STI OUTLOOK 2006 – COUNTRY RESPONSE TO POLICY QUESTIONNAIRE

SOUTH AFRICA

1. General framework and trends in science, technology, and industry

The Government of South Africa, during 2005 announced the three-tier governance model for all Science, Engineering and Technology (SET) institutions in South Africa. This encourages better coordination of SET activities and expenditure. This can be outlined as follows:

- *type I capacity:* ***Cross-cutting S&T*** - Large scale, broad scope new S&T platforms and challenges (e.g. space science, biotechnology, climate-change, nanotechnology, the hydrogen economy). **DST provides a core service to Government and the nation by leading the portfolio of *type I* activities, whether in government laboratories or universities;**
- *type II capacity:* ***Sector-specific S&T*** - Sector-focused relatively mature research domains (mining, veterinary science, water etc). **DST ensures a common governance framework and KPIs, system indicators and records government S&T budget**
- *type III capacity:* ***Technology-intensive services*** - Routine technology based services (*e.g.* marine resource estimation, standards writing, geological surveying, forensics, etc)

Sector-specific departments assume primary responsibility for *type II* activity with DST partnership. These Departments have full responsibility for *type III* activities. Government resources are being structured over an agreed period to reflect the classification described above. As a consequence an integrating S&T System Act providing such a mandate is currently being established.

The Department of Trade and Industry (**the dti**) policies are geared to promote growth, equity and employment in the South African economy. The responsibility for the CSIR regarding priorities for technology development and funding and has been transferred from **the dti** to DST.

1.1 Gender equity policy

Policy on advancing women's participation in and benefit from science, engineering and technology (SET) is being prepared. The policy on "women in SET" will include three sections: SET by Women; SET for Women; and Monitoring and Evaluation of Gender in the National System of Innovation. The rationale for this policy is (a) the current low levels of women's participation in the natural sciences and engineering, the feminisation of some aspects of the health sciences, low numbers of women in the Professoriate, low publications output of women in SET and (b) lack of attention to women's specific needs regarding the differential impact of SET research and innovation on women and men.

The policy on "women in SET" will contribute to developing the human resources for the S&T system, as South Africa's total human resource pool is currently small in relation to demand.

1.2 Indigenous Knowledge Systems Policy.

The Indigenous Knowledge Systems (IKS) Policy adopted by Cabinet in 2004 is an enabling framework to stimulate and strengthen the contribution of indigenous knowledge to social and economic development in South Africa. The IKS Policy is underpinned by the following drivers:

- The affirmation of African cultural values in the face of globalisation – a clear imperative given the need to promote a positive African identity.
- Practical measures for the development of services provided by IK holders and practitioners, Like many developing countries, South Africa seeks to ensure the benefits of innovation associated with Indigenous Knowledge accrue to its holders and practitioners. This is particularly true in the field of traditional medicines where some of the most glaring evidence of misappropriation and exploitation are witnessed. The issue of access to and use of indigenous knowledge in traditional medicine is becoming increasingly important because of the huge financial implications. There are also opportunities for the development of other IKS related technologies for example those technologies linked to food security, sciences, arts, natural resources, cosmology and the cosmos linked to arts and cultural performances.
- Underpinning the contribution of indigenous knowledge to the economy – the role of indigenous knowledge in employment and wealth creation.
- Interfaces with other knowledge systems, for example indigenous knowledge is used together with modern biotechnology in the pharmaceutical and other sectors to increase the rate of innovation.

To implement the IKS policy, the following functions, institutions and legislative provisions will be required:

- An Advisory Committee on Indigenous Knowledge Systems, reporting to the Minister of Science and Technology (in the process of being established).
- A development function, including, academic and applied research, development and innovation in respect of IKS.
- A National Office on IKS (will be established on the 1st April 2006).
- A recordal system for indigenous knowledge and indigenous knowledge holders, where appropriate, to pro-actively secure their legal rights.
- Legislation to protect intellectual property associated with indigenous knowledge.

Furthermore, the policy proposes that existing IKS laboratories and IKS centres at tertiary institutions and communities will be utilised in various areas of IK. This will ensure the active participation of researchers and developmental institutions in the protection, development and promotion of IK. This participation will establish networks between economic development agents and government institutions, which will influence innovative behaviour and performance of indigenous and local communities in a coherent way.

