



2009/10
Corporate Strategy



VISION

To create a prosperous society that derives enduring and equitable benefits from science and technology.

MISSION

To develop, coordinate and manage a National System of Innovation that will bring about maximum human capital, sustainable economic growth and improved quality of life for all.

AIM

To realise the full potential of science and technology in social and economic development through the development of human resources, research and innovation.

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FOREWORD BY THE MINISTER OF SCIENCE AND TECHNOLOGY



For the past five years the Department has provided broad-based support for research in a variety of disciplines, including astronomy, space science and technology, biotechnology, and climate change science, as well as serving as a nucleus for activities in technology development, transfer and commercialisation.

The challenge we face is making sure that our scientists contribute to improving the lives of the poor, boosting the economy, and expanding knowledge.

The government has made improving access to health care and education its top priorities. The Department's innovation strategy for South Africa from 2008 to 2018, *Innovation towards*

a Knowledge-Based Economy (the Ten-Year Innovation Plan) aims to drive South Africa's transformation towards a knowledge based economy, in which the production and dissemination of knowledge leads to economic benefits and enriches all fields of human endeavour. In this regard, we will measure success by the level to which science and technology play a driving role in enhancing productivity, economic growth and socio-economic development.

Key development focus areas identified in the plan as grand challenges include developing South Africa's bio-economy, developing space science and technology, providing energy security, responding adequately to global climate change, and increasing our ability to anticipate the complex consequences of change due to human and social dynamics.

The Department's implementation of the Ten-Year Innovation Plan continues throughout 2009/10, with a strong focus on science and engineering that makes use of South Africa's unique geographic position and science capabilities. To date, this has seen the development of a number of large-scale global science and technology initiatives in radio astronomy, space science, and biotechnology. A number of key international partnerships have already been established to support these initiatives, confirming South Africa's standing as a preferred science and technology investment destination.

Minister of Science and Technology, Mrs Naledi Pandor

Following the announcement in September 2006 that South Africa had been shortlisted alongside Australia as one of two possible sites to host the Square Kilometer Array (SKA) telescope, the country is set to gain further local and international investment in its radio astronomy endeavours. Currently, it is estimated that the telescope will cost R1 billion to build and about R150 million per year to operate. If South Africa wins the bid, which it has a good chance of doing, a significant part of both the capital and the operating costs is likely to be spent in Southern Africa, and particularly in the Northern Cape.

The South African SKA demonstrator telescope, MeerKAT, and the final SKA facility will be major users of South Africa's planned broadband optical fibre data transport backbone and the proposed undersea cable to Europe. The MeerKAT will therefore require a link to Cape Town and Europe from a site in the Karoo region of the Northern Cape.

Significant progress has been made towards the establishment of the National Space Agency, Technology Innovation Agency and National Intellectual Property Management Office. Collectively, these crucial institutional instruments will help to foster the funding and support partnerships that are required for the development of cutting-edge science and technology capabilities in the country.

Finally, we need to work together to expand our partnerships with stakeholders in the National System of Innovation, the private sector and the international community of scientists to ensure that we achieve our target of investing one per cent of GDP on research and development. The 2006/07 national research and development survey results show that we are close to reaching that target, with national expenditure on research and development at R16,5 billion, or 0,95 per cent of GDP.

I have no reason to doubt that the vision encapsulated in this corporate strategy is one that will take our country a step further on the road to placing science and technology at the heart of progress and development.

We shall pursue this vision with vigour.



Naledi Pandor MP,
Minister of Science and Technology

I. Strategic overview and key policy developments: 2005/06 2011/12

The Department of Science and Technology (DST) derives its mandate from the 1996 White Paper on Science and Technology. The basic premise is that science, technology and innovation (STI) play a critical role in economic growth and socio-economic development. The 2009-2014 Medium Term Strategic Framework (MTSF) identifies technology innovation as one of the critical policy areas required to speed up growth and the transformation of the economy to create decent work and sustainable livelihoods.

The MTSF emphasises the need to build on the current range of strategies and support programmes already supporting innovation in firms and research and development (R&D) in the private and public sectors, with emphasis on biotechnology and pharmaceuticals, space science and technology, energy security and other opportunities presented by climate change. In this regard, the appropriate, continuous and effective implementation of the 2007 Cabinet-endorsed Ten-year Innovation Plan will be crucial.

The Ten-year Innovation Plan seeks to transform the South African economy into a knowledge-based economy, in which the production and dissemination of knowledge will lead to economic benefits and enrich all fields of human endeavour. The success of the Technology Innovation Agency (TIA) and Intellectual Property Rights (IPR) from Publicly Financed Research and Development Act will be important to address the failure to commercialise and protect the results of scientific research. In turn, this will strengthen the innovation capacity of the country.

Innovation and economic growth depend on, among other things, the quality outcomes of education. Several interventions are currently being implemented to address persisting challenges of access, participation, and success rates at all levels of education, the ageing and unrepresentative nature of the scientific workforce, and low publication and patenting rates. These interventions will be consolidated and integrated when the science, engineering and technology (SET) human capital development strategy is finalised.

The growth and sustainability of the country's innovation capacity also depends on the availability of an adequate number of innovation-enabling skills (such as intellectual property rights management skills). These skills are necessary to support the entire innovation value chain. To this extent, the development of the innovation-enabling skills strategy will be critical as a subset of the SET human capital development strategy.

I.1 Goals and key deliverables

The DST's five principal goals are to –

- develop the innovation capacity of the science system and thereby contribute to socio-economic development;
- develop South Africa's knowledge-generation capacity;

- develop appropriate human capital for research, development and innovation (RDI);
- build world-class RDI infrastructure; and
- position South Africa as a strategic international RDI partner and destination;

The DST has a number of key deliverables under each of these goals, including the following:

- The development of strong innovation chains in biotechnology, nanotechnology, the hydrogen economy, space science, information technology and advanced manufacturing
- The development of technologies to address poverty and the poor quality of life of so many of South Africa's people
- The development of an innovative and diverse flux of young people seeking and finding careers in science and engineering
- The accomplishment of notable successes in turning trends in global science to the national advantage, for example, in astronomy and space science.

1.2 Grand challenges

The achievement and realisation of these goals and deliverables are crucial to the success of the Ten-Year Innovation Plan. The plan sets out core projections, which are summarised as South Africa's grand challenges in science and technology (S&T). The grand challenges are the following:

- **Farmer to Pharma:** Over the next decade, South Africa should develop its bioeconomy to become a world leader in biotechnology and pharmaceuticals, using the nation's indigenous resources and new developments in genomics
- **Space S&T:** South Africa will become a key contributor and partner to global space S&T through the establishment of the National Space Agency, a growing satellite industry and a range of innovations in space science, including innovations in earth observation, communication, navigation and engineering
- **Energy security:** The race is on for safe, clean, affordable and reliable energy supplies, and South Africa should meet its medium-term energy supply requirements while innovating for the long term in clean coal technologies, nuclear energy, renewable energy and the promise of the hydrogen economy
- **S&T in response to global change:** South Africa should exploit its geographic position, which enables it to play a leading role in climate change science
- **Human and social dynamics:** As a leading voice among developing countries, South Africa should contribute to a greater global understanding of shifting social dynamics, and the role of science in stimulating growth and development

The effective implementation of the plan will require policy leadership from the DST and other government departments, and strengthened cooperation in all science and technology matters.

2. Strategic assessment of the contributions of the DST

The National Research and Development Strategy (NRDS) has been well received in the National System of Innovation (NSI) and substantial financial resources have already been committed for the necessary attainment of its objectives. In addition, the responsiveness and scale of the S&T system continues to develop. About 677 businesses participated in the latest annual R&D survey, which is up from 607 in the previous year.

The 2006/07 R&D survey results show national R&D spending to be R16,5 billion, or 0,95% of gross domestic product (GDP) as expenditure on R&D. Government has committed itself to achieving an investment of 1% of GDP on R&D by 2008. This relatively low target is already behind many of the developing countries against which South Africa benchmarks itself. However, to attain this target, which is a critical indicator of South Africa's capacity to become a knowledge-based economy, both public and private expenditure on R&D will have to increase.

The high-level findings of the survey indicate that the business sector uses its own money to fund up to 66,9% of its R&D. The country has some 39 591 researchers and support staff in the public and private sectors, with nearly 18 572 full-time equivalent researchers. This fundamentally important area of human capital development is one of the DST's main focus areas, and there is a concerted effort to increase innovation and engineering skills.

Recent initiatives that are directed by specific strategies in S&T and informed by the NRDS include the following:

- The revision of the National Biotechnology Strategy and development of a Health Innovation Strategy will be consolidated into a single Bioeconomy Strategy. Although biotechnology R&D investment can take many years to bear fruit, some successes resulting from investments and interventions of the 2001 strategy are already being realised.
- The establishment of the African component of the International Centre for Genetic Engineering and Biotechnology, hosted by the University of Cape Town, provides an opportunity to leverage a global network of biotechnology institutions in dealing with challenges such as HIV/Aids and malaria.
- The establishment of centres of excellence (CoEs), which are exceeding their targets for attracting additional research funds and enrolling postgraduate students. Given the early success of this programme, the DST intends to expand the number of CoEs.
- The implementation and further development of the South African Research Chairs Initiative (SARChI), which is aimed at building much-needed human resources for R&D and attracting partners to achieve the objectives of the NRDS.

- The establishment of a programme to promote nanotechnology and nanoscience.
- The launch of the South African Environmental Observation Network (SAEON).
- The continuing implementation of the Indigenous Knowledge Systems (IKS) policy.
- The DST's participation in competitive international research funding programmes, such as the framework programmes of the European Union (EU).
- South Africa's successful inclusion in the shortlist of two bidders to host the R2 billion international Square Kilometre Array (SKA) radio astronomy facility.
- Approval by Cabinet of the South African Hydrogen Strategy.

Over and above these specific developments, the country's capacity to harness innovation as a source of socio-economic development continues to increase because of the Department's funding and sustaining of research careers for young scientists and engineers. The DST has also undertaken a number of initiatives to deal with poverty and the impact of poverty on people's lives, using established and effective technology platforms in the domain of job creation. These projects have demonstrated that positive results can be achieved by combining technology with the entrepreneurial skills of the people of South Africa.

3. Strategic Management Framework

The NSI faces many challenges, including the fragmented governance structures of research institutions, and inadequate infrastructure and low spending on R&D in both the public and the private sectors. To address some of these challenges, the DST developed a strategic management framework, which was approved by Cabinet in October 2004, and which classifies the technology-related services and R&D activities supported by government into the following three basic groups:

- Early stage or highly cross-sectoral generic technology and associated human resources, for which the DST is responsible.
- Focused, sectoral and relatively mature technology domains, which are primarily the responsibility of sector-specific departments, with the DST's assistance.
- Standard technology-based services, for which sector-specific departments are responsible.

This strategic framework and the change in approach to the publicly-funded portion of South Africa's S&T system have led to a number of concrete organisational and operational changes, aimed at maximising impact in the DST's focus areas. Structured engagements between the DST and key national departments, as well as between the DST and provincial governments continually give effect to the strategic management framework.

The Department's strategic approach for the future is underpinned by the following:

- A synthesis review of the NSI, which takes account of the independent reviews of the country's science councils since 2004.
- A review by the Organisation for Economic Cooperation and Development (OECD) of the NSI's structures, policies and performance.

These two important reviews indicate that while South Africa's National System of Innovation (NSI) has strong and effective governance principles and high levels of business expenditure on R&D, the country is still a relatively small player in the global realm of research and innovation. It is unlikely that the country will be able to effectively meet the growing national challenges without significantly increased public investment in S&T.

4. Implementing the strategy: targeting investment in specific areas

A number of key factors will guide the DST through the next phase in the development of the NSI.

4.1 Human capital development

South Africa is not producing enough scientists, engineers or technologists, and careers in research are not sufficiently attractive to keep young South Africans in research through the challenging early years of such careers. South Africa's knowledge base is being gradually eroded, and with it the country's ability to develop new industries in the country, leading to a dependence on natural resources and resource-based industries.

Scientists, engineers and technologists remain in short supply in most sectors, compromising the country's ability to develop and harness new knowledge in support of a healthy NSI. The DST has developed the Youth into Science Strategy and is in the process of finalising the SET Human Capital Development Strategy.

The DST and the Department of Education share the responsibility for addressing the current low rates of academic achievement in Mathematics and Science in the country. It is particularly necessary to increase the number of African learners studying these subjects.

