should be allowed to retain funds in a prescribed manner to be able to keep on funding multiyear projects.

7.2 Challenges contributing to lower external revenue

Time taken by Projects to Commercialise

As noted in the Business Case, the model under which TIA operates envisages that product development is extremely long, and which will not yield short term returns. It also envisages a systemic role which it will play in de-risking projects and handing over those projects for funding (including commercialization) to other role players within the NSI. As such those financial returns will not accrue to the Agency.

Revenue Sources from Invested Portfolio

A significant contributor to the lack of success of start-ups is attributed to lack of support to provide patient capital in incubating the entities during the prolonged period towards reaching financial break-even. This has an impact that returns to be realized by TIA for its investments (e.g., royalties which is dependent on the success of the entity) is low.

Socio-Economic Mandate

Further, given the Objective of the agency as noted within the Act i.e., stimulating and intensifying technological innovation to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations, TIA must make funding decisions based on the socio-economic impact and not merely on the financial returns. As noted, such funding decisions may result in very low economic returns however significant socio-economic impact.

7.3 Challenges regarding leveraging funds from the domestic private sector

Challenges experienced in leveraging funds from the private sector primarily include that Private sector was traditionally a low spender on R&D over the years. Various NACI STI reports have identified this as an important area that required focus if South Africa was to achieve the 1 per cent spend of GDP on R&D. The latest NACI report (2021), pages 35 to 37, confirms that this is still the case and shows that in 2009/10 BERD (Business Expenditure on Research and Development) as a percentage of GERD (Gross Domestic Expenditure on Research and Development) approximated 53.2 per cent. The report further raises the concern that this has been on a downward trajectory to now 39.3 per cent in 2018/19 (lowest point in the last decade).

However, for its part TIA has put in place various strategies to promote collaboration with the private sector. These are discussed briefly below, and include Technology Stations, Enterprise Development Programmes, Technology Innovation Clusters and Industry Matching Fund.

To augment its funding capacity TIA has for many years throughout the previous strategic cycle included a specific performance indicator relating to fundraising through partnerships. Though efforts under this indicator TIA successfully raised an amount of approximately R3bn (direct and indirect) between 2015/16 to 2020/21.

7.4 Overall expenditure on TIA

Table 11: Aggregate expenditure by programme and percentage split

Division	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	% split per programme
Administration	134,257	153,576	173,202	165,844	139,739	165,583	28.9%
Bio-economy	153,684	87,042	117,539	192,668	185,766	205,674	35.9%
Technology Stations	120,929	97,858	100,534	96,501	114,354	91,019	15.9%
Commercialisation	60,367	70,334	77,849	84,122	78,902	72,273	12.6%
Innovation Enabling	115,911	54,021	70,568	73,409	38,433	37,654	6.6%
Total Expenditure	585,148	462,832	539,701	612,544	557,192	572,203	100.0%

Source: National Treasury Public Entities Database - TIA

Over the period 2016/17 to 2020/21, expenditure accounted for R2.8 billion or 96.5 per cent of total revenue generated in the same period. Overall, expenditure showed an average annual rate decline of 0.8 per cent. This is due to a decrease in transfers from the DSI owing to unfavourable economic conditions. Over the 2021 medium term, expenditure is expected to amount to R1.6 billion (R546.2 million in 2021/22 to R558.6 million in 2023/24) representing an increase of an average annual rate of 0.2 per cent. Bio-economy and Administration are the largest categories of expenditure, at approximately 35.9 per cent and 28.9 percent respectively. Expenditure within the Bio-economy mainly provides for the seed and technology innovation cluster programme and complementary funding received from DSI supporting related objectives. Administration hosts the Office of the Chief Executive Officer, corporate affairs and support services of TIA, which include centralised services such as, legal services, internal audit, finance, marketing, supply chain and facilities. An observable trend in spending is that commercialisation, despite being a key mandated function of TIA only accounted for R371.5 million or 12.6 per cent of spending incurred between 2016 and 2021.