In addition the IKS Policy seeks to establish the promotion and support of initiatives to ensure the validation and accreditation of IK by integrating this function into the functions of the institutions that already exist. The IKS Policy also proceeds from the premise that innovation is an all-embracing notion based on the production and creative application of knowledge, which will demand a National Research

Policy integrated with the National Research and Development Strategy and cross-sectoral cooperation with strategic stakeholders.

1.3 Technology for poverty alleviation

The Government has also introduced Technology for poverty alleviation projects with positive outcomes in businesses and cooperatives focused on, among others, bee-keeping, papermaking, African design incorporation in clothing and textiles based on natural fibres, and indigenous cattle production. These projects are concentrated in the poverty nodes as identified by the government's Integrated Sustainable Rural Development Plan, and have yielded over 2899 jobs employing 1675 women, 862 youth and 68 people with disabilities. The identified areas of technology transfer are:

- **Aquaculture** (mainly fresh water – warm (tilapia, catfish) and cold (rainbow trout) water. Cage-net production and primary processing technologies are provided to small-scale fish farmers utilizing farm and irrigation dams. (Stellenbosch, & ARC)
- **Essential Oils,** Propagation of essential oils herbs and steam distillation technology. Technology is provided to community groups to propagate, distill, and manufacture products (e.g. mosquito repelling candles) or to retail the high quality oils, e.g. geranium etc. (CSIR)
- **Indigenous Medicinal Plants**, Propagation and primary processing of indigenous medicinal plants, for retail, secondary processing for nutritional supplements, and for R&D by pharmaceutical companies. Working with the MRC-IKS, and CSIR
- **Agro-processing**, transfer post-harvest processing of various natural resources e.g. indigenous foods, leather, hand paper-making from alien species etc.

1.4 Changes in the IPR regime of South Africa to create additional incentives for business investment and innovation.

South Africa is a signatory to the Agreement on Trade Related Aspects of Intellectual Property (TRIPS). In an effort towards strengthening and restructuring the IPR enforcement infrastructure, the former South African Companies Registration Office (SAPRO) and the South African Patent and Trademarks Office (SAPTO) were merged in March 2002 to form the current Companies and Intellectual Property Registration Office (CIPRO). CIPRO coordinates all IP registrations within the country and is currently working towards the creation of an electronic IP database to facilitate easy access of IP data to researchers and innovators.

The legal framework governing IP protection in South Africa has been going through various amendments in order to keep up with international IP protection regimes. In addition to that, South Africa recognizes the importance of protecting its biological resources and indigenous knowledge which are seen as a comparative advantage which if prudently exploited and protected against bio-piracy. To that effect South Africa has developed a Draft Bill for the protection of Indigenous Knowledge Systems.

South Africa has a long tradition of research and posses a strong research infrastructure; both within the academic and public research institution sectors. In order to support innovation in these sectors South Africa is currently developing a policy framework that is aimed at harmonizing IP protection emanating from publicly funded research. At present the draft policy framework is due for discussion and deliberation at a round of consultative sessions and the final draft will be presented to Cabinet for approval.

1.5 Implementation of the Biotechnology of the Biotechnology Strategy

The National Biotechnology Strategy, launched in 2001, provides for the creation of a biotechnology-based economy in the country, with over R150m (~US$30m) invested each year. Resulting from the National Biotechnology Strategy, The Department of Science and Technology has established several strategy instruments as key drivers of innovation in biotechnology. The Biotechnology Innovation Centres (BICs) serve as vehicles for facilitating and supporting biotechnology innovation and commercialization.

South Africa's nascent biotechnology sector is small but is founded on a sound science base at the various research institutions, Universities and Universities of Technology. The three BRIC's (Biotechnology Regional Innovation Centres), CapeBiotech, BioPAD and LIFElab, have three core functions:

- To drive the commercialization/maturity of innovative biotechnology concepts.
- To drive the incubation and establishment of new biotechnology.
- Companies.
- To create the appropriate technology platforms that enable biotechnology innovation.

In addition, the DST has a National Bioinformatics Network (NBN), with nodes at eight Universities around the country, to build the necessary technology platform that would enable bioinformatics capacity development and infrastructure to support the biotechnology initiative.

A Public Understanding of Biotechnology (PUB) programme through the South African Agency for Science and Technology Advancement (a division of the National Research Foundation) continues to create awareness. The purpose of PUB was to provide for fact-based engagement with South African society and thereby to enhance the understanding of biotechnology.