It is essential that this effort should start at school level, with learners being enrolled in science programmes that complement the school activities of the Department of Education. There are considerable challenges to be faced, and much work still needs to be done to ensure that young people are attracted to careers in SET and that human capital programmes are strengthened and properly financed.

4.2 Attractive, world-class, large-scale innovation projects

Success depends on focused initiatives, of which one of the most important is the Technology Innovation Agency (TIA), which will absorb the Innovation

Fund and the Biotechnology Regional Innovation Centres (BRICs), among other bodies, and will significantly expand the innovation development portfolio of these entities and programmes.

TIA, which has been established through an Act of Parliament, is envisaged as the institutional mechanism that has the competency to assist the NSI to mine the existing body of knowledge, as well as to stimulate the generation of new knowledge in order to develop technology-based products and services that have the potential to be commercialised and distributed locally and abroad.

To date, the Innovation Fund has consolidated its operations and developed into an instrument that plays a major role in driving the commercialisation of innovation for the benefit of South Africa. Since its inception in 1999, it has funded about 173 projects in various sectors, including health, agriculture, manufacturing, mining, education, safety and security, information and communication technologies (ICT) and biotechnology. The value of this funding is about R900 million.

Since 2004, there has been a growing emphasis on the creation and successful exploitation of South African-developed intellectual property for the benefit of all South Africans. To date, this has led to the design and implementation of a legislative and policy framework that provides for the establishment of a dedicated agency function for the identification and effective management of intellectual property arising from publicly funded research. As a result of the Intellectual Property Rights from Publicly Financed Research and Development Act, 2008, the National Intellectual Property Management Office (NIPMO) will be established during 2009 to fulfil this function.

The massive scale of current and projected expenditure towards the procurement of power infrastructure makes it imperative for South Africa to develop cutting-edge capabilities in these technologies. Investment in these capabilities will ensure that the country is able to source and produce energy technologies locally, as well as supply these to global markets. This will have a positive effect on the country's technology balance of payments (TBP) and will make the South African energy sector globally competitive.

The DST has prioritised those areas of science in which South Africa has a geographic advantage, such as astronomy. The Department has developed the Astronomy Geographic Advantage Programme to build astronomy capabilities in Southern Africa. The Astronomy Geographic Advantage Act, 2007, will preserve the environment for astronomy, particularly in the Northern Cape, to maintain South Africa's geographic advantage for a wide range of ground-based astronomy facilities.

The construction and operation of the South African Large Telescope (SALT), which commenced in 2005, brought the country a step closer to creating a hub of astronomy research in Southern Africa. The Department's ongoing participation in international initiatives, including the Group on Earth Observation and South Africa's bid to host the SKA radio astronomy telescope, will open doors to further global research and innovation opportunities.

While the Northern Cape has basic infrastructure in place, including roads, electricity and telecommunications, the SKA bid and related Accelerated and Shared Growth Initiative of South Africa (AsgiSA) projects are part of the national infrastructure investment and development programme in this area. The DST is working closely with the Northern Cape provincial government to ensure the alignment of activities and deliverables in this regard.

The South African SKA demonstrator telescope, MeerKAT, and the final SKA facility will be major users of South Africa's planned broadband optical fibre data transport backbone and the proposed undersea cable to Europe. The MeerKAT will therefore require a link to Cape Town and Europe from a site in the Karoo region of the Northern Cape.

The lack of low-cost bandwidth for research and innovation is cutting South Africa off from global research. However the South Africa National Research Network (SANReN) will address this, presenting South Africa with an opportunity to provide cost-effective broadband access to global research networks in order to stimulate research and the establishment of academic communities in research and innovation. It will also make the country a more attractive destination for multinational companies that wish to conduct research. SANReN will assist in keeping pace with global trends in research connectivity, meeting existing obligations in international projects like SALT, and grasping new opportunities such as those presented by the SKA.

If the bid to host the SKA in Africa is successful, there will be considerable direct foreign investment into the further development of ICT infrastructure, including broadband communication networks, data storage and the possible establishment of computing grid infrastructure. The SKA Africa partner countries (such as Mozambique, Kenya and Namibia) will benefit from the ICT infrastructure and help increase participation in the global knowledge economy.

South African scientists and engineers currently enjoy access to numerous global mega-science infrastructures and initiatives, such as the nuclear research institute CERN (the European Organisation for Nuclear Research in Geneva), the Joint Institute for Nuclear Research in Russia, the Group on Earth Observation, the biotechnology cluster in southern California, and the ICT clusters in California and Seattle.

4.3 Essential S&T infrastructure and research equipment

In terms of S&T, focused investment on RDI will position South Africa for enhanced technological innovation and increase its capacity to create new high-tech products and services. This will have benefits at several levels, mainly in respect of wealth creation and the improved quality of life of all South Africans.

Integrated infrastructure planning is essential for accelerating the modernisation of the South African economy from a resource-based economy to one that is based on knowledge. The DST, with partners, has developed an e-based toolkit to enhance integrated planning and accelerate community infrastructure

planning and service delivery. The Toolkit for Integrated Planning provides capabilities for the integrating profiling of past and current development needs and the simulation of future development needs.

4.4 Research, development and innovation

Significant progress has been made towards the establishment of the National Space Agency, TIA and NIPMO. Collectively, these crucial institutional instruments will help foster the funding and support partnerships that are required for the development of cutting-edge S&T capabilities in the country.

The high risk and complexity of R&D investments makes funding the major obstacle to the successful commercialisation of technological innovations. Creative funding mechanisms that could help address some of these problems are emerging through increased public-private partnerships. These partnerships are expected to help close the financing gap, and become effective vehicles for financing medium and high-tech innovations.

Among other things, the establishment of TIA will address the innovation chasm and the fragmentation of funding instruments that are currently evident in the NSI. In partnership with industry and public research institutions, the agency will establish a network of centres of competence (CoCs) focused on market opportunities to build a competitive technology edge for South Africa.

The product offerings of TIA are aimed at maximising socio-economic benefits throughout the country by:

- providing funding that is targeted at the technology development and early commercialisation stages of the innovation value chain;
- facilitating capacity building for innovation, including the development of innovation-enabling skills;
- establishing technology nursery programmes that are aimed at supporting technology development and the establishment of technology-based enterprises;
- developing technology commercialisation advocacy programmes and campaigns that are aimed at promoting a national culture of innovation;
- facilitating national and international collaboration for technology development and innovation; and
- proactively encouraging and supporting inbound technology transfer.

In the medium term, the implementation of the Ten-Year Innovation Plan, through the five grand challenges that have been identified, will demonstrate South Africa's innovation strengths and capabilities. These grand challenges will be briefly discussed.

Space Science and Technology

South Africa is increasingly reliant on space-based services, particularly those underpinning earth observation, communications and navigation, which will

be essential in addressing social, economic and environmental challenges effectively in the coming decades. The focus of this grand challenge is on technologies that will contribute to making the country a regional hub of space S&T. The geopolitical implications of developing national competence in space-related activities could change the future of provinces like the Western Cape and the Northern Cape, which have already seen a number of space and astronomy infrastructure investments as a result of the DST and other national policy initiatives.

In July 2006, Cabinet approved the establishment of the National Space Agency as an institutional vehicle to establish space S&T in South Africa. The South African National Space Agency Act, 2008, sets out the strategic focus of the agency, which will be on the following:

- Promoting the peaceful use of outer space
- Supporting the creation of an environment conducive to industrial development in space technologies
- Fostering research in astronomy, earth observation, communications, navigation and space physics
- Advancing competencies and capabilities in SET through human capital development and outreach programmes
- Fostering international cooperation in space-related activities.

In support of these developments and in order to coordinate a national approach to the development of space S&T in South Africa, the DST formulated the National Space Strategy in conjunction with the Department of Trade and Industry. The strategy was approved by Cabinet in 2008 and is focused on leveraging the benefits of space S&T for socio-economic growth and sustainable development. The national space S&T programme will be aligned with the following three primary goals:

- To capture a global market share for small to medium-sized space systems in support of the establishment of a knowledge economy through fostering and promoting innovation and industrial competitiveness.
- To empower better decision making through the integration of space-based systems with ground-based systems for providing the correct information products at the right time.
- To use space S&T to develop applications for the provision of geospatial, telecommunication, timing and positioning products and services.

Farmer to pharma

Combining the benefits of new technologies in the fields of biotechnology and genetics with South Africa's indigenous knowledge and rich biodiversity will allow the country to participate competitively in a knowledge-based bioeconomy. This will involve integrating a number of technologies, research domains, economic infrastructures and government practices. The focus of

this grand challenge is on cross-cutting issues to which a horizontal and multidisciplinary approach is suited, and to areas in which public policy can be effective in removing barriers, encouraging innovation, and improving understanding and cooperation among the various stakeholders.

Energy security

The recent collapse of the global financial system has negatively affected plans to expand the national power infrastructure, and currently also dictates the prioritisation of demand-side management and energy efficiency interventions. In response to these developments, the Department will boost investment in energy technology innovations that will help local energy technology capabilities and enhance the global competitiveness of the South African energy industry.

The development of cutting-edge capabilities in alternative and clean fossil fuel solutions remains important in the medium to long term. The Department will therefore continue to establish and direct platforms to ensure the delivery of South African-designed solutions for local and global markets.

Global change

Given its proximity to the Antarctic and Southern Oceans, and the Agulhas and Benguela currents, South Africa is positioned to serve as a unique laboratory for R&D on earth-systems change, and to make a major contribution to understanding such phenomena. The projected effects of climate change in Africa include the increased incidence of malaria, schistosomiasis and other vector-borne diseases. Urgent responses are required, including research on prevention and early warning systems, field detection and treatment, public health infrastructure requirements, and treatment regimes.

The country is also well positioned to lead research on the continent in terms of understanding and projecting changes to the physical system and the impact of these changes, as well as mitigating their long-term effects.

Human and Social Dynamics

The focus of this grand challenge is on multidisciplinary examinations of the dynamics of human behaviour (for example, the way individuals and organisations – including families and other informal organisations – create, grow, learn, change, and act under the impetus of internal and external stimuli), the influence of organisational, community, and environmental structures and processes on these dynamics, the interplay of evolutionary forces and human behavioural changes, and individual cognitive, computational, linguistic, developmental, social, biological and other processes as dynamic evolving systems. These processes include systems of coordination and control in the behaviour of individuals, the dynamics of coordination between individuals, and the dynamics of change across the life span of individuals and organisations.

4.5 International relations and technology transfer strategies

To make progress with these challenges, South Africa needs to strengthen its international partnerships – both to enhance its knowledge and to create an environment conducive to the transfer of technology. Knowledge-based economies are connected through a growing international research and cooperation network. International cooperation will be used to achieve the following:

- Provide a base for cooperation in the development of human capital
- Leverage foreign direct investment through South Africa's extensive bilateral and global research networks and existing international competencies
- Strengthen South Africa's infrastructure development through appropriate international connections
- Project South Africa as an important global RDI partner.

4.6 Policy and strategy capacity

The NRDS provides a long-term planning basis for the NSI in the form of a framework of indicators to monitor the performance of the S&T system at macro level. The feasibility of an integrated R&D management information system has been established. The Department has also been approached by a consortium of universities requesting a coordinated approach across the sector for such a reporting system. This system is aimed at capturing statistical information on government expenditure on R&D activities by public entities, including science councils, universities and other government R&D funding agencies. The development and implementation of the InfoEd Research Information Management System is now in progress.

Currently, nanotechnology, biotechnology and fuel cell technologies are undergoing rapid development, and major innovations of the future will emerge at the confluence of scientific disciplines and technologies. Important sectors such as transport, communications and construction have gained a high degree of importance in economic competitiveness and have an enormous influence on social development. Significant progress in long-range S&T planning methodologies has been made internationally, especially in industry. These emerging challenges and opportunities have made it necessary for South Africa to create permanent capacity to evaluate future S&T development, including foresight, knowledge assessments, technology road mapping and integration with retrospective analysis.

The DST has developed an option for establishing an enhanced national database for the monitoring and evaluation of its public investments in S&T. Over the past few years, it has worked closely with National Treasury to develop data requirements for such a system. In 2007, the Department introduced the R&D Tax Incentive Programme to encourage private sector investment in R&D activities. This allows the DST to work optimally with the South African Revenue Service (SARS) and National Treasury on tax incentives, and ensure

that the national S&T indicator system continues to play a key role in the Department's long-term S&T planning.