Figure : TIA overall expenditure by programme

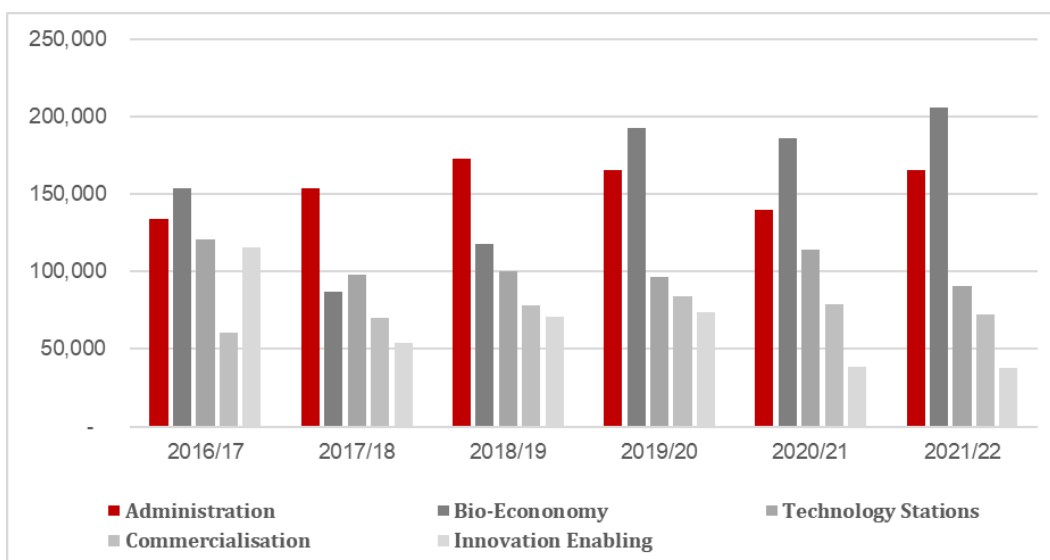


Figure 8: Percentage split per programme

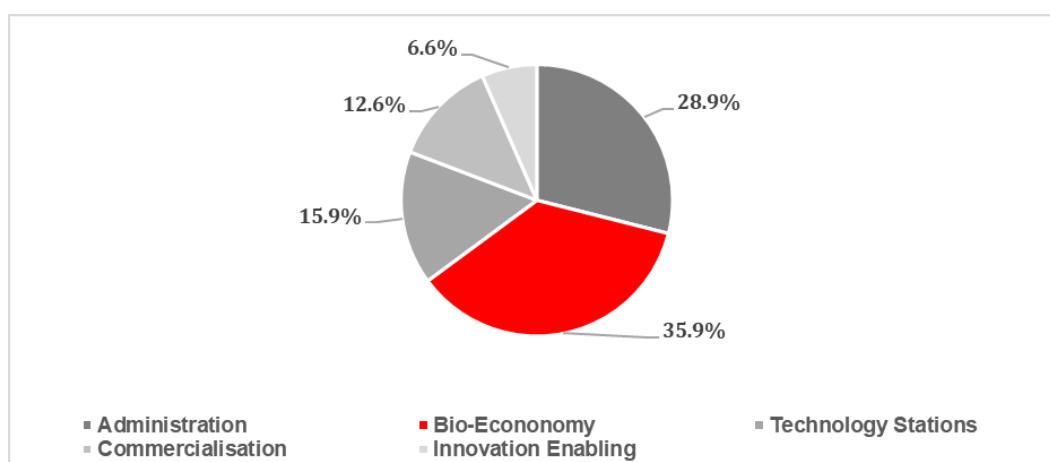


Table 12: Administration Programme

	2016/17	2017/18	2018/19	2019/20
ADMINISTRATION	134,257	153,576	173,202	165,844
Marketing	5,601	3,081	7,151	4,285
IT	6,815	6,297	6,874	7,154
Human Resources	5,005	6,127	8,838	7,211
Facilities	13,754	13,553	14,096	15,278
Business and Knowledge Management	1,144	5,305	4,235	2,054
Legal Services	1,472	3,322	3,115	3,039
Internal Audit	370	131	371	207
Office of the CEO	779	1,566	1,489	35
Finance	5,336	7,922	11,413	8,045
Supply Chain Management				352
Other Operating	5,593	7,843	11,017	10,269
Total Support Costs	45,869	55,328	68,598	57,930
Total HR Costs	88,388	98,248	104,604	107,914

Source: TIA Data

Operational costs are centralised within the Administration programme. Overall administrative expenditure grew by 5.4 per cent between 2016/17 and 2019/20. The agency incurred significant increase in expenditure during the 2017/18 and 2018/19 financial years.

In 2017/18, operating costs increased significantly as compared to the financial year, mainly due to initiatives launched by the agency to streamline value chain and optimise transactional processes, aligned to its cost-containment strategies is to optimise the procurement and use of fixed assets.

During 2018/19, administrative expenditure increased due to employee-related costs, such as the three-year cadet leadership development programme, wherein all personnel also attended a staff alignment framework event to improve overall efficiencies in TIA. Cost saving measures (reduction in the use of consultants, decrease in travel and reduction in subscription and certification costs) are evident in the 2019/20 financial year.

During 2019/20, TIA maximised its internal expertise and capabilities and expenditure on consultants was limited to those cases where a significant impact was to be derived and utilised digital platforms to host meetings and other business engagements, allowing the savings to be reprioritised towards investment expenditure. Facilities makes up the bigger portion of the total administration costs.

Ideally the bigger portion of the administration spending should be on marketing activities of the entities which would feed into the entity leveraging from market uptake of its commercialised products.

Table 13: Expenditure Distribution 2015/16 to 2019/20

	2015/16	2016/17	2017/18	2018/19	2019/20
ADMINISTRATION	141,659	150,814	158,807	167,045	175,711
Support and infrastructure cost	54,430	56,607	59,607	32,587	65,717
Human Resources	87,229	94,207	99,200	104,458	109,994
INVESTMENTS	315,651	365,594	387,385	414,161	442,035
BIOTECHNOLOGY	157,253	158,141	166,048	178,769	190,608
Investments	100,208	100,774	105,183	115,341	123,818
Technology Innovation Programmes	5,000	5,028	7,673	12,000	15,000
Technology Development	80,927	81,384	83,419	87,840	92,496
Commercialisation support	14,281	14,362	14,721	15,501	16,322
Technology Platforms	57,045	57,367	60,236	63,428	66,790
INDUSTRIAL	93,398	102,057	106,921	114,058	112,467
Investments	93,398	102,057	106,921	114,058	112,467
Technology Innovation Programmes	5,000	7,500	10,000	12,000	15,000
Technology Development	75,807	81,235	83,266	87,697	92,326
Commercialisation support	12,591	13,322	13,655	14,379	15,141
TECHNOLOGY STATION PROGRAMME	70,000	70,396	73,916	77,834	81,960
Ring fenced	34,317	34,511	36,237	38,158	40,180
Additional initiatives	35,683	35,885	37,679	39,676	41,780
OTHER PROGRAMMES	31,000	35,000	40,500	43,500	47,000
Innovation Skills Development	3,000	5,000	6,000	7,000	8,000