As a final instrument to promote biotechnology innovation, a national PlantBio Innovation Centre was created by DST to give specific focus on plant biotechnology as relevant to nation food security and poverty alleviation needs. PlantBio operates effectively as another BRIC, but with a national focus

Biotechnology is a key feature of many of (particularly the more recent) the bilateral Science and Technology agreements reached. These include India, South Korea, Japan, Cuba, and IBSA (India, Brazil, South Africa). A number of projects are being jointly supported or are under current development. These include the sectors of health, plant biotechnology, bioinformatics and bioprocessing.

2. Public sector research and public research organizations

The South African Department of Science & Technology has reaffirmed its commitment to building a solid and conducive research & innovation environment. A number of Science & Technology initiatives have been implemented and are constantly being supported by the government. Such include, among others:

- South African Space Portal (www.space.gov.za).
- South African Biotechnology Information Facility, (www.sabif.ac.za).
- Social Impact Research, Technology and Innovation Portfolio.
- South African Large Telescope (SALT) (www.salt.ac.za).
- Square Kilometer Array (www.ska.ac.za).

In addition to these initiatives, South Africa has signed over 10 international agreements on science & technology, as a way of show-casing local science advances and improving our research capabilities in areas where the country needs development. A larger number of negotiations are being pursued with other international bodies.

These initiatives are fully supportive of the South African National Systems of Innovation, which is a framework on coordination and support of science, technology and innovation as drivers of economic development.

On the other hand expenditure on R&D, according to the 2001/02 survey, currently stands at 0,76% of GDP. Over half of this research and development is conducted by the private sector, indicating the increasing role of innovation in South African industry. However, the government has indicated its commitment to raise this level of investment to at least 1% of GDP, which is target set in the 2002 Research and Development Strategy.

R& D expenditures for the period 2003 – 2005

Year	2003	2004	2005	
R&D funding	459 006	492 937	524 645	

Government support for private sector R&D and Innovation

The Government has commissioned a study in 2005 to assess the suitability of Fiscal Incentives as a tool for encouraging the private sector to increase their level of expenditure on R&D. The outcomes of the study were presented to Treasury to motivate for an implementation of some form of fiscal incentives for R&D. In the 2006 budget speech it was announced that companies will be allowed a 150% tax deduction on their R&D expenditure as opposed as opposed to the current level of 100%. This scheme will be effected once its management modalities have been finalized.

Support programmes are being reviewed to address current government priorities such as:

- Support for the 2nd Economy.
- SMME's with programmes geared to increase SMME participation.
- Black Economic Empowerment (BEE) which also uses procurement policies adapted to allow for greater BEE and SMME participation.
- Women Empowerment and Spatial Development.

The Industrial Development Corporation (IDC) has introduced several financing mechanisms to support small business.

The Incubator programme aims at supporting small business.

Technology transfer programmes supporting business innovation

A series of institutions has been set up to facilitate growth of small to medium business enterprises that are innovation driven. These innovations either stem from academic institutions; research institutions or from small existing businesses.

The GODISA Trust (Godisa means grow) was created by the South African government to provide technology and business development support to small enterprises. The SA government, though the GODISA Trust, therefore seeks to enhance the capacity of small enterprises in response to the demands facing a modernizing and global economy. GODISA aims to stimulate economic growth and development through technological innovation, enhancement of productivity, sustainability and the international competitiveness of small enterprises supported by the programme.

GODISA objectives are:

1) To identify and implement effective Technology Business Centres for creating viable technology-based small enterprise in SA.
2) To assist the existing centres to optimise delivery.
3) To establish GODISA as a centre of Competence in business and Technology incubation.
4) To fulfill a programme management function for Department of Science & Technology, Department of Trade & Industry and Treasury on the use of funds invested in the respective centres.
5) To develop and implement a resourcing (financial and other) strategy.

Tshumisano Trust (Tshumisano means co-operation or partnership) of the National Department of Science & Technology is the implementation agency for the Technology Station Programme. The Trust provides technical and financial support to Technology Stations, which are based at Universities of Technologies/Technikons. The Technology Stations in turn offer technical support to existing SMME's in terms of technology solutions, services and training.