4.7 Broader S&T impact across government

A knowledge-based economy assumes a greater degree of intergovernmental and interdepartmental cooperation and coordination. The core elements of the Cabinet-approved strategic management framework include a renewed focus on frontier S&T programmes, the sustainability of the national research base, strong alignment with sector innovation, and S&T services to enhance service delivery. The devolution of S&T budgets allows departments to fund sector-specific programmes that boost research capability. Some national departments have made progress in developing medium-term R&D priority plans, but these are not yet fully funded.

In addition, several other areas will receive urgent attention over the medium term, including interdepartmental S&T initiatives, enhanced innovation and growth in priority sectors and the use of public procurement to support innovation within the context of the development of small, medium and micro-enterprises (SMMEs). To encourage innovation, the DST will also partner with provincial governments and facilitate the development of regional innovation systems.

Lastly, because science and technology are playing increasingly important roles in regard to South Africa's international engagements (both multilateral and bilateral relations), the Department is actively aligning its international work with that of other government departments through the International Relations, Peace and Security Cluster.

5. Organisation and structure

The DST was established in 2002 when it was separated from the Ministry of Arts, Culture, Science and Technology. Subsequently, Cabinet approved a new management framework for S&T. It comprises the following:

- Programme 1: Corporate Services and Governance
- Programme 2: Research, Development and Innovation
- Programme 3: International Cooperation and Resources
- Programme 4: Human Capital and Knowledge Systems
- Programme 5: Socio-Economic Partnerships

5.1 Expenditure trends

Expenditure increased at an average annual rate of 17% between 2005/06 and 2011/12, rising from R2 billion to R5,1 billion. This increase is indicative of the substantial allocations the department has received in the past three years for RDI projects, human capital development initiatives and increases in funding for organisations such as SANReN, the National Research Foundation (NRF), the Council for Scientific and Industrial Research (CSIR), and the Human Sciences Research Council (HSRC).

Additional allocations of R580 million over the Medium-term Expenditure Framework (MTEF) are for inflation-related adjustments in respect of the compensation of employees, capital assets and capital transfers, and the implementation of the Ten-Year Innovation Plan. An amount of R280 million is set aside for human capital development through SARChI, postgraduate bursaries (NRF), and the new Innovation Planning and Instruments Programme.

5.2 Expenditure estimates

SUMMARY OF EXPENDITURE ESTIMATES BY PROGRAMME							
R thousand	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	Outcome			Revised estimate	Medium-term estimates		
	MTEF Baseline						
1. Administration	107,342	226,042	119,188	115,086	171,255	177,106	186,620
2. Research, Development and Innovation	333,517	395,969	525,346	863,066	1,142,883	1,315,478	1,383,163
3. International Cooperation and Resources	77,635	124,304	99,433	130,838	131,282	137,799	146,611
4. Human Capital and Knowledge Systems	639,021	876,121	1,272,883	1,452,835	1,598,038	1,795,824	2,018,078
5. Socio-Economic Partnerships	883,757	990,563	1,110,430	1,159,890	1,190,653	1,281,876	1,363,306
Departmental Total	2,041,272	2,612,999	3,127,280	3,721,715	4,234,111	4,708,083	5,097,778
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
CURRENT PAYMENTS							
Compensation of employees	65,125	83,743	104,075	135,889	192,819	204,182	215,921
Goods and services	108,343	90,173	106,843	106,963	141,960	147,254	154,455
Total transfers and subsidies	1,865,086	2,293,388	2,908,359	3,476,728	3,894,847	4,353,429	4,724,032
Total payments for capital assets	2,689	145,607	7,921	2,135	4,485	3,218	3,370
TOTAL PAYMENTS	2,041,272	2,612,999	3,127,280	3,721,715	4,234,111	4,708,083	5,097,778

6. Programmes

6.1 Programme I: Corporate Services and Governance

This Programme is responsible for the overall management of the Department and for providing centralised support services to ensure that funded organisations comply with good corporate governance practices and are aligned with the strategic focus of the NSI, as well as monitoring and evaluating the science councils. It has three subprogrammes:

- The offices of the Minister, the Deputy Minister and the Executive Committee.
- Corporate Services, which is responsible for finance, strategy and planning, communications, human resources, legal services, information technology systems and support, and internal auditing.
- Property Management, which covers functions and funds that have been devolved from the Department of Public Works.

6.1.1 Expenditure estimates

PROGRAMME NAME: Administration DETAIL BY SUB-PROGRAMME							
R thousand	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	Outcome			Adjusted appropriation	Medium-term estimates		
					MTEF Baseline		
Minister 1	933	1,038	1,107	1,612	1,709	1,811	1,913
Deputy Minister 2	776	865	949	1,328	1,407	1,492	1,575
Management	12,369	13,289	11,297	15,182	50,246	53,034	55,811
Corporate Services	88,329	206,364	97,727	89,131	105,079	106,899	112,681
Governance	2,416	2,636	3,801	4,686	9,519	10,061	10,602
Property Management	2,519	1,850	4,307	3,147	3,295	3,809	4,038
Total of subprogrammes	107,342	226,042	119,188	115,086	171,255	177,106	186,620
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
Compensation of employees	31,709	37,465	47,412	63,012	94,441	99,939	105,635
Goods and services	71,146	41,783	61,308	47,147	72,294	73,964	77,678
Total transfers and subsidies	2,930	2,619	3,548	3,447	1,000	1,000	1,000
Total payments for capital assets	1,528	144,087	6,838	1,480	3,520	2,203	2,307
TOTAL PAYMENTS	107,342	226,042	119,188	115,086	171,255	177,106	186,620

6.1.2 Expenditure trends

Expenditure for this Programme grew from R107 million in 2005/06 to R186 million in 2011/12 at an average annual growth of 20%. This is indicative of the substantial annual salary increases of 2008/09 and the resultant increase for subsequent years.

6.2 Programme 2: Research, Development and Innovation

This Programme envisions South African communities that are prospering through enhanced employment prospects, the creation and retention of local wealth, and an enriched cultural and social environment. To realise this vision, the Programme strives to foster and promote South African innovation and high-technology development in a manner that will enhance and add value to the country's technology products and services, including exports.

The overall strategic purpose of the Programme is to-

- deliver new technology-based industries to the South African economy by developing appropriate strategic roadmaps for chosen sectors of the economy, including energy, space, health and biotechnology;
- create the appropriate policy and institutional implementation instruments in order to deliver technology products and services from the sectors of the economy; and
- develop and implement appropriate policies to promote and protect intellectual property that is the result of publicly financed R&D in South Africa.

The interaction of the appropriate policies, incentives and funding environment influences the efficacy of the implementation instruments and their

ability to deliver new industries and employment opportunities in the economy. In order to contribute to the national coordination of these interactions, the Programme provides policy leadership in the DST's long-term cross-cutting RDI initiatives through the following four subprogrammes:

- Space Science and Technology;
- Hydrogen and Energy;
- Biotechnology and Health Innovation;
- Innovation Planning and Instruments.

Collectively, this Programme focuses on the following core activities:

- Developing appropriate space technology platforms and promoting the use of space applications for socio-economic benefits.
- Providing strategic direction towards the construction of the SKA demonstrator telescope and other activities to ensure that South Africa is well positioned to host the SKA.
- Driving strategic interventions to stimulate innovation towards sustainable energy security for South Africa and the region.
- Providing strategic direction in building the bioeconomy in South Africa through the National Biotechnology Strategy and CoCs that are established to address the various research agendas in biotechnology.
- Driving strategic interventions to bridge the innovation chasm and facilitate the exploration of basic research outputs for socio-economic development through the design and implementation of appropriate innovation policies and institutional instruments, including TIA and NIPMO; together these instruments are aimed at establishing partnerships between government, academia and industry in respect of the translation of a greater proportion of R&D into technology-based products and services with the potential for commercialisation.

6.2.1 Expenditure estimates

PROGRAMME NAME: Research, Development and Innovation DETAIL BY SUBPROGRAMME							
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
R thousand	Outcome			Adjusted appropriation	Medium-term estimates		
					MTEF Baseline		
Space Science	153,764	204,237	296,157	341,428	574,271	638,369	688,183
Hydrogen and Energy	20,969	9,587	29,320	286,319	149,856	134,261	142,881
Biotechnology and Health	158,075	178,114	194,164	228,952	259,191	314,538	291,972
Innovation Planning and Instruments	709	4,031	5,705	6,367	159,565	228,310	260,127
Total of subprogrammes	333,517	395,969	525,346	863,066	1,142,883	1,315,478	1,383,163
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
Compensation of employees	4,770	5,805	8,824	11,564	20,829	22,071	23,340
Goods and services	6,690	7,688	7,241	23,409	22,710	23,891	25,014
Total transfers and subsidies	321,467	382,038	508,888	827,900	1,099,119	1,269,279	1,334,561
Total payments for capital assets	590	438	393	193	225	237	248
TOTAL PAYMENTS	333,517	395,969	525,346	863,066	1,142,883	1,315,478	1,282,163

6.2.2 Expenditure trends

Expenditure is dominated by current and capital transfers and subsidies, of which the total increases at an average annual growth rate of 28%, from R333,5 million in 2005/06 to R1,3 billion in 2011/12. This was due to projects and programmes that were funded on a much larger scale than before and the inclusion of the SKA.

Over the medium term, the Programme's budget will grow at an average annual rate of 10% to R1,38 billion in 2011/12. Increased expenditure over the medium term is attributable to increased spending associated with implementing the Ten-Year Innovation Plan, which includes additional funds of R80 million allocated to the Subprogramme: Innovation Planning and Instruments for the establishment and operationalisation of the TIA and the NIPMO.

6.2.3 Service delivery objectives and indicators

Space Science, Engineering and Technology

The Subprogramme focuses on two aspects that are critical for a viable space programme. The first relates to the development of relevant and appropriate space technology platforms in order to ensure that South African space applications deliver in a wide array of key priority areas, including earth observation, in the most cost-effective manner. The second aspect relates to radio astronomy and has entailed the creation of the Radio Astronomy Advances function within the Subprogramme. This function is responsible for

developing and implementing strategies to optimise Africa's bid to host the SKA radio telescope.

Hydrogen and Energy

Over and above ensuring a supportive policy environment, the Subprogramme: Hydrogen and Energy sets up and gives strategic direction to platforms that develop and commercialise innovative technology solutions to help achieve energy security in a way that contributes to economic growth, ensures access to modern energy services for all South Africans, and protects the environment.

The framework for implementation is provided by the draft energy RDI strategy document, which is to be presented to Cabinet for approval during 2009. In support of the Ten-Year Innovation Plan, the strategy is intended to transform South Africa's energy industry into a globally competitive sector that delivers knowledge-intensive technology solutions to both local and global markets.

Biotechnology and Health

The Subprogramme: Biotechnology and Health strategises for the development of a world-class bioeconomy in South Africa. To date, the subprogramme has focused on the implementation of the National Biotechnology Strategy of 2002. The establishment of a number of BRICs has changed the biotechnology sector in South Africa, resulting in the creation of biotechnology platforms, infrastructure, start-up companies, products and services. Thus far, the DST investment in BRICs has been used to leverage an additional 33% funding in BRIC projects.

The Framework for Science and Technology for Health Innovation was developed in 2005. In strengthening its policy leadership, the subprogramme will build on synergies with IKS, as well as the biodiversity research grouping, to deliver on the Ten-Year Innovation Plan's Farmer to Pharma grand challenge.

Innovation Planning and Instruments

The overall goal of the Subprogramme: Innovation Planning and Instruments is to develop policies and strategies that will enable South Africa to establish local technological capabilities in order to produce its own goods and services, to improve competitiveness in key sectors, to reduce reliance on imported technologies, and to become a net exporter of locally produced high-technology products and services.

To do this, the main focus of the Subprogramme is the development of innovation policy and strategic interventions that address the challenges associated with taking research outcomes to market by creating an enabling environment for technology commercialisation for positive socio-economic impact.

6.2.4 Recent outputs

Biotechnology and Health Innovation

Among the achievements of the BRICs, PlantBio's highlights, in particular over the past few months, include the following:

- The launch of the National Biosafety Platform
- The successful completion of a second year of the Cyclotron Mutagenesis Project, funded by PlantBio, by the African Centre for Crop Improvement (based at the University of KwaZulu-Natal), in collaboration with the RIKEN Institute in Japan, to generate variants of maize, millet and sorghum
- The launch of a biological control company, XSit (Pty) Ltd, in 2008; SunBio, a company that conducts yeast and wine-related research, development and commercialisation, was spun out as a result of this
- Shimoda Biotech, established through the National Biotech Strategy, which is awaiting approval to access European markets
- The official launch of the Centre for Proteomic and Genomic Research.