Youth Technology Innovation	3,000	5,000	8,000	10,000	10,000
Seed fund	25,000	25,000	26,500	26,500	29,000
TOTAL EXPENDITURE	493,310	516,408	546,192	581,206	617,745
Allocation from DST	385,188	387,364	406,732	428,289	450,988
Additional income target	98,122	119,044	129,460	142,917	156,757
Interest Income	10,000	10,000	10,000	10,000	10,000

Source: TIA Data

The TIA board has recognised the relevance and significance of TIA's role in the NSI, and has prioritised the Bioeconomy Strategy, the Technology Stations, and Commercialisation for the successful implementation of TIA's mandate. As such, the Bioeconomy (35.9 per cent), Technology Stations (28.9 per cent) and Commercialisation (15.9 per cent) makes up the major portions of TIA's spending at programme level. Figure 8 shows that TIA's expenditure was devoted primarily towards the bio-economy sector, comprising health, agriculture, industrial biotechnology and, to a lesser extent, indigenous knowledge systems. The natural resources portfolio includes mining, water, waste and sanitation.

Table 14: Expenditure by programme vs associated employees and related costs

	2018/19			2019/20			2020/21		
	Investment Expenditure	Number of employees	Expenditure per employee	Investment Expenditure	Number of employees	Expenditure per employee	Investment Expenditure	Number of employees	Expenditure per employee
Bio- economy	71,389,100	20	14,115,808	121,707,000	20	19,202,541	138,640,000	30	21,292,875
Agriculture	1,904,100	7	2,720,142	25,967,000	8	3245875	26,271,000	6	4,378,500
Industrial Biotech							16,018,000	2	8,009,000
Health Portfolio	7,777,000	7	1,111,000	21,368,000	6	3,561,333	27,681,000	6	4,613,500
Technology Platform support	61,708,000	6	10,284,666	74,372,000	6	12,395,333	68,670,000	16	4,291,875
Commercialisation	77,848,000	21	10,808,858	84,122,000	20	16,866,116	61,621,000	20	15,680,966
Advanced manufacturing	22,491,000	6	3,326,333	18,319,000	4	4,579,750	19,815,000	5	3,963,000
Energy	19,958,000	5	3,018,800	18,907,000	5	3,781,400	8,109,000	5	1,621,800
ICT	15,094,000	8	2,538,125	26,227,000	6	4,371,166	31,777,000	6	5,296,166
Mining	20,305,000	2	1,925,600	20,669,000	5	4,133,800	1,920,000	4	4,800,000
Innovation Enabling	173,928,000	17	28,974,600	165,160,000	17	35,972,250	148,599,000	18	30,889,000
Seed Fund	38,530,000	2	1,926,500	32,688,000	3	10,896,000	8,769,000	3	2,923,000
Innovation Skills Development	12,700,000	4	3,175,000	4,041,000	4	1,010,250	4,030,000	5	806,000
Technology Innovation Cluster	22,155,000	6	3,692,500	3130,000	4	7,982,500	21,446,000	5	4,289,200
Technology Station Support	100,543,000	5	20,180,600	96,501,000	6	16,083,500	114,354,000	5	22,870,800
Total									

Source: TIA Data

From the table above, the Innovation Enabling programme and the Bio-Economy programme are TIA's core business units. Most of TIA's expenditure relates to specific disbursements for

technology enablement, supporting an enabling environment for innovation and related, with personnel expenditure accounting for 43 per cent of total expenditure. The table shows that as at the 2020/21 financial year, the Bioeconomy programme had more at a total of 30 compared to other programmes; commercialization with 20 employees and the Innovation Enabling programme with 18 employees. This despite the Innovation Enabling programme being allocated the majority of the budget with expenditure per employee totalling R30.9 million per employee for this programme relative to R21.3 million for the Bio-Economy and R15.7 million for commercialization as at the 2020/21 financial year.

Personnel expenditure for top management is distributed across all programmes depending on respective responsibilities. This resulted in an inflated average cost per employee because of top management. As of 31 March 2020, 63.2 per cent of TIA's staff were female, 28.9 per cent are classified as youth (between the age of 20 and 35) and 5.3 per cent were people with disabilities (against a target of 3 per cent).

According to a 2018 survey conducted by the DPME on the "Evaluation of Government Business Incentives", programme coordinators within the TIA state that the administrative elements of the programme are a significant burden for the entity's small staff complement as they must sit on each of the higher education institutions' committees as well as those for the provincial agencies. Additionally, they must prepare short-listed applications for final sign-off by the TIA EXCO and administer performance monitoring of beneficiaries. In the same survey, programme coordinators indicate that the average time for application approval is four months from submittal. To that extent, a better programme design could be the key to relieving personnel capacity constraints as illustrated in the table above.

Through previous reviews, TIA has provided its own assessment of the programme's current pitfalls. Their stated critical issues include:

- **Sourcing:** Trouble with sourcing socio-economic relevant projects/ applications, building the pipeline, and the quality of submissions within the SMME sub-programme needs to be addressed.
- **Reporting:** There remain issues in the reporting process as many partners face institutional delays and feel that templates and formats should be streamlined. TIA cites the need for better evidence-based reporting.
- **Project management:** TIA explains that the approach to performance tracking, following up with recipients, financial & administrative support, and portfolio performance needs to be tightened.
- **Marketing and communication:** Partners state that TIA does little to promote the programme, relying almost solely on partners to reach out to beneficiaries.