Infrastructure investment

Government has already begun to ramp up public sector investment. Public sector investment fell below 4% of GDP. In recent years it rose above 6% GDP. In order to roll back the backlog that has emerged in the public infrastructure sector, public sector investment is planned to rise to al level of around 8% of GDP. Of this about 40% will be spent by public enterprises, mostly Eskom (R84bn), and Transnet (R47bn). This will be spent mostly on power generation, power distribution, rail transport, harbours and an oil pipeline. The general purpose is to improve the availability and reliability of infrastructure services in response to rapidly growing demand.

Electronic communications also constitute a key commercial and social infrastructure. Plans to be implemented include:

- The implementation of a strategy to grow South Africa's broadband network.
- Implementation of a plan to reduce telephony costs more rapidly.
- The completion of a submarine cable project that will provide competitive and reliable international access, especially to Africa and Asia.
- The provision of subsidies to encourage the establishment of telecommunications – and labour intensive business in poor areas.

Sector Strategies

In order to promote private sector investment, sector strategies are being prepared, and some are in the implementation stage. A broader National Industrial Policy framework is in the final stages of preparations and is expected to be submitted to Cabinet in its first quarter of 2006. These includes amongst other things:

- Broad Based Black Economic empowerment (BBBEE) and small business development.
- Chemicals.
- Metals beneficiation including capital goods sector.
- Creative industries (crafts, Film and TV contents and music.
- Clothing and textiles.
- Durable consumer goods.
- Wood, pulp and paper.

There are several cross-cutting industrial policy challenges being addressed too, including:

- Inadequate competition and import parity pricing.
- Capacity for trade negotiations.
- A more coordinated Africa development Strategy.
- Better incentives for private R&D investment.
- Better use of BBBEE to encourage industry transformation, beyond the transfer of equity.

Enhancing collaboration and networking among innovation and research organizations

A major challenge major facing the STI is to build the research and development human resource capacity that provides in the needs the industrial sector. This challenge is inter alia addressed by the Technology and Human Resource for Industry Programme (THRIP)

Building Partnerships in Research and Technology For Africa's Development

Following the adoption of NEPAD as a development plan for Africa in August 2001, the Plan of Action for Science and Technology was adopted in November 2003 by the African Ministerial Council for Science and Technology (AMCOST). This plan outlined priority areas of intervention in scientific research and technology to further the NEPAD social and economic goals.

Since then, the Plan of Action has been elaborated upon into specific projects and timeframes through an interactive consultative process, which involved workshops held in all five regions in Africa. The result: a Consolidated African Science and Technology Plan of Action which was adopted during the second meeting of AMCOST in Senegal during September 2005.

Projects Already under Implementation

- The African Laser Centre (ALC) - a virtual network of laser research labs across the continent. This network was launched in November 2003 and has grown into 18 participating institutions. The current programme involves more than ten funded research and capacity building projects with the South African government providing financial support to the ALC since 2003.

- The African Biosciences Initiative is already in operation through focal points in all the regions of the continent. The hub for Southern Africa is hosted at the Council for Scientific and Industrial Research (CSIR) in South Africa. This network of biotechnology nodes in the region have put together programme of cooperation in life sciences and biotechnology with emphasis on agriculture, health, environment and industrial manufacturing.
- The African Institute for Mathematical Sciences (AIMS) is already in its 3rd academic year. It has already graduated its second cohort of students from all over the continent. Plans are at an advanced stage to establish a network of AIMS-like institutions across all regions of Africa, to form a continent-wide network called AMI-NET.

AFRICA BILATERAL RELATIONS

- The key drivers of our bilateral programme are to: (1) support NEPAD and SADC programmes; (2) contribute to political and economic regional integration; (3) harness strategic research partnerships to address common development priorities; (4) market San R&D products and services.
- Countries that we have bilateral programmes with include Algeria, Egypt, Nigeria, Mali, Botswana, Namibia, Lesotho and Kenya.
- An illustration of joint projects include: potato tissue culture (Lesotho); radioisotope production (Algeria); indigenous medicinal plants and foods (Namibia); nanotechnology for solar energy & rural applications (Senegal); Karoo Basin Geological survey (Namibia & Botswana); search for S&T content in the Timbuktu manuscripts (Mali).