Space Science, Engineering and Technology

This subprogramme uses the National Space Strategy to promote a space knowledge economy in South Africa and Africa. It has developed legislation like the South African National Space Agency Act, 2008, and the Astronomy Geographic Advantage Act, 2007. South Africa's own microsatellite, SumbandilaSAT, which was completed in December 2006, is scheduled to be launched into orbit during 2009.

Hydrogen and Energy

The Hydrogen and Fuel Cell Technologies Research, Development and Innovation Strategy was officially launched in September 2008. The strategy is aimed at stimulating the development of platinum group metal-based industries that will supply the future global hydrogen economy. Platinum group metals are key catalytic materials in the production of hydrogen and the conversion of hydrogen to electricity.

Three CoCs have been established under the strategy, each with a unique responsibility, but with the common vision of fostering proactive innovation and developing the human resources required to undertake competitive R&D activities in the field of hydrogen and fuel cell technologies. The centres have already initiated their R&D activities, and contractual agreements with industry partners are being finalised.

In order to advance energy security and leverage the country's automotive capabilities, the DST funded the development of an electric vehicle designed in South Africa called the Joule. A working prototype of the Joule was launched in Cape Town and at the Paris Motor Show, France, in October 2008. Through stakeholder engagement, the Department is now initiating the industrialisation of this innovation.

The Department established a number of other platforms to develop the country's capabilities in alternative energy technologies. These include two research hubs for energy efficiency and renewable energy that are currently doing both research work and postgraduate training. Research chairs focusing on second and third generation biofuels, nuclear energy, and clean coal technologies have been established. Human capital challenges in the nuclear power sector are being addressed through the South African Nuclear Human Asset Research Programme, which funds over 160 South African students for studies related to nuclear energy.

6.2.5 Selected medium-term output targets

Subprogramme	Output	Measure/Indicator	Target
Space Science, Engineering and Technology	Companies spun out of established technology platforms	The number of companies	Six in 2011/12
	Space applications, products and services developed	Total number of space-related technology services launched by South African-based companies	13 in 2011/12
	National Space Agency established	Space Agency Board in place; CEO appointed and agency fully operational	Fully operational space agency
	Patent cooperation treaty (PCT) patent applications in space-related research and technologies	The number of PCT applications resulting from publicly funded space research	Three in 2011/12
	Commercialisation partnerships	The number of intellectual property transactions through commercialisation partnerships leading to the commercialisation of space technologies	Three in 2011/12
	Outcome of the SKA bid	Successful bid	End 2011
	Astronomy and space engineering human capital developed in bidding process	The number of students that graduate	600
Innovation Planning and Instruments	TIA established	TIA Board and CEO in place. All entities migrated and agency fully operational	Fully operational agency
	TIA-supported products and services that are effectively commercialised	The number of effectively commercialised products and services	10 in 2011/12
	The number of companies established as a result of TIA interventions	The number of new technology-based companies established as a result of R&D programmes	30 in 2011/12

Subprogramme	Output	Measure/Indicator	Target
	NIPMO established	NIPMO corporate form finalised and approved. NIPMO Advisory Board and CEO appointed and fully operational	Fully operational NIPMO
	Intellectual property registered by NIPMO for the repository	The number of new patent applications resulting from publicly funded research	At least 100 patents referred for further commercialisation support by TIA by 2018/19
	Establishment of collaborative venture capital fund	Venture capital pilot business case finalised and approved. Amount of funding leveraged from external sources.	R500 m 2011/12
	Formalised industry partnerships	Total number of technology commercialisation partnerships entered into with private sector, including foreign direct investment	10 in 2011/12
Hydrogen and Energy	Related spin-off companies established through the development of commercialised alternative energy technologies	Total number of alternative energy technologies demonstrated and entering the local market	18
	Development of human capital for the alternative energy and nuclear power industries	The number of graduates	150
	Patent applications in energy-related research and technologies	The number of patent applications resulting from publicly funded space research	10
	Partnerships entered into for commercialisation purposes	The number of intellectual property transactions through commercialisation partnerships leading to the commercialisation of space technologies	Four
Biotechnology and Health Innovation	Spin-off biotechnology companies from established technology platforms	The number of companies	15
	New policy briefs developed in response to local and international developments	The number of South African policy responses to national and international developments	Three
	Patent applications in biotechnology- related research and technologies	The number of patent applications resulting from publicly funded space research	30
	Partnerships entered into for commercialisation purposes	The number of intellectual property transactions leading to the commercialisation of biotechnologies	18

6.3 Programme 3: International Cooperation and Resources

This Programme aims to strategically develop, promote and manage international relationships, opportunities, and S&T agreements that strengthen the NSI and enable an exchange of knowledge, capacity and resources between South Africa and its regional and international partners.

It has three subprogrammes:

- Overseas Bilateral Cooperation
- Multilateral Cooperation and Africa
- International Resources

6.3.1 Expenditure estimates

PROGRAMME NAME: International Cooperation and Resources DETAIL BY SUBPROGRAMME							
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
R thousand	Outcome			Adjusted appropriation	Medium-term estimates		
					MTEF Baseline		
Multilateral Cooperation and Africa	57,529	68,857	73,261	59,443	56,321	59,370	63,161
International Resources	9,517	27,285	10,048	39,189	50,516	52,639	56,340
Overseas Bilateral Cooperation	10,589	28,162	16,124	32,206	24,445	25,790	27,110
Total of sub-programmes	77,635	124,304	99,433	130,838	131,282	137,799	146,611
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
Compensation of employees	13,411	17,401	19,849	25,206	27,785	29,442	31,135
Goods and services	18,366	24,604	20,285	18,322	24,077	25,329	26,519
Total transfers and subsidies	45,395	81,791	59,014	87,156	79,130	82,723	88,638
Total payments for capital assets	463	508	285	154	290	305	319
TOTAL PAYMENTS	77,635	124,304	99,433	130,838	131,282	137,799	146,611

6.3.2 Expenditure trends

Between 2005/06 and 2011/12, expenditure increased from R77,6 million to R146,6 million at an average annual rate of 14%. Over the medium term, growth in expenditure slowed to an average annual rate of 5,7%, reaching R146,6 million in 2011/12. Expenditure in the Programme is increasing steadily as the Department aims to benefit from cross-border flows of knowledge, innovation, capacity and resources through increased international cooperation. The increase for the Subprogramme: Multilateral Cooperation and Africa is mainly attributable to the Department's expanded involvement in the New Partnership for Africa's Development (NEPAD) S&T programme and its leadership role in Southern African Development Community (SADC) S&T development.

6.3.3 Service delivery objectives and indicators

Overseas Bilateral Cooperation

The Subprogramme: Overseas Bilateral Cooperation promotes and facilitates collaborative activities, as well as leveraging resources in support of the NSI from countries outside Africa, with specific focus on developing a knowledge-driven economy. Through the implementation of a new international cooperation strategy, these relationships will be realigned to address the grand challenges and associated cross-cutting imperatives set out in the Ten-Year Innovation Plan and the NRDS.

In terms of the strategy, the Subprogramme will promote the leveraging of foreign direct investment, functional bilateral relationships, an innovation culture, an increased number of large-scale research projects, and access to international skills and big science facilities. In addition, the subprogramme will focus on obtaining international

support for the development and implementation of new the DST strategies in support of the grand challenges and other the DST initiatives, including the National Space Agency and TIA. The subprogramme will also focus on leveraging international support for human capital development, knowledge generation, knowledge infrastructure and research excellence, using instruments such as the Science and Technology Agreements Fund (managed by the NRF), SARChI, and the CoE and CoC programmes.

Multilateral Cooperation and Africa

The Subprogramme: Multilateral Cooperation and Africa advances and facilitates South Africa's participation in strategic bilateral agreements and multilateral organisations on STI to strengthen the NSI and to achieve shared economic and social development in the region and the continent.

To support the implementation of the Ten-Year Innovation Plan, the subprogramme will-

- attract foreign direct investment, expertise and knowledge into the science system, and enlarge research and innovation networks through functional strategic multilateral partnerships;
- create opportunities to promote South Africa and the NSI in multilateral S&T organisations;
- leverage resources from international partners in support of closer S&T links with regional and African partners; and
- deepen regional integration in STI to support the implementation of the Consolidated Science and Technology Plan of Action (CPA) and the SADC Protocol on Science, Technology and Innovation, including providing support for the establishment of the SADC S&T Desk.

The subprogramme will continue to strengthen current bilateral agreements and promote South Africa's strategic bilateral relations in the SADC region. It will continue to expand and leverage financial resources for the Southern African Regional Cooperation Fund and the African Scholarship Fund, as well as instituting new funding instruments aimed at enhancing cooperation in Africa. Because South Africa is the current SADC chair and remains a member of the Troika until 2010, the country has a specific responsibility with regard to SADC for the short to medium term. In this context, the subprogramme will prioritise the successful implementation of the SADC Plan of Action on STI. In addition, the subprogramme will promote and support the African Union (AU) and NEPAD programmes, especially the implementation of the CPA, and will continue to participate in the African Ministers' Council on Science and Technology to influence S&T policy in Africa.

The subprogramme maximises opportunities for South Africa's participation in S&T multilateral organisations through the United Nations family of organisations, follow-ups on key summits, global science projects and south-south organisations. Participation is geared towards lobbying for common positions at regional and continental level to strengthen international negotiations. Multilateral organisations are used to benefit South Africa's scientific community, among others. The subprogramme will continue to explore the potential of multilateral organisations to assist the DST to achieve its goals. In addition, it will engage with policy organisations such as the OECD, the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the United Nations Industrial Development Organisation (UNIDO) to help build sound national, regional and continental STI systems. Lastly, the subprogramme facilitates the provision of the DST's input to other government departments leading multilateral initiatives, for example, with the Department of Environmental Affairs and Tourism, which is the lead department for the UN Framework Convention on Climate Change.

International Resources

The Subprogramme: International Resources supports the DST by leveraging funding, human capital and knowledge, facilitating access to international research facilities for the benefit of the NSI, and securing the location of global research infrastructures in South Africa. In the next five years, the subprogramme will intensify its efforts in this regard, with a special emphasis on innovation and close-to-market activities in line with the Ten-Year Innovation Plan.

The Subprogramme works to increase the flow of international resources into the country by creating conditions for access to international STI skills and global projects. This includes maintaining highly functional relationships with international partners at bilateral and multilateral level, and brokering these at institutional level for the benefit of all NSI institutions. The subprogramme will also seek to leverage organised groups such as the African Diaspora as key partners, particularly in terms of human capital and skills. The efforts of the Subprogramme will be supported by the development of dedicated competence in research, which will increase the effective targeting of appropriate partners. Lastly, but very importantly, the subprogramme facilitates the integration of partnerships with donor countries into the DST's national and regional S&T activities.

6.3.4 Recent outputs

Overseas Bilateral Cooperation

The Subprogramme: Overseas Bilateral Cooperation has achieved the implementation of over 400 R&D projects in areas such as energy, space, ICT and biotechnology, advanced manufacturing and robotics.

International bilateral agreements served as a basis for implementing cooperation in the India-Brazil-South Africa Framework and other flagship projects such as Biota South (capacity development in mapping biodiversity) and Inkaba Ye Afrika (a multidisciplinary programme that surveys a cone-shaped sector of the earth from core to space aiming to trace earth history). INSITE, the International Science, Innovation and Technology Exhibition, also falls under this subprogramme. In September 2008, it accommodated activities for promoting international cooperation in areas such as biotechnology and palaeontology.

Multilateral Cooperation and Africa

South Africa was awarded membership of the International Institute of Applied Systems Analysis in July 2007, associate membership of the European Molecular Biology Conference in February 2008, and executive membership of the Supporting Entrepreneurs for Sustainable Development in May 2008. The country was appointed SADC representative at the United Nations Commission on Science and Technology for Development in January 2009.

The SADC Heads of State and Government signed and approved the Protocol on Science, Technology and Innovation at the SADC Summit in August 2008. The department seconded an official to the SADC Secretariat in Botswana to establish the SADC STI Desk, and hosted a SADC ministerial conference on S&T in December 2008.