- **Governance and accountability:** There are concerns around a lack of clarity in delegation of authority to the Seed Fund Committees and procedures – (e.g., some committees have not assembled the final short-list or collated meeting minutes. leaving that to the administrative units at Implementing Partners.

TIA's perspective on the issues is not necessarily shared by its implementing partners.

The programme's initial design focused largely on devolving administration to fund partners on innovative projects. Although the Seed Fund Programme still relies heavily on its implementation partners, it has ramped-up oversight and involvement at each stage in implementation. This increased role by TIA staff was a response to low-quality submissions from some implementing partners, but a better approach might be to look at the overall design of the funding mechanism for innovation and commercialization.

However, rather than alter the fundamental programme design, TIA has begun to develop guidelines and frameworks to aid the project selection process, committee administration, and reporting on beneficiaries. TIA has committed to delivering a set of internal initiatives that will improve implementation. The entity is embarking on standardising operating procedures, developing a systemic performance management framework, and revising the Investment Framework Policy, which serves to guide the Seed Fund Committees. Moreover, the organisation seeks to re-engineer the on-boarding process of implementing partners and to develop a suite of new tools and user guides to assist these partners.

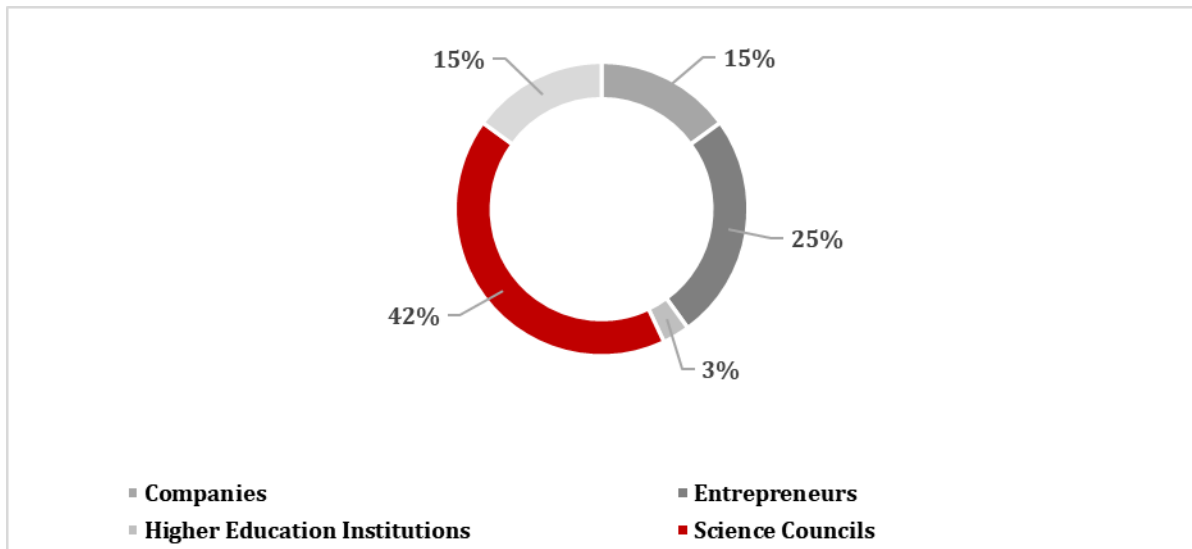
The 2020/21 financial year is the first year of the new five-year strategic planning cycle, which begins with numerous structural challenges in the broader economy. This has already led to reductions in TIA's budget over the Medium-Term Expenditure Framework period, as approved by the DSI. Accordingly, the Board has directed the agency to focus on its mandate and core activities and reduce its salary and administrative budget by R50 million in 2020/21. Funding for the technology development pipeline, a crucial area of the agency's funding activities, has been constrained by the availability of funds. This makes it necessary for the agency to adjust its budget by reducing staff and administrative costs to release funding for project and programme expenditure. Over the period ahead, funds resulting from these reductions will be reprioritised towards investments.

Table 15: Portfolio by market segment

Portfolio by market segment	Market Share
Companies	15%
Entrepreneurs	25%
Higher Education Institutions	3%
Science Councils	42%
Small, Medium and Micro Enterprises	15%
Total	100%