SADC

The African Cooperation unit is responsible for engaging with partners in the SADC region to develop and strengthen national systems of innovation in order to provide scientific and technological solutions for sustainable socio-economic development and poverty eradication. The strategy of the Department is in line with the SADC Regional Indicative Strategic Plan (RISDP). The RISDP recognizes the importance of science and technology in economic development, increasing competitiveness and economic regional integration.

DST has engaged in a number of projects in the past years in order to achieve these objectives. The projects were mainly targeted at the following key areas:

- Policy development.
- Capacity development.
- Developing a legal framework for science and technology.

Human Resources

Human capital development is one of the major focus of the South African Research & Development strategy. This is further concretised by the Department of Education's empasis on institutions of higher learning to develop a plan of developing and retaining science; mathematics and engineering graduates.

Some of the policy instruments currently being used to achieve the sustainable human capital in key priority areas include:

- **Centres of Excellence (COE) -** These are physical or virtual Centres of research, which concentrate existing capacity and resources to enable researchers to collaborate across disciplines and across institutions on long-term projects. These projects are locally relevant and

internationally competitive to enhance the pursuit of research excellence and capacity development.

- **Research Chairs -** Research Chairs can be defined as a facility at a university sponsored by stakeholders. Research Chairs are mechanisms that compile study material and transform students into skilled workers. In this process of human resource development, good and appropriate curriculum has to be developed that will lead into quality postgraduates, scientific publication, development of new technology and economic development.
- **Research Professional Development Programme (PDP) -** This programme, carried out at Science Council (SC) is designed to enable outstanding M & D graduates to obtain experience of research at a SC or in partnership with a university to secure a supply of highly qualified South Africans with leading edge scientific and research skills
- **Innovative Post-Doctoral Programme -** This programme is designed to enable outstanding doctoral graduates to obtain experience of research at a university in partnership with a science council to secure a supply of highly qualified South Africans with leading-edge scientific and research skills for South African universities, science councils, industry and government.

In raising awareness of science among the youth, the *Youth into Science Strategy* sets the parameters for DST's activities in this area. What follows is a summary of the approach, target group, disciplines, and goals guiding the strategy.

A National System of Innovation (NSI) has two significant high-level goals, viz. quality of life; and growth and wealth creation. NSI encompasses among others, Research and Development (R&D) and other determinants of innovation, like highly skilled human capital required for R&D.

Approach

To develop a highly skilled human capital required by the R&D, more youth representative of South Africa's demographics need to be recruited into the fields of science, technology engineering and mathematics. In order to achieve this goal, the Department of Science and Technology developed a draft Youth into Science Strategy (2005 – 2009) which seeks to strengthen efforts to develop high-level skills required for the production of new generation of productive and representative researchers. Such skills will be developed through strategies that focus on youth (Youth into Science Strategy) as well as post-graduate and post-doctoral practitioners (envisaged Human Capital Strategy).

To be in effective in its delivery, the Youth into Science Strategy will be multi-faceted, multi-pronged, multi-sectoral and multi-disciplinary. The approach it adopts in its implementation is incremental, targeted, collaborative and integrated.

Target Group

The focus of the Youth into Science Strategy is to excite and develop high-level skills among the school-going youth as well as under-graduates. In order to expand the pool of youth with high-level skills in science and technology from which the National System of Innovation will draw, youth from disadvantaged (especially disabled, African and girl youth) backgrounds will be targeted. This also applies to the historically and currently disadvantaged institutional forms such as ex-DET and homeland schools as well as historically Black Universities.

Disciplines

The key knowledge disciplines to be targeted in this Strategy are those that have a potential to develop high-level skills required for socio-economic development. Those that have been identified by the White Paper on Science and Technology (1996) and the Collaboration Agreement signed with the Department of Education (DoE/DST, 2004) are: the Natural Sciences, the Physical Sciences, Computer Sciences, the Life Sciences, Mathematics and Mathematical Literacy (hereafter collectively referred to as science, technology and mathematics).

Key thrusts and goals

The key thrusts and strategic goals of the Youth into Science Strategy are:

- **Science and technology Literacy**: To enhance science and technology literacy among the public in general and the youth in particular.
- **Nurturing youth talent and potential for science and technology-based careers**: To enroll more and representative youth with talent and potential into science and technology-based careers.

Monitoring & Evaluation

The performance of this Strategy will, through a tracking system, be continuously monitored against the stated milestones. Summative evaluation of the Strategy will be conducted in 2009.