International Resources

The DST became the first-ever recipient of sector budget support for S&T from the EU. The EU has allocated a total of €30 million to address poverty, underdevelopment and marginalisation through science, engineering and innovation interventions. The DST also signed agreements on the South Africa-Finland ICT Knowledge Partnership (SAFIPA) programme and the Finnish-Southern African Partnership Programme to strengthen the Southern Africa Network for Biosciences (BioFISA), through which approximately R150 million will flow to national and regional RDI initiatives.

SAFIPA aims to implement projects for the creation and delivery of ICT-based service applications. BioFISA will enable the Southern Africa Network for Biosciences to implement its business plan to advance life sciences R&D, mainly in biodiversity, biotechnology and IKS. South Africa continues to play a significant role in the implementation of the Global Earth Observation System of Systems as a founding member of the Group on Earth Observation. The South African chapter of the African Initiative for Capacity Development has been established and will provide for the generation, coordination and dissemination of knowledge, as well as international training opportunities.

6.3.5 Selected medium-term output targets

Subprogramme	Output	Measure/Indicator	Target
Overseas Bilateral Cooperation	Realigned and expanded functional relationships	Existing bilateral instruments realigned or expanded	10 existing bilateral agreements realigned or expanded
	Improved cooperation and integration with other NSI players	Joint projects with other programmes in the DST and other NSI players	10 new jointly-funded projects
Multilateral Cooperation and Africa	Increased support for AU/NEPAD and SADC STI initiatives located in South Africa	The number of SADC or African countries participating in AU/NEPAD flagships	Eight SADC or African countries
		Value of resources	R5 million
	Managed bilateral relations	Programmes of action negotiated	Three bilateral joint calls for proposals
		Country strategies established	Three country strategies finalised
International Resources	Access to resources and international capacities	Funding and in-kind assistance leveraged	R50 million in funds and in-kind assistance from international sources
	Support for capacity development	Value of human capital development interventions	R10 million value
		The number of human capital development interventions	Four interventions

6.4 Programme 4: Human Capital and Knowledge Systems

This Programme aims to develop and implement national programmes to produce knowledge, human capital and the associated infrastructure, equipment and public research services to sustain the country's system of innovation. It has the following three subprogrammes:

- Human Capital and Science Platforms
- Emerging Research Areas and Infrastructure
- Indigenous Knowledge Systems

6.4.1 Expenditure estimates

PROGRAMME NAME: Human Capital and Knowledge Systems DETAIL BY SUBPROGRAMME							
R thousand	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	Outcome			Adjusted appropriation	Medium-term estimates		
					MTEF Baseline		
Human Capital and Science Platforms	631,443	751,937	943,641	1,061,176	1,117,727	1,280,069	1,458,399
Indigenous Knowledge Systems	5,277	8,382	10,508	11,889	25,240	27,242	29,125
Emerging Research Areas and Infrastructure	2,301	115,802	318,734	379,770	455,071	488,513	530,554
Total of subprogrammes	639,021	876,121	1,272,883	1,452,835	1,598,038	1,795,824	2,018,078
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
Compensation of employees	9,682	10,206	11,869	16,002	20,944	22,192	23,516
Goods and services	6,804	7,728	9,483	7,885	8,138	8,563	9,008
Total transfers and subsidies	622,522	857,900	1,251,468	1,428,794	1,568,856	1,764,964	1,985,444
Total payments for capital assets	13	287	63	154	100	105	110
TOTAL PAYMENTS	639,021	876,121	1,272,883	1,452,835	1,598,038	1,795,824	2,018,078

6.4.2 Expenditure trends

Expenditure increased at an average annual rate of 22%, from R639 million in 2005/06 to R2 billion in 2010/11. Over the medium term, the budget grows at a steady average annual rate of 12%. Expenditure has grown substantially over the past three years, showing the Department's unwavering commitment to human capital initiatives, as well as supporting the Subprogramme: Emerging Research Areas and Infrastructure. This is also evident in terms of the additional funding of R50 million for postgraduate bursaries and R150 million to the NRF for the SARChI.

6.4.3 Service delivery objectives and indicators

Human Capital and Science Platforms

The Subprogramme: Human Capital and Science Platforms conceptualises, formulates and implements programmes that address the availability of human capital for NSI, produces new knowledge

to build the knowledge resources of the country (through science investment in areas of geographic advantage – the science missions), and interfaces positively with the institutions that are key in the production of S&T knowledge and human resources for the NSI. Focus areas include astronomy, human palaeontology, research chairs at South African universities, CoEs and a postdoctoral fellowship programme. The eighth CoE, focusing on global change, is being established.

Emerging Research Areas and Infrastructure

The Subprogramme: Emerging Research Areas and Infrastructure steers the advancement of novel and cross-cutting research areas and the establishment of world-class research infrastructure in the NSI. It drives the strategic direction to synergise opportunities for emerging research areas, infrastructure, large-scale facilities and the development of critical mass. Complementary initiatives among stakeholders in the public sector will be facilitated to develop a competitive research nucleus.

Indigenous Knowledge Systems

The Subprogramme: Indigenous Knowledge Systems focuses on the development of indigenous knowledge and its integration into the NSI through the development and implementation of policy and undertaking of strategic projects. It works through networks of science councils, universities and civil society organisations. Museums and science centres have also begun to play key roles in the interfacing of indigenous knowledge through public awareness campaigns.

6.4.4 Recent outputs

Human Capital and Science Platforms

SARChI has awarded a total of 72 research chairs in key areas aligned to government strategies. The process of awarding a further 15 research chairs is currently underway, and the cumulative number of SARChI chairs should ultimately be 87. SARChI is set to revitalise the NSI through an injection of expertise and funding.

The Innovation Honours Bursary programme supported 271 students in 2008 with 85% of all awards given to black students and 55% to female students. The programme funded 262 students in 2007 with a throughput rate of 82%.

The Research Professional Development Programme is aimed at increasing research capacity among young professionals by placing them in science councils. A total of 68 students were placed in 2008, bringing to 197 the number of beneficiaries to date. On average, 76% of benefiting students are black and 50% are female.

The Innovation Postdoctoral Programme supported 70 postdoctoral

fellows (30 continuing and 40 new postdoctoral fellows) at various NSI institutions in 2008. When these cohorts have completed the two-year programme, the number of funded postdoctoral researchers will be 110.

The seven existing CoEs continue to foster the exploitation of cross-disciplinary and cross-institutional collaboration among researchers and institutions. In 2008, a total of 395 postgraduate students received grantholder-linked financial support under the CoE programme. A total of 220 research articles were published in peer-reviewed articles across the seven CoEs. The eighth CoE, focusing on global change, is being established.

The implementation of the Youth into Science Strategy continued to be implemented through National Science Week, the National Roll-out Plan for the Establishment of a Network of Science Centres, the National Plan to Place and Support Graduates, the National Plan for Science, Technology, Engineering and Mathematics Olympiads, Competitions and Camps, the Mathematics, Science and Technology Educators Support Plan, and the National Supplementary Tuition Programme.

In order to contribute to an environment enabling existing science centres to respond adequately to the Youth into Science Strategy, 17 science centres across eight provinces received project grant funding. Four Japanese volunteers have been deployed in three science centres to impart their exhibit development skills with the local science centre community.

National Science Week 2008 was conducted in more than 67 sites countrywide. Of the 195 000 participants, 89% were learners. Over three million people were reached using electronic and print media.

A total of 125 unemployed SET graduates were employed at 22 science centres. The Minister launched the Federation of Engineering, Science and Technology Olympiads and Competitions (FESTOC), the National Youth Service and the University of KwaZulu-Natal Science Centre. Educators and learners attended summer camps in Canada. Some disadvantaged learners received bursaries from the German government to study engineering and science at higher education institutions.

Research grants and postgraduate bursaries were awarded to support the African Origin Platform and marine biosciences.

Emerging Research Areas

The first two nanotechnology innovation centres (based at Mintek and the CSIR) were established as part of implementing the nanotechnology strategy.

A primary node of the Centre for High Performance Computing

(CHPC) has been established in Cape Town. This is a joint initiative between the DST, the Meraka Institute and the University of Cape Town. The main purpose of the CHPC, launched in May 2007 and now operational, is to provide researchers with the computing power they need to undertake sophisticated research and innovation. The process for the layout of the first phase of the physical infrastructure for SANReN is underway. This infrastructure will provide national broadband networks and global connectivity for the transmission of research data.

The National Equipment Programme (NEP) continues to provide new equipment and upgrade existing equipment for research institutions to enable them to undertake world-class research and provide infrastructure for research capacity development. The second year of the programme was characterised by the acquisition of state-of-the-art equipment in a variety of science areas.

Indigenous Knowledge Systems (IKS)

The Indigenous Knowledge Systems (IKS) research chair (traditional medicines and health systems) was established at the University of KwaZulu Natal. The University of Zululand-based IKS centre undertook a comprehensive audit of IKS-related databases in government and research agencies, as well as higher education institutions.

The Ministerial Advisory Committee was established. It comprises IKS holders and practitioners, communities, institutions and other stakeholders.

6.4.5 Selected medium-term output targets

Subprogramme	Output	Measure/Indicator	Target
Human Capital and Science Platforms	Youth into Science Strategy implemented	Increased participation of youth and general public in National Science Week	A total of 200 000 learners to visit National Science Week sites countrywide
		Volunteers in the National Youth Service Programme	125 new volunteers
		Supplementary tuition provided	Supplementary tuition offered in 18 DST-adopted Dinaledi Schools and 4 schools under the Historic Schools Restoration Project
		Increased number of educators supported to contribute to improved quality of Mathematics and Science teaching	450 educators
		Widened distribution and access of science-based career materials	A total of 40 000 career booklets to be distributed countrywide
		Implementation of incentive scheme accelerated	10 new bursaries to be awarded to disadvantaged students at the DST camps; the existing bursary-holders will be supported as well
		Capacity of existing science centres enhanced	20 science centres to receive the DST funding support
South African Research Chairs Initiative		The number of new candidate research chairs appointed by October 2009	Five new research chairs
		The number of master's degrees completed by the end of March 2010	63 master's and 32 PhD students graduating
		The number of peer-reviewed articles published	175 articles
Professional Development Programme		The number of Masters and PhD graduates involved in accelerated research professional development at science councils by April 2009	80 researchers
		The number of researchers awarded research career awards by August 2009	10 researchers
Innovation Honours Bursary programme		The number of students funded at higher education institutions by July 2009	200 honours students, 150 first-year and 50 second-year master's students
Internship Programme		The number of interns placed at the various NSI institutions by June 2009	100 interns

Subprogramme	Output	Measure/Indicator	Target
	Innovation Postdoctoral Fellowship Programme	Increase the number of South African postdoctoral students at higher education institutions by July 2009	60 postdoctoral students
	Centres of excellence	Another CoE established by November 2009	One new CoE established
		The number of master's and PhD students who have completed their studies by the end of March 2010	170 master's and 70 PhD students
		The number of peer-reviewed articles published	300 articles
	Sustainable funding framework for formation of research consortia and development of young researchers	African Origins Platform funding framework for developing researchers	African Origins Platform funding framework presented for approval to Exco in April 2009
	Review the state and development of a national strategy for multi-wavelength astronomy, including an implementation plan, a three-year funding cycle and monitoring and evaluation instruments	Development of the astronomy research and infrastructure framework	Astronomy review and strategy presented to Exco for comment in August 2009
	National Marine Strategy	Marine research strategy, incorporating the development of the African Coelacanth Ecosystem Programme, approved by Exco	The strategy to be submitted to Exco in September 2009
Emerging Research Areas and Infrastructure	Well-developed nanotechnology R&D platform for the creation of new and novel devices for application in various areas	Continued support of the flagship projects for the development of nanotechnology-based devices to offer solutions to some of the social challenges identified	Assessment of projects' progress by June 2009, identifying gaps where they exist; identifying and implementing appropriate interventions by November 2009 to address identified gaps
	Development of new research areas	Implementation of the National Synthetic Biology Strategy	Finalisation of the National Synthetic Biology Strategy in August 2009; establishment of research centres to be completed by November 2009; a minimum of three fundamental research projects started; human capital development programmes put in place, with a minimum of 10 students receiving training by January 2010