Source: TIA annual Report, 2019/20

Figure 9: Percentage split per programme

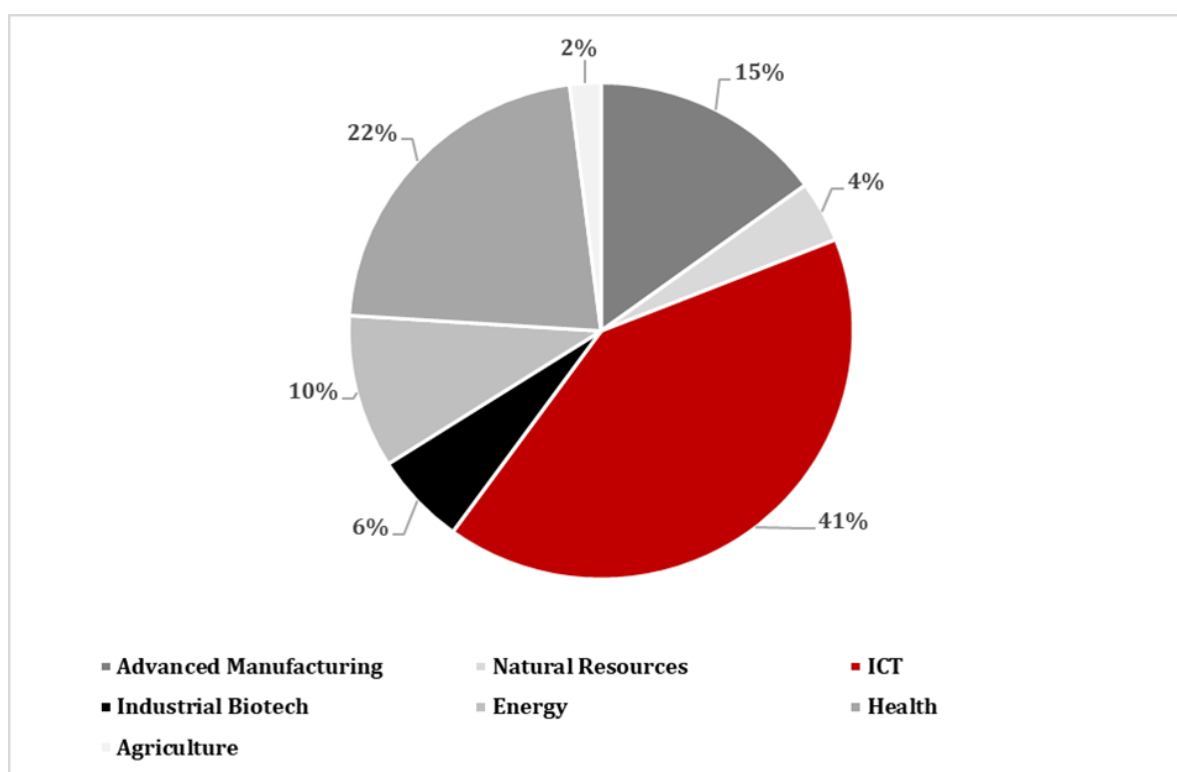


Source: TIA annual Report, 2019/20

Over the previous strategic period, TIA funded 185 projects to the cumulative amount of R1.1 billion, this excludes the Seed Fund Programme. The entity has a contractual obligation to 160 ongoing projects, with 25 projects having been fully disbursed. The figure above illustrates that TIA allocated a majority of its funding to science councils (42 per cent), entrepreneurs (25 per cent) and followed by companies and SMMEs (15 per cent respectively) during the 2019/2020 period. To date, the higher education institutions sub-programme has disbursed R163.6 million and the SMME sub-programme has disbursed R87.2 million.

TIA's impacts are mainly economic in nature, specifically improved business activity, performance and competitiveness for small businesses (including increased revenue); increased salaries and wages; increased employment; skills development; taxes paid; and additional funding attracted. These impacts are especially significant when considering that these companies are mostly SMMEs.

Figure 10: Commercialised projects per sector



Source: TIA annual Report, 2019/20

TIA effectively plays its role as a grant-making agency and approaches the accrual of return on investment not in terms of balance sheet, but rather benefits to the national economy from commercialised innovations (e.g., jobs).

TIA intends to intensify efforts to increase the rate of translation of locally developed technologies; exploit intellectual property from publicly funded institutions; ensure that these are commercialised in a manner that promotes economic growth and the competitiveness of industry; and respond to the imperatives of transformation and inclusive development.

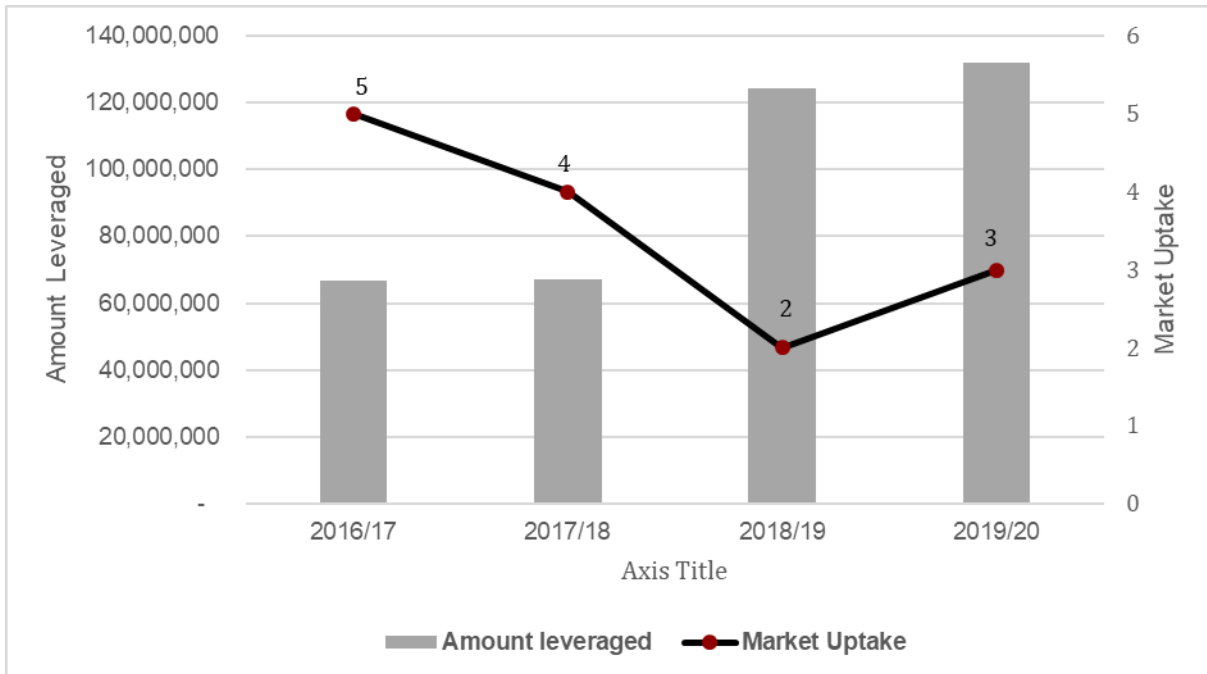
TIA leverages local and global partnerships to support the translation of knowledge from higher education institutions, science councils and the private sector into commercialised innovations that will have a positive impact on the lives of all South Africans.