Implementing, Managing & Resourcing

The Cabinet-approved Collaboration between the Departments of Science and Technology, and Education will be strengthened to support the delivery of the Youth into Science Strategy. Given the magnitude of implementing this Strategy, intra-Governmental, international and public-private partnerships will be sought to support its delivery. Collaborations with Non-Governmental Organisations, institutions, professional bodies and community-based organisations will be entered into to support effective implementation of the Strategy.

In addition, the Government has published a Human Resource Development Strategy for South Africa[1]. There are also a number of high level HRD – related strategies and initiatives each with its own logic and intent, but not part of the broader strategic framework of national Human Resources Development. The most important are the following:

- The national skills Development Strategy of the Deparrtment of Labour.
- Sector skills plans of the Sector Education and Training Authorities (SETAs).
- The Department of Education's national plan fo Higher Education.
- A Department of Education plan for Further Education and Training currently being drafted.
- The 2002 national Reseach and Development Strategy of the Department of Arts, Culture, Science and Technology.
- Various training, development and skills initiatives of employers.

[1] Department of Education and Department of Labour, Pretoria 2001

While these plans and initiatives are proceeding, a specific joint venture by the government, business and labour to address critical shortages of skills in the identified sectors of the economy over the short and medium term. This joint initiative[2] will have a life span of three years.

It has been identifies that the knowledge worker is becoming an increasingly important commodity in determining global competitiveness in SET. In looking to the future, the DST Human Capital Subprogramme is in the process of drafting a SET HC strategy to guide the development of SET human capital in South Africa. This strategy is based upon the framework of the NSI and knowledge economy. What follows is a brief summary of the propose strategy:

The proposed national SET Human Capital strategy is being developed in an era where knowledge and human capital are increasingly becoming the driving force for further economic growth. Accordingly, new sources for further growth need to be found in knowledge and human capital. Thus strengthening and increasing human capital in strategic areas of science, engineering and technology becomes important. The new era of the knowledge economy demands more emphasis on human capital development which is equipped to deal with the challenges of the knowledge economy. Such human capital can move across industries and occupations and adapt to changing situations

The SET HC strategy is aimed at producing knowledge workers who will be able to work into the sharp end of the knowledge economy. It is a national initiative which seeks to facilitate increased speed into the knowledge economy by improving the environment conducive to the development of the knowledge-based economy and national system of innovation. The logic is that in order for the country to secure its place in the knowledge economy, it needs to develop human capital that is knowledgeable, flexible, innovative and life-long learners. Such human capital can move across industries and occupation because it is able to respond to change and expertise needed in specific social and economic contexts

The Science Engineering and Technology (SET) Human Capital Strategy has two key drivers, namely:

- Human resources for service delivery, and
- Human resources to support a globally competitive economy

The SET HC Strategy has three main objectives:

a) Produce knowledge workers and new knowledge. This entails providing an environment that strengthens retention, productivity

b) Human capital for service delivery increasing investment in human capital development

Policy evaluations

Section G. Policy evaluations

Strategic management system for South Africa's Government funded S&T functions

The government is busy developing a framework for the strategic management system that will be used in monitoring and evaluation of government investments in the public sector R&D programmes. The purpose of this initiative is to design a framework for an S&T Management Information System that will

[2] Joint Initiative on Priority skills Acquisition (JIPSA) which is established in support of the accelerated growth initiative for South Africa over the short and medium term.

provide data for indicators that are currently in use, and report on research inputs, outputs and processes as well as assess existing systems in the various Science Councils. The overall objectives of the project are:

- To address a highly disaggregated, fragmented and partial picture of R&D.
- To co-ordinate different organisations'needs for data.
- To provide reliable and comparable data sets for national surveys as well as routine information required by different statutory bodies and stakeholders.
- To generate specifications that will facilitate collection of data and information in a standardized way with greater accuracy and efficiency.

This initiative will initially cover the following public sector institutions:

a) Science Councils such as **HSRC**, **CSIR**, **NRF**, **ARC**, **MINTEK** and **NECSA** to assess their management information systems **(MIS)** with respect.

b) Government Departments particularly those which rely on information from the Science Councils in order to determine their requirements and needs, namely DST, the Department of Minerals and Energy **(DME)** and the Department of Agriculture **(DoA);**

c) It is anticipated that other research institutions not mentioned will also use this framework.