Subprogramme	Output	Measure/Indicator	Target
	10-year infrastructure plan	Develop a 10-year strategic infrastructure plan to guide the meeting of infrastructure needs across the NSI in a strategic manner	Draft plan approved by Exco by November 2009
National Indigenous Knowledge Systems Office	An alternative legal system for the protection of IKS	A draft Bill on an alternative legal system for the protection of IKS	A draft Bill approved by Cabinet in December 2010
	A regulatory framework on medicinal plants	Feasibility study conducted and policy developed and implemented	Approved by Cabinet in December 2011
	National Expo	Increase in the number of participants, exhibitors, practitioners and communities	Expo to be rolled out in three provinces in August 2010
	Public awareness campaign	IKS policy awareness programme in place	Awareness programme with performance measurement system in place by December 2010
	Provincial nodes	Increase in the number of nodes	Nine provincial nodes operational (memorandum of agreement in place) by 2010
	Practitioners trained in intellectual property rights	A number practitioners trained in intellectual property	40 government officials, 30 tertiary institution academics and 20 community practitioners trained in intellectual property by 2010
	National IKS research agenda	The new IKS research management model implemented	Full implementation of the new model by December 2010
	IKS research chairs	Priority list of chairs identified in a 10-year plan	Establish and fund four chairs by May 2011
	IKS CoEs	Priority CoEs in line with a 10-year plan	Establish two IKS CoEs by March 2011
	IKS Bioprospecting Platform as part of farmer to pharma strategy	Full implementation of the Bioprospecting Strategy	Full funding and implementation by 2010
	IKS centres	Pilot and establish IKS centres to collect, document and disseminate indigenous knowledge	Four IKS centres established by June 2010
	IKS recordal system	Recordal system to capture synchrotextual documentation	A fully functional recordal system by June 2011
	IKS-holders and practitioners registered	Develop GPS databases/registries of IKS-holders and practitioners	An active GPS containing an accreditation of indigenous knowledge-holders and practitioners by December 2010

6.5 Programme 5: Socio-Economic Partnership

This Programme aims to provide policy, strategy and direction-setting support for R&D-led growth. Its strategic focus is informed by government's Micro-Economic Reform Strategy, the National Industrial Policy Framework (NIPF), the Ten-Year Innovation Plan, the National Framework for Sustainable Development, and AsgiSA.

Interventions are aimed at promoting growth in public and private investments in R&D, advancing national growth objectives through sustainable, value-added exploitation of the natural resources and by supporting the greater use of ICT applications in government and society. The national objectives of growing the base of SMMEs, black-owned businesses (particularly engineering companies), job creation and poverty reduction are key considerations in the design and implementation of interventions. This programme has the following three subprogrammes:

- S&T for Economic Impact
- S&T for Social Impact
- S&T Investments

6.5.1 Expenditure estimates

PROGRAMME NAME: Socio-Economic Partnerships DETAIL BY SUBPROGRAMME							
R thousand	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
	Outcome			Adjusted appropriation	Medium-term estimates		
					MTEF Baseline		
Science and Technology for Economic Impact	714,965	769,045	851,508	865,249	896,689	963,605	1,025,698
Science and Technology for Social Impact	166,106	216,047	254,076	271,920	269,962	291,752	309,558
Science and Technology Investment	2,686	5,471	4,846	22,721	24,002	26,519	28,050
Total of subprogrammes	883,757	990,563	1,110,430	1,159,890	1,190,653	1,281,876	1,363,306
SUMMARY OF ECONOMIC CLASSIFICATION OF PAYMENTS							
Compensation of employees	5,553	12,866	16,121	20,105	28,820	30,538	32,295
Goods and services	5,337	8,370	8,526	10,200	14,741	15,507	16,236
Total transfers and subsidies	872,772	969,040	1,085,441	1,129,431	1,146,742	1,235,463	1,314,389
Total payments for capital assets	95	287	342	154	350	368	386
TOTAL PAYMENTS	883,757	990,563	1,110,430	1,159,890	1,190,653	1,281,876	1,363,306

6.5.2 Expenditure trends

Expenditure increased from R883,7 million in 2005/06 to R1,3 billion in 2011/12, an average annual growth rate of 8%. The growth is more evident in the Subprogramme: Science and Technology for Economic Impact, which accounts for 75% of the programme expenditure between 2009/10 and 2011/12, signifying the DST's concerted effort

to support government's objective of alleviating poverty through the creation of sustainable job and wealth opportunities in poor municipal areas.

The programme has not received any additional funds for the medium term, resulting in an average annual growth rate of 7% over the MTEF.

6.5.3 Service delivery objectives and indicators

Science and Technology for Economic Impact

The Subprogramme: Science and Technology for Economic Impact strengthens the achievement of government's strategic economic growth and development objectives through the following three major interventions:

- Supporting the development of cutting-edge technology or knowledge-based industries in new growth areas in the technology mission areas of advanced manufacturing, metals beneficiation, information and communications technologies, and environmental goods and services through targeted RDI programmes
- Supporting an increase in the value of public sector procurement contracts that can be accessed by local technology-intensive companies through a focused technology localisation effort
- Supporting the development of key priority industrial sectors by consolidating and enhancing current research, development, innovation and technology transfer efforts in the NSI.

Science and Technology for Social Impact

The objective of the Subprogramme: Science and Technology for Social Impact is to introduce and promote innovative technology and management systems to support the creation of sustainable jobs and wealth opportunities in areas of deprivation and, with a focus on sustainability, to contribute to issues of human settlement. The subprogramme focuses on technologies and systems that are mature, but do not have widespread application, and are seen to have the potential to achieve government's broad objectives.

Science and Technology Investments:

The Subprogramme: Science and Technology Investments leads and supports the development of S&T indicators, monitors national S&T expenditure, and plans and implements programmes to enhance private sector expenditure on R&D

- Supporting an increase in the value of public sector procurement contracts that can be accessed by local technology-intensive companies through a focused technology localisation effort

- Supporting the development of key priority industrial sectors by consolidating and enhancing current research, development, innovation and technology transfer efforts in the NSI.

Science and Technology for Social Impact

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Science and Technology Investments:

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6.5.4 Recent outputs

The NIPF advocates the approach of diversifying the South African economy with a particular emphasis on building technology or knowledge-intensive industries. Subsequent to the adoption of the R&D strategy in 2002, the DST initiated a number of key technology mission areas and began the process of supporting strategic R&D in these technology mission areas. Following the adoption of the Ten-Year Innovation Plan and in line with the priorities of the NIPF, considerable progress has been achieved in terms of facilitating the development of a number of new long-term industrial opportunities. The development of these new industries will be achieved largely through targeted CoCs that bring together existing capabilities.

A Fluorochemicals Centre of Competence (FCoC) was conceptualised and initiated in partnership with the Department of Trade and Industry. The FCoC will support the development of new export-focused downstream industries in fluorochemical products over the next five to 10 years. The global fluorochemical industry is estimated at over \$16 billion and South Africa has the opportunity to target key opportunities. On the basis of an assessment of key market opportunities, three major areas of focus were identified: a new range of fluorochemical refrigerants, fluoropolymers and fluoroelastomers, and performance fluorocarbons and specialty gases. Agreement has been reached with the Department of Trade and Industry on a targeted partnership where the DST will fund focused research and development efforts and advanced human capital development programmes in these areas where there are clear commercialisation

opportunities. The Department of Trade and Industry will support efforts at understanding the fluorochemical industry internationally and business development. The FCoC will be formally launched early in the next financial year.

Considerable advances were made in the development of a long-term Titanium Industry Development Programme across the titanium value chain. This included advances in addressing technology challenges, as well as advances in the finalisation of a strategy for developing the industry. At laboratory level, a small amount of titanium powder was successfully produced. Additional work is still required to enhance its purity, and this will continue in the next financial year. In addition, through an investment casting project, progress was made in terms of the successful casting of an aerospace-grade product using a titanium, aluminium, and vanadium alloy. Further R&D work is required to ensure consistency of the investment casting.

At the strategy level, a detailed industrial development programme was developed in partnership with other key government departments including the departments of Trade and Industry, Public Enterprises, and Minerals and Energy. A key area of focus is around the production of titanium metal in a powder form. In addition, the strategy includes the consolidation of the titanium work that the DST is supporting under the Advanced Metals Initiative and the Advanced Manufacturing Technology Strategy into a Titanium Centre of Competence. Under the government task team, the process of evaluating and understanding changing conditions in the dynamic titanium market (both in terms of supply and demand) continues to ensure that the South African Titanium Industrial Development Strategy is appropriately revised and improved.

Work that started in the 2007/08 financial year to build a research and innovation base that will lead to the development of a substantial information security support industry in South Africa also continued. A detailed programme of R&D work is being finalised, including support for the establishment of a national computer security incidence reporting team for South Africa and the identification of priority information security products and services that can be used to enhance government's move towards e-government.

Arising from the successful industry-government-research community partnership in post-harvest technology, a specific opportunity to build an industrial base in the production of biodegradable packaging was finalised. Through a focused project, the DST will support the development of new products that can support an increasingly important global industry.

The successful Wireless Mesh Network (WMN) project was taken to the next level through the development of large-scale

demonstrators in three priority areas in South Africa aligned to the APEX 3 priorities. The aim of the large-scale demonstrator is not only focused on the technical challenges but is strongly oriented towards a workable model for the large-scale roll-out of WMNs through community-based entrepreneurs.

The Global Change Science Plan will be launched in the 2009/10 financial year. It provides a clear indication of the key science and research work that will be conducted to take forward the global change grand challenge. The focus for 2009/10 will shift towards the development of innovations and technologies in the environmental goods and services sector. These innovations and technologies not only assist South Africa in confronting the impacts of global change, but these innovations and technologies will also provide an important growth sector of the economy.

Finally, a new area of work aimed at more effectively supporting the National Industrial Policy Framework was initiated. This is the development of a number of sector development programmes in the areas of agriculture, minerals processing, forestry, fisheries, agro-processing and mining, as well as the cross-cutting area of water. The development of sector development programmes will form a key part of the work of the DST over the MTEF period. In tandem with the development of the sector development programmes, processes have begun to support the development of initiatives in key sector innovation plans. This includes a partnership with the minerals processing industry in efforts to identify breakthrough innovations that will strengthen the competitiveness of the industry and the reorientation of efforts to use nuclear technologies to support agricultural development. The Programme will be introducing changes to its structure to ensure that there is adequate capacity to deliver on this new area of work.

6.5.5 Selected medium-term output targets

Subprogramme	Output	Measure/Indicator	Target
Science and Technology for Economic Impact	Directed programmes that support the development of new cutting-edge industries in selected technology mission areas	Effective institutionalisation of CoCs within the NSI (including finalisation of a long-term development and investment plan; scoping and finalisation of new CoCs	Two fully institutionalised CoCs by March 2010 Two fully institutionalised CoCs by March 2011
	RDI support programme for key sectors of the economy	Finalisation of a strategic sector innovation plan; initiation of priority initiatives that support a strategic sector innovation plan	Two sector innovation plans to be completed by March 2010, 2 sector initiatives by the end of December 2009 and a further six by March 2012
	Enhance the contribution of local firms to leverage public sector state procurement efforts through technology localisation support	Finalisation of innovation strategies that support technology localisation in specific sectors; provision of technology assistance packages to local manufacturers	Two strategies completed by December 2010, initiate 25 assistance packages during the 2009/10 financial year and complete localisation by 2012
	Directed SET programmes advancing implementation of the technology missions of the R&D Strategy	Incubation plan for industry value-chain elements finalised and operationalised Research results, reports and advocacy activities in the technology mission areas of advanced manufacturing technologies, ICT, chemicals and related industries, and resource-based industries	Competency for metal production demonstrated by 2011, industry development ongoing over 10-year period One report for each of the four technology mission areas during the course of 2009 and stakeholder workshops to promote responses to the findings; follow up with reports every two years.
Science and Technology for Social Impact	Directed, large-scale scientific research programmes set up to address the challenges of human and social dynamics in development	Increased number of research chairs in humanities and social sciences University community platforms New IT-based tools for integrating planning across service delivery sectors	Seven more research chairs in humanities and social sciences in 2009/10. Scope 20 more during 2011/12 Launching of three pilot studies of community-based assessment centres in 2009/10 to run for three years
	Enhanced integration in development planning and decision making	New IT-based tools for integrating planning across service delivery sectors	Institutionalisation of the geospatial observatory IT-based toolkit in partnership with the Development Bank of South Africa and other stakeholders during 2009/10 for a 10-year period
	Directed technology programmes contributing to learning and decision-making for sustainable livelihoods and sustainable human settlements	Technology demonstrations, case study reports and advocacy activities; process completed for the establishment of institutional platforms for social impact activities	Eight reports and three workshops during 2009/10, thereafter one report per year; business case and consultations finalised for establishing the Public Benefit Foundation; launch new programme of work during the first quarter of 2011
Science and Technology Investments	A portfolio of directed monitoring, assessment and reporting activities on STI investments and performance	National R&D survey Government S&T expenditure plan National innovation survey	R&D survey report produced annually Report on government S&T expenditure by August 2009 Innovation survey report, 2010 and 2012

Subprogramme	Output	Measure/Indicator	Target
		TBP assessment facility Indicators for transition to a knowledge economy	TBP derived from available statistics for 2008 and calculated from approved model by 2009 with a report every year from then on National approach and methodology adopted in 2008, baseline determined and assessment during 2009/10
	Evaluation of the R&D Tax Incentive Programme	Report and advocacy activities to promote increased R&D investments by the private sector	Report to be submitted to Cabinet every year 100% of advocacy activities directed to small and medium-sized manufacturing companies

7. Public entities and agencies reporting to the Minister

The allocation of funds to science councils and financial instruments begins with National Treasury's budget guidelines. Science councils then interact with the DST on national development priorities and make three-year budget submissions. From these, the Department coordinates a consolidated submission to National Treasury. The resulting government allocation for the respective councils is included in the DST's MTEF allocation and is distributed to individual science councils in line with advice from the National Advisory Council on Innovation.