Table 16: Market uptake and amounts leveraged

Year	Amount leveraged (Rand)	Market Uptake (No. of Firms)
2016/17	66,864,620	5
2017/18	67,088,576	4
2018/19	124,078,423	2
2019/20	131,972,120	3

Source: TIA annual Report, 2019/20

Figure 11: Market uptake and amounts leveraged



Source: TIA annual Report, 2019/20

For the period, 2016/17 to 2019/20, the number of market uptakes decreases from 5 to 3 relative to the expenditure amount of R66.9 million in 2016/17 to R132 million in 2019/20.

Although the agency supports a range of innovations over several periods, the current socioeconomic context requires that TIA explores a variety of approaches to increase the rate at which it can accelerate early-stage ideas to higher levels of maturity, and thereby increase its commercialisation success rate.

It worth noting that the entity was able to leverage R132 million from the market with only 3 market uptakes in 2019/20. This is an improvement compared to the 2016/17 leveraged amount of R66.9 million.

Table 17: Operating Costs: Administration and Salaries as a percentage of total investment

	Actuals 2016/17	Actuals 2017/18	Actuals 2018/19	Actuals 2019/20	Actuals 2020/21
Administration	74,316	76,788	86,601	82,922	69,869
Salaries Support*	44,194	49,124	52,302	53,957	50,175
	118,510	125,912	138,903	136,879	120,045
Direct Investments	450,891	309,256	366,499	446,700	417,454
Admin indirect *	74,316	76,788	86,601	82,922	69,869
Salaries Investment	44,194	49,124	52,302	53,957	50,175
	569,401	435,168	505,402	583,579	537,498
% Admin / Support	21%	29%	27%	23%	22%

% Salaries / Investment	10%	16%	14%	12%	12%
<i>*assumed 50% support based on AFS segment disclosure</i>					

Source: TIA annual Report, 2019/20

For the years 2018/19 to 2020/21, administration costs as a percentage of direct investment, decreased from 27 per cent to 22 percent. Respectively, salaries as a percentage of investment also decreased from 14 per cent in 2018/19 to 12 per cent in 2020/21. Personnel expenditure for top management includes remuneration paid to the former CEO, as well as remuneration paid to the Interim CEO. This resulted in an inflated average cost per employee for top management.

8 Findings and Recommendations

8.1 Overall Findings

The primary purpose of the review was to reflect on the establishment and operations of TIA to assess its strengths and weaknesses. The review was to be based on TIA's current strategic plans and its performance since its inception in 2008.

- 1) The findings and recommendations in this report are based on the following:
 - Synthesised input received from all stakeholders.
 - An analysis of TIA's documents (e.g., business case, National Treasury's Estimates of National Expenditure, e-mail communication with the entity).
 - The TIA's legal framework (the TIA Act and the Public Finance Management Act, 2019 White Paper on Science and Innovation, DSI decadal plan, United Nations Sustainable Development Goals).
 - The TIA's annual reports, strategic plans and performance reports.
- 2) TIA is set up as a public entity that enhances the country's capacity to translate a greater proportion of local research and development (R&D) into commercial technology products and services. The agency is tasked with exploiting the existing body of knowledge at universities and public research institutions and channelling it effectively towards the development of technology based industries.
- 3) To meet its mandate, TIA provides and mobilises financial and non-financial support across broad technology areas in various sectors of the economy through:
 - appropriately structured financial and non-financial interventions for the commercialisation of R&D results;

- the development and maintenance of advanced human capacity for innovation as opposed to just R&D human capital; building a culture of innovation in the South African economy; and
- leveraging local and international partnerships to facilitate in-bound technology transfer, build local technological competencies, and encourage foreign direct investment for the commercialisation of technologies in South Africa.

The goal of TIA is to use South Africa's science and technology base to develop new industries, create sustainable jobs, and help diversify the economy away from commodity exports towards knowledge-based industries equipped to address modern global challenges.

4) Based on the expenditure analysis, the following is observed:

- TIA receives some R500 million in transfers and contract income from DSI and expends on average R600 million per annum.
- The agency derives approximately 80% of its revenue from the department. Other sources of income include co.funding partnerships, and interest and royalties earned.
- Over the past five years' administrative costs have averaged some 24 per cent. While there is no immediate comparative data available, data from other sources indicates these costs are unusually high given the TIA's primary mandate as a funder.²
- Human resources are central to the agency's operations, compensation of employees is its largest cost driver, accounting for an estimated 20% of expenditure.
- Goods and services are the second largest spending area, accounting for 9% of expenditure.
- Only 20 per cent of expenditure (excluding administration) is directed at core commercialisation activities (this increases to about 70 per cent if bio-technology and innovation enablement are included).

5) While TIA has seen good improvements in the last 3 years in respect of attracting other funding and increasing the rate of commercialisation, there are opportunities to enhance its efficiency and effectiveness. Some of the key observations in respect of effectiveness arising from this review are as follows:

² For example, available data indicates that the Jobs Fund (a very high touch impact challenge Fund) averages some 8% management and administration fees. Other comparators include the Private Equity industry where management fees are typically 1-2.5% of invested funds (Private Funds CFO, Fees & Expenses Survey 2020 and StepStone (2016), Uncovering the Costs and Benefits of Private Equity).

- The overall rationale for TIA remains critical, and there continues to be a need for a public instrument that can close the innovation chasm between local R&D and commercial products and services
- Overall TIA's translation and commercialisation success rate has been suboptimal, hampered both by limited funding as well as insufficient investable projects. This requires the development of a more robust project pipeline, as well as a more proactive partnership strategy with private funders and role players.
- While TIA has been able to leverage co-investment (mainly from the IDC), and follow on funding with industry and the private sector, the leveraged amount from the industry has been relatively small compared to other sources of revenue received by the entity.
- While the TIA business case focuses predominantly on sourcing innovative ideas from publicly funded R&D activities, there is a need to expand support across all sectors of and to all actors in the South African economy and the NSI. There is a need for a stronger focus on the private sector.
- There needs to be better integration of functions and an improvement in coordination between institutions with similar/ complementary roles as TIA. These are functions for instance in DTIC: Support Programme for Industrial Innovation (SPII); SEDA: Technology Support Programme; NRF; CSIR; IDC and Technology Human Resource for Industry Programme.

8.2 Recommendations

- 6) **Refocus the primary mandate of TIA to be a funding agency.** This will require that all other programmes that are not its core mandate (i.e., funding) be removed (for example the Technology Station Programme). TIA must develop and agree a performance improvement plan that addresses key operational areas including the following: turnaround times for enquiries and applications, drawdown of project funding, overhead costs, and communication with stakeholders. Critically TIA management must table a plan to reduce the administrative / management cost to 10 per cent over the next 3 years.
- 7) **Develop a revised monitoring and evaluation framework that enables TIA to effectively** monitor the outcomes and impact, as well as value for money. This must be underpinned by a robust theory of change that reflects TIA's mandate and clearly articulates the role of its funding interventions.

- 8) **Refocus the TIA mandate to proactively drive commercialisation in partnership with the private sector.** There is a need for TIA to become more proactive in driving a pipeline of fundable projects – preferably aligned to key DSI / national objectives. TIA's role must be to utilise public funding to de-risk and crowd in other funding. More critically TIA should increase funding to entrepreneurs and firms (currently only some 35% of funds) as opposed to science councils and universities. Furthermore, the TIA should be given a clear target to leverage its funding from private sources (such as venture capital funds). The proposal is to reach 5 times its own funding within the next 3 years.
- 9) **Reduce reliance on annual transfers.** While it is critical that TIA retain a mandate to fund higher-risk project and the early stages of products, services and firms (and must therefore **not** be incentivised to undertake low risk investments), the organisation must be encouraged generate more of its own income. The proviso is that this revenue must come from core funding operations and not non-core activities (such as programme management). This funding model must incentivise TIA to find, fund and promote commercialisation opportunities. This should include reconsideration of the corporate form of TIA (currently a 3A listed public entity in terms of the PFMA) to assess if a change is required (for instance to a 3B Government Business Enterprise). Such a change could support TIA accessing other funding sources and develop incentive mechanisms to attract private investment.
- 10) **Review the overall government funding landscape for innovation to identify an opportunity to consolidate institutions and scale funding available.** Currently funding for commercialisation is being provided mainly through the DSI and several incentive schemes of the Department of Trade, Industry and Competition, including the Technology and Human Resources for Industry Programme; the Support Programme for Industrial Innovation; and the Industrial Development Corporation's Technology Venture. The overall system is fragmented and does not operate at sufficient scale. There is an opportunity to build a more substantial fund with appropriate capability and capacity. This should include consideration of the possible incorporation of NIPMO.

9 References

- Technology Innovation Agency Annual Reports (various years)
- National Treasury Budget Review 2021
- Department of Science and Innovation Decadal Plan
- Report to the OECD Country Review of South Africa's National System of Innovation National, 2006

- Summary report on the review of the technology innovation agency prepared for the Minister of Science and Innovation
- A review of the South African science, technology and innovation institutional landscape
- Technology Innovation Agency (TIA) business case
- Evaluation of Government Business Incentives: Case Studies 2018
- White Paper on Science and Innovation 2019
- Technology Innovation Agency Strategic Plans (various years)