7.1 Council for Scientific and Industrial Research

The CSIR is governed by the Scientific Research Council Act, 1988. Its mandate is to foster scientific and industrial development in the national interest, through multidisciplinary research and technological innovation, either by itself or in partnership with public and private sector institutions.

7.1.1 Expenditure estimates

Table 1 Council for Scientific and Industrial Research (CSIR): Financial information

R thousand	Audited outcome			Revised estimate	Medium-term estimate		
	2005/06	2006/07	2007/08		2008/09	2009/10	2010/11
Statement of financial performance							
Revenue							
Non-tax revenue	616,712	726,779	868,522	951,719	980,053	1,056,861	1,138,535
Sale of goods and services other than capital assets	581,602	660,587	776,908	877,675	917,831	1,000,209	1,087,218
of which:							
Sales by market establishments	581,602	660,587	776,908	877,675	917,831	1,000,209	1,087,218
Other non-tax revenue	35,110	66,192	91,614	74,044	62,222	56,652	51,317
Transfers received	421,631	460,443	429,013	520,908	515,747	544,669	577,078
Total revenue	1,038,343	1,187,222	1,297,535	1,472,627	1,495,800	1,601,530	1,715,613
Expenses							
Current expense	980,217	1,160,586	1,243,394	1,441,480	1,462,784	1,566,534	1,678,518
Compensation of employees	541,786	592,828	628,319	725,586	784,724	843,125	905,516
Goods and services	380,794	510,700	580,593	640,809	593,209	630,478	670,809
Depreciation	40,239	50,682	28,061	75,085	84,851	92,931	102,193
Interest, dividends and rent on land	17,398	6,376	6,421	–	–	–	–
Total expenses	980,224	1,160,689	1,243,259	1,441,480	1,462,784	1,566,534	1,678,518
Surplus / (Deficit)	58,119	26,533	54,276	31,147	33,016	34,996	37,095
Statement of financial position							
Carrying value of assets	300,139	219,135	225,429	345,463	349,579	363,708	379,281
of which: Acquisition of assets	119,734	66,443	41,794	195,119	88,967	107,060	117,766
Investments	17,842	200,000	–	–	–	–	–
Inventory	46,866	43,203	61,712	57,999	42,691	58,544	64,398
Receivables and prepayments	159,980	146,906	267,076	209,102	237,591	268,136	299,423
Cash and cash equivalents	294,011	379,243	691,476	584,237	576,826	588,581	647,439
Assets not classified elsewhere	–	95,070	94,890	–	–	–	–
Total assets	818,838	1,083,557	1,340,583	1,196,801	1,206,687	1,278,969	1,390,541
Accumulated surplus/deficit	319,929	347,716	392,732	423,879	456,895	491,891	528,986
Post-retirement benefits	14,897	12,751	8,595	5,580	1,806	–	–
Trade and other payables	387,413	623,750	819,549	684,236	657,816	689,244	755,405
Provisions	65,300	72,248	76,595	83,106	90,170	97,834	106,150
Liabilities not classified elsewhere	31,299	27,092	43,112	–	–	–	–
Total equity and liabilities	818,838	1,083,557	1,340,583	1,196,801	1,206,687	1,278,969	1,390,541
Accumulated Surplus, Capital & Reserves	319,929	347,716	392,732	423,879	456,895	491,891	528,986

7.1.2 Expenditure trends

The CSIR is funded by transfers (as core grant) from the DST, as well as ring-fenced allocations, and generate about 62% of its total revenue from R&D contract income. Allocations over the MTEF period are R587,9 million in 2009/10, R620,9 million in 2010/11 and R657,8 million in 2011/12 (including VAT). Over and above the MTEF allocations the CSIR has been allocated additional (ring-fenced) allocations of R60,5 million in 2009/10, R70,8 million in 2010/11 and R79,6 million in 2011/12, which reflects an increase of 4,6% over the MTEF period.

Over the medium term, the CSIR's estimated revenue is set to grow at an average annual rate of 5,3% from R1,5 billion in 2008/09 to R1.7 billion in 2011/12.

7.2 National Research Foundation

The NRF was established in line with the National Research Foundation Act, 1998. The foundation is responsible for promoting and supporting research in all fields of the humanities, the social and natural sciences, engineering and technology. It serves as a catalyst for stimulating both fundamental and applied research for a broader knowledge economy by supporting knowledge production and highly skilled human capital needs, and providing critical science platforms.

In accordance with legislation, the NRF performs the function of an agency on behalf of the DST and is a service provider to all government departments. The clustered activities of the foundation include research innovation support and advancement, national research facilities, astro, space and geosciences, biodiversity and conservation, and nuclear sciences.

In 2007/08, the foundation developed a new strategic plan up to 2015. The plan recognises the following high level strategic goals, aimed at contributing to a prosperous and sustainable continent: an internationally competitive science, technology and innovation system, a representative research and technical workforce, world class science benchmarking and granting systems, leading edge research, technology and innovation platforms, and a vibrant national system of innovation. Medium term priorities are to increase student bursary values and establish a stable funding base in order to recapitalise equipment and the national research facilities' infrastructure.

7.2.1 NRF expenditure estimates

Table 2 National Research Foundation: Financial information

R thousand	Audited outcome			Revised estimate 2008/09	Medium-term estimate		
	2005/06	2006/07	2007/08		2009/10	2010/11	2011/12
Statement of financial performance							
Revenue							
Non-tax revenue	447,342	255,634	491,221	653,110	869,335	1,161,466	1,027,439
Sale of goods and services other than capital assets	7,659	19,790	25,344	25,184	30,198	33,500	36,180
of which:							
Sales by market establishments	7,659	19,790	25,344	25,184	30,198	33,500	36,180
Other non-tax revenue	439,683	235,844	465,877	627,926	839,137	1,127,966	991,259
Transfers received	542,144	580,411	621,260	399,831	537,156	356,335	610,243
Total revenue	989,486	836,045	1,112,481	1,052,941	1,406,491	1,517,801	1,637,682
Expenses							
Current expense	393,839	427,497	491,840	660,234	652,071	743,071	799,375
Compensation of employees	203,582	221,675	242,846	308,836	341,922	375,966	394,869
Goods and services	178,993	190,085	219,921	319,430	276,681	322,188	350,439
Depreciation	11,103	15,074	28,649	31,524	32,968	44,417	53,567
Interest, dividends and rent on land	161	663	424	444	500	500	500
Transfers and subsidies	636,857	397,386	483,976	529,372	754,420	774,730	838,307
Total expenses	1,030,696	824,883	975,816	1,189,606	1,406,491	1,517,801	1,637,682
Surplus / (Deficit)	(41,210)	11,162	136,665	(136,665)	–	–	–
Statement of financial position							
Carrying value of assets	163,078	210,559	240,111	603,322	794,766	1,232,744	1,474,274
of which: Acquisition of assets	43,351	62,755	59,768	395,025	224,412	482,395	295,097
Investments	81,149	53,418	52,046	52,046	50,000	50,000	50,000
Inventory	2,863	2,696	2,579	3,093	3,500	3,500	4,000
Loans	3,051	3,462	–	–	–	–	–
Receivables and prepayments	745,719	102,878	298,462	250,086	300,000	350,000	375,000
Cash and cash equivalents	311,506	371,159	507,334	422,276	380,000	350,000	300,000
Total assets	1,307,366	744,172	1,100,532	1,330,823	1,528,266	1,986,244	2,203,274
Accumulated surplus/deficit	(69,005)	(72,618)	42,562	(92,309)	(55,000)	(48,000)	(40,000)
Capital and reserves	77,649	77,073	98,558	125,558	125,558	125,558	125,558
Borrowings	9,787	–	–	–	–	–	–
Post-retirement benefits	88,060	88,967	93,630	96,597	99,612	102,580	105,431
Trade and other payables	1,037,419	456,643	644,459	650,000	654,730	596,762	569,411
Provisions	15,729	–	–	–	–	–	–
Liabilities not classified elsewhere	147,727	194,107	221,323	550,977	703,366	1,209,344	1,442,874
Total equity and liabilities	1,307,366	744,172	1,100,532	1,330,823	1,528,266	1,986,244	2,203,274
Accumulated Surplus, Capital & Reserves	8,644	4,455	141,120	33,249	70,558	77,558	85,558

7.2.2 Expenditure trends

The NRF is funded by transfers (as a core grant) from the DST, as well as ring-fenced allocations. Allocations over the MTEF period are R691,7 million in 2009/10, R751,4 million in 2010/11 and R804,9 million in 2011/12. Over and above the MTEF baseline allocations, the foundation will receive additional allocations of R36,9 million in 2009/10, R42,9 million in 2010/11 and R45,9 million in 2011/12.

The decrease in the audited outcome in 2006/07 and 2007/08 compared to 2005/06 is attributable to the disaggregation of two key programmes (the Innovation Fund and the Technology for Human Resources and Industry Programme) from the consolidated results of the foundation.

In terms of accounting standards, control 2009 Estimates of Public Expenditure 28 over these programmes rests with the DST and the Department of Trade and Industry respectively.

The foundation received a lower government grant (6%) in 2007/08. However, overall income increased substantially due to the increase in contract funded programmes, which correlates with the spending pattern. This impact is reflected mainly in expenditure items relating to salaries and wages and research grants. Key contract funded programmes include the Department of Labour Scarce Skills Study, the development of the Research Information Management System, the South African National Antarctic Programme, the Department of Science and Technology Innovation Honours Programme, the African Coelacanth Ecosystem Programme, and the establishment of six South African environmental observatory network nodes. The single largest source of contract funds is from the initial phase of the Square Kilometre Array Project, which is capital intensive and therefore impacts significantly on deferred income.

7.3 Human Sciences Research Council

The HSRC is a statutory research council established in 1968 to undertake, promote and coordinate research in the human and social sciences. It carries out collaborative research projects and publishes and disseminates research findings. It has offices in four provinces. The new Human Sciences Research Council Act, 2008, mandates the council to address developmental challenges in South Africa, Africa and the rest of the world through strategic basic and applied research in the human sciences, inform policy making and evaluate its implementation, stimulate public debate by disseminating fact-based research results, build research capacity and infrastructure for the human sciences, foster research collaboration, networks and institutional links, respond to the needs of vulnerable and marginalised groups through its research, and develop and make available data sets underpinning research, policy development and the public discussion of development issues.

The Act also allows the council to undertake or commission research on any subject in the field of the human sciences and to charge fees for the research and other services it provides. The council aligns itself with South Africa's national development priorities, notably poverty reduction through economic development, skills enhancement, job creation, the elimination of discrimination and inequality, social inclusion and exclusion, and effective service delivery. Thematic research areas include crime and violence, democracy and governance, youth and children, education and science, science and innovation, HIV/Aids, and the family and society. Community-based demonstration projects are designed to gather scientific evidence to inform government policies and intervention programmes.