10 Appendices

Logframe

IMPACT		Stimulating and intensifying technological innovation to improve economic growth and the quality of life of all South African by developing and exploiting technological innovations						
Indicator		Knowledge utilisation for economic development in revitalising existing industries and spurring research and development-led industrial development						
Frequency		Annually						
Source of data		Department of Science and Innovation Survey on Research and Development Expenditure, Technology Innovation Agency Annual Report, Technology Innovation Agency Annual Strategic Performance Plans						
OUTCOME	OUTC1	Human capabilities and skills for the economy and for development	OUTC2	Increased knowledge generation and innovation output	OUTC3	The use of knowledge for inclusive development	OUTC4	A transformed, inclusive, responsive and coherent National System of Innovation
Indicator		Increasing number of employment opportunities and Sustaining of struggling sectors through introduction of new technologies		Increase the relative contribution of South African researchers and science, technology and innovation institutions to global scientific and innovation output over the next five years		Improve inclusion and build more linkages across the National System of Innovation		Number of formalized partnerships between constituent parts of the National System of Innovation
Frequency		Annually		Annually		Quarterly and annually		Quarterly and annually
Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Final Output	FINOUT1	Creation of employment and employment opportunities, innovation skills development, innovative product,		Increase the number of commercialised technologies, prototypes and demonstrators		Expand the use of scientific knowledge (as evidence) in support of innovation for societal benefit and public good		Expand, transform and enhance the responsiveness of the National System of Innovation

		processes and services supporting economic growth						
Indicator		Number of knowledge innovation products produced because of TIA funding and support programmes, number of knowledge innovation products produced by TIA supported programmes receiving additional funding and Number of Small, Medium, and Micro Enterprises receiving technology support		Increase the number of prototypes developed through the Technology Innovation Agency interventions		Number of institutional capacitybuilding initiatives		Number of collaboration and coordination among various constituents of the National System of Innovation to bolster the execution of its mandate and develop sound strategic capital for its main clients – innovators
Frequency		Quarterly and annually		Annually		Quarterly and annually		Quarterly and annually
Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Intermediate outputs	INTOUT1	Creative and Innovative Products, Processes, Services and Start-up Companies		Technology products and/or services commercialised		Locally developed technology deployment across the three spheres of government		Provide support to Small, medium and micro enterprises through strategically informed and regionally distributed risk funding
Indicator		Number of technologies, processes or services accelerating, and number of innovation project outputs taken up in the market.		Translation rate between publicly financed intellectual property disclosure and licensing rate		Number of institutional capacitybuilding initiatives		Growth of collectives and small, medium and micro enterprises; contribute towards innovation led industrialisation processes; and foster inclusive development through an expanded spatial footprint and enhanced access for entrepreneurs throughout the country

Frequency		Annually		Quarterly and annually		Quarterly and annually		Annually
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Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Activities	ACT1.4	Business Support and Advisory: regular structured one-on-one sessions or trainings aimed to provide the recipient with necessary business knowledge, tools and competencies to develop sustainable techno-enterprises.		Provide technology development funding and support in strategic high impact areas		Integrate innovation strategies into local and regional economic development		Skills transfer on innovation management and commercialisation
Indicator		Number of Technology Innovative SMMEs receive financial, administration and technical support from the Technology Innovation Agency		Number of technologies, processes or services advancing by 1 or more technology readiness levels per year		Number of Patent, trademark applications received		Number of Technology Innovative SMMEs receive financial, administration and technical support from the Technology Innovation Agency
Frequency		Quarterly and annually		Annually		Quarterly and annually		Annually
Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Activities	ACT1.3	Skills Development: skills development is provided to recipients to effectively and efficiently participate in the funding process and innovation development.		Provide an enabling environment for technology innovation		Provide financial and nonfinancial support		increasing foreign investment

Indicator		Number of Technology Innovation initiatives undertaken by the Technology Innovation Agency		Number of knowledge innovation products produced by agency supported programmes receiving additional funding per year		Number of support package for grassroots innovation		Number of International Partnerships programme, in collaboration with the Department of Science and Innovation and the Technology Innovation Agency
Frequency		Quarterly and annually		Annually		Quarterly and annually		Quarterly and annually

Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Activities	ACT1.2	Technology development, IP support, business development support, market access opportunities for grassroots innovators.		Establish a significant relationship with the South African Small and Medium Enterprises, which presents opportunities to tap into its pool of partnerships with other players and fund managers in South Africa		Strengthening collaborative R&D instruments		Increase visibility of innovation activities
Indicator		Number of Technology Innovation initiatives undertaken by the Technology Innovation Agency		Number of SMMEs receiving technology support per year		Number of higher education institutions relevant stakeholders		Number of innovation value chain and seamless progression of innovative projects from lab to market
Frequency		Quarterly and annually		Annually		Quarterly and annually		Annually
Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Activities	ACT1.1	Grant funding new, creative and innovative ideas, products, processes and projects.		Stimulate scientific innovation		Increase transformation in National System of Innovation		Historically disadvantaged SMMEs supported through Technology Stations

Indicator		Number of Technology Innovation initiatives financially supported by the Technology Innovation Agency		Number of technology innovation initiatives undertaken by the agency, consisting of conference papers, presentations and posters, policy recommendations, panel discussions, position papers, publications, think tanks and keynote addresses		Number of Indigenous knowledge systems supported		SMMEs owned by historically disadvantaged individuals assisted as a percentage of total SMMEs supported, receiving funding, and receiving support and/or technology services from the agency
Frequency		Quarterly and annually		Annually		Quarterly and annually		Annually
Source of data		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation
Inputs		Youth Technology Innovation Programme and Innovation for Inclusive Development		Innovation led by industry demand, funding instruments offered by the Technology Innovation Agency		Commercialisation for productfunded projects through riskfunding schemes		Public and private funding of innovation
Responsibility		Technology Innovation Agency, Department of Science and Innovation		Technology Innovation Agency, Department of Science and Innovation, Small and Medium Enterprises		Technology Innovation Agency, Department of Science and Innovation, Beneficiary Industries		Technology Innovation Agency, Department of Science and Innovation, International Partners