The council's performance is measured in terms of indicators for its public purpose mandate, international collaboration (with emphasis on research in Africa), the implementation and impact of research, transformation of the workforce, excellence and capacity building in research, and sustainability by securing external funding to supplement the government grant to support long-term, large-scale research projects and programmes.

7.3.1 Expenditure estimates

Table 3 Human Sciences Research Council (HSRC): Financial information

R thousand	Audited outcome			Revised estimate	Medium-term estimate		
	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12
Statement of financial performance							
Revenue							
Non-tax revenue	126,873	138,081	133,862	164,873	178,888	194,093	210,591
Sale of goods and services other than capital assets	113,896	124,605	113,628	127,649	138,499	150,272	163,045
of which:							
Sales by market establishments	113,896	124,605	113,628	127,649	138,499	150,272	163,045
Other non-tax revenue	12,977	13,476	20,234	37,224	40,388	43,821	47,546
Transfers received	104,293	107,479	130,464	136,951	157,580	164,967	174,960
Total revenue	231,166	245,560	264,326	301,824	336,468	359,060	385,551
Expenses							
Current expense	228,370	240,549	256,707	262,093	325,536	359,014	383,014
Compensation of employees	112,623	121,153	138,639	131,388	167,566	181,545	196,697
Goods and services	111,642	115,602	113,877	126,477	146,981	164,908	174,722
Depreciation	4,105	3,794	4,191	4,229	10,989	12,561	11,595
Total expenses	228,370	240,549	256,707	262,093	325,536	359,014	383,014
Surplus / (Deficit)	2,796	5,011	7,619	39,731	10,932	46	2,537
Statement of financial position							
Carrying value of assets	90,424	89,420	92,423	366,531	392,584	407,466	413,097
of which: Acquisition of assets	4,743	2,832	7,356	278,337	37,041	27,442	17,226
Inventory	2,023	3,268	3,631	3,631	3,940	4,275	4,638
Receivables and prepayments	21,466	34,393	37,674	25,063	27,193	29,505	32,013
Cash and cash equivalents	15,903	29,393	46,864	76,345	82,834	89,875	97,515
Assets not classified elsewhere	–	46	305	1,821	1,976	2,144	2,326
Total assets	129,816	156,520	180,897	473,391	508,527	533,264	549,588
Accumulated surplus/deficit	89,606	90,286	97,905	137,636	139,579	135,880	138,383
Capital and reserves	–	–	–	210,314	273,200	301,432	306,183
Trade and other payables	32,124	52,621	59,213	99,873	69,170	68,276	76,155
Provisions	8,086	9,748	10,110	11,898	12,908	14,006	15,197
Liabilities not classified elsewhere	–	3,865	13,669	13,670	13,670	13,670	13,670
Total equity and liabilities	129,816	156,520	180,897	473,391	508,527	533,264	549,588
Accumulated Surplus, Capital & Reserves	89,606	90,286	97,905	347,950	412,779	437,312	444,566

7.3.2 Expenditure trends

The HSRC is funded by transfer payments (as a core grant) from the DST, as well as ring-fenced allocations. External income is obtained from research grants, contract research work and non-research activities such as rental income. Between 2005/06 and 2008/09, expenditure increased at an average annual rate of 4,7% from R228 million to R262 million. The largest increase (of 6,7% in 2007/08) was primarily due to increases in salary-related expenses in the period, driven by increases in the number of staff, including project staff on a number of large demonstration projects, and general salary increases. It should be noted that costs were contained throughout the period, resulting in surpluses at the end of each budget year since 2005/06.

Allocations over the MTEF period are R162,1 million in 2009/10, R169,4 million in 2010/11 and R179,5 million in 2011/12 (including VAT). Over and above the MTEF allocations, the HSRC is allocated additional (ring-fenced) allocations of R2,5 million in 2009/10, R20 million in 2010/11 and R20,9 million in 2011/12, which is an increase of 6,9% over the MTEF period. The entity's total budget is projected to grow at the same average annual rate of 8,5% over the MTEF period, from R302 million in 2008/09 to R385,5 million in 2011/12.

7.4 Africa Institute of South Africa

The AISA is a statutory body established in terms of the Africa Institute of South Africa Act, 2001. It focuses primarily on political, socio-economic, international and development issues in contemporary Africa, and contributes to the goals of the NSI through research programmes that impact on knowledge production, human resource development (especially developing capacity in African studies, a scarce resource in South Africa), social science, and innovation.

AISA's key role is to conduct research and support policy development, embark on training programmes, and establish, participate in and maintain networks for peace, development and prosperity in Africa. AISA's research also ensures the quality of policy decision making.

AISA is funded by the transfers (as core grant) from the DST. Allocations for the MTEF period are R29,5 million in 2009/10, R30,9 million in 2010/11 and R32,8 million in 2011/12, which is an increase of 2,5% over the MTEF period. Although there is a decrease of R978 000 in the actual budget allocation from 2008/09, over the medium term, the entity's budget is set to grow by 3,4% from R30,1 million in 2009/10 to R31,4 million in 2010/11 and by 6% in 2010/11 to R33,3 million in 2011/12.

R thousand	Audited outcome			Revised estimate	Medium-term estimate		
	2005/06	2006/07	2007/08		2008/09	2009/10	2010/11
Statement of financial performance							
Revenue							
Non-tax revenue	1,126	1,265	1,222	721	779	841	908
Sale of goods and services other than capital assets	134	118	54	36	39	42	45
of which:							
Sales by market establishments	134	118	54	36	39	42	45
Other non-tax revenue	992	1,147	1,168	685	740	799	863
Transfers received	20,468	23,454	26,530	30,464	29,280	30,594	32,440
Total revenue	21,594	24,719	27,752	31,185	30,059	31,435	33,348
Expenses							
Current expense	21,027	21,535	24,047	27,407	24,938	23,630	30,612
Compensation of employees	12,627	11,655	11,206	14,476	13,320	11,461	14,110
Goods and services	7,716	9,438	12,396	12,566	11,258	11,732	16,008
Depreciation	675	345	314	329	321	395	449
Interest, dividends and rent on land	9	97	131	36	39	42	45
Total expenses	21,027	21,535	24,047	27,407	24,938	23,630	30,612
Surplus / (Deficit)	567	3,184	3,705	3,778	5,121	7,805	2,736
Statement of financial position							
Carrying value of assets	1,043	1,521	2,386	3,302	3,641	4,263	4,502
of which: Acquisition of assets	292	97	1,221	1,412	660	1,017	688
Investments	31	32	34	–	–	–	–
Inventory	615	815	704	1,820	2,820	4,820	3,320
Receivables and prepayments	4,006	1,015	368	718	1,860	2,263	1,911
Cash and cash equivalents	624	6,072	8,221	8,288	11,049	11,049	11,401
Assets not classified elsewhere	–	1,331	2,285	3,277	2,285	4,282	6,376
Total assets	6,319	10,786	13,998	17,405	21,655	26,677	27,510
Accumulated surplus/deficit	2,999	7,756	11,461	15,239	19,489	24,511	26,433
Borrowings	–	666	–	–	–	–	–
Trade and other payables	2,959	1,694	1,667	1,096	1,091	1,091	506
Provisions	361	670	870	1,070	1,075	1,075	571
Total equity and liabilities	6,319	10,786	13,998	17,405	21,655	26,677	27,510
Accumulated Surplus, Capital & Reserves	2,999	7,756	11,461	15,239	19,489	24,511	26,433

7.5 Tshumisano

Tshumisano is funded by transfer payments (as a core grant) from the DST, as well as ring-fenced allocations. Allocations over the MTEF period are R49,9 million in 2009/10, R53,6 million in 2010/11 and R55,7 million in 2011/12. Over and above the MTEF allocations, Tshumisano has been allocated additional (ring-fenced) allocations of R694 000 in 2009/10, R840 000 in 2010/11 and R880 000 in 2011/12, which is an increase of 3,9% over the MTEF period.

7.6 Academy of Science of South Africa

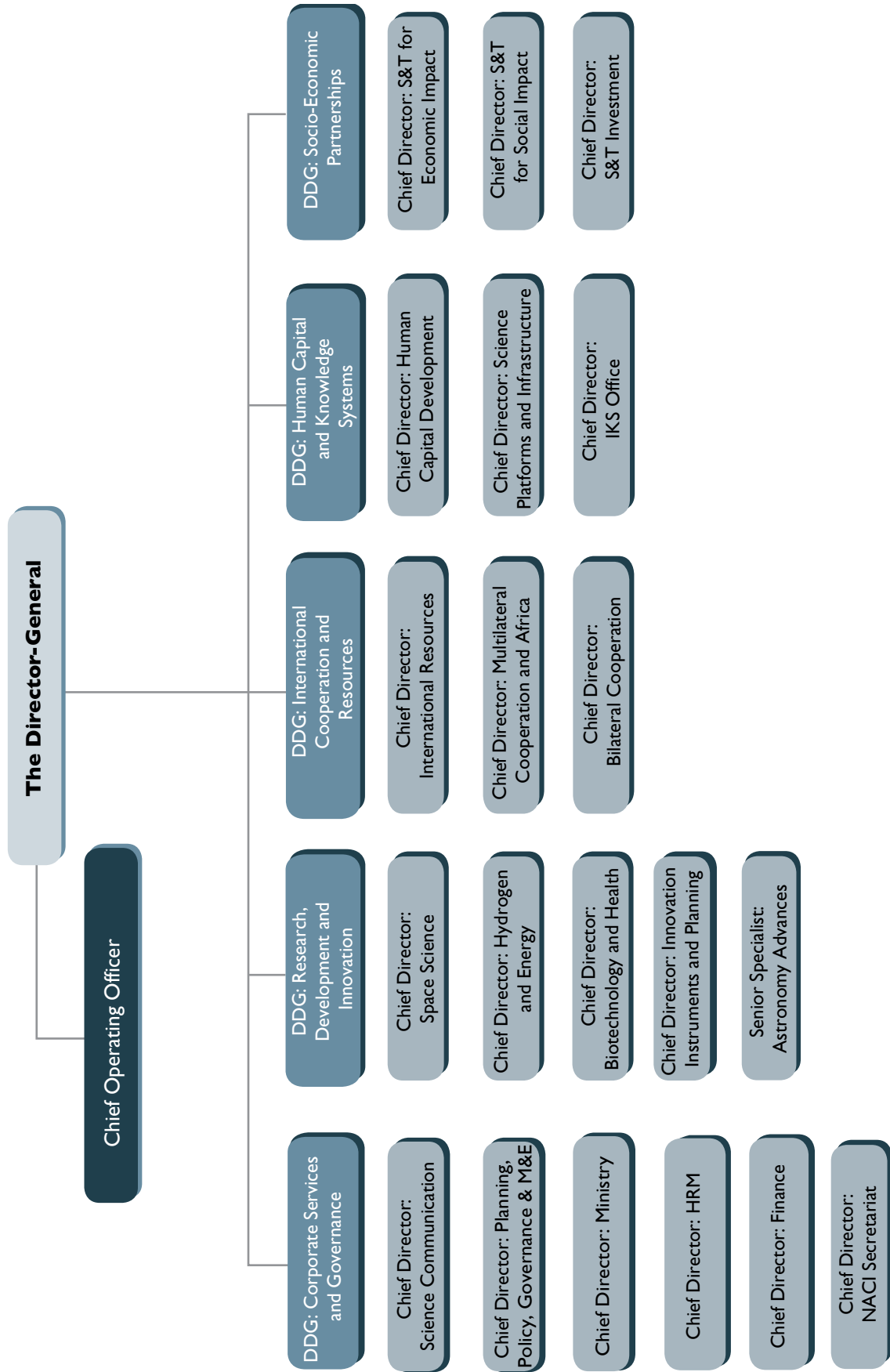
ASSAf was established through the ASSAf Act, 2001. ASSAf's objectives are to promote common ground for scientific thinking across all disciplines, to promote innovative and independent scientific thinking, to promote the development of the intellectual capacity of all people, and to link South Africa with scientific communities at the highest levels, particularly in Africa. The Academy publishes scientific reports, investigates matters of public interest about science, and manages South African journals.

7.6.1 Expenditure estimates

Table 5 Academy of Science of South Africa: Financial information

R thousand	Audited outcome			Revised estimate 2008/09	Medium-term estimate		
	2005/06	2006/07	2007/08		2009/10	2010/11	2011/12
Statement of financial performance							
Revenue							
Non-tax revenue	544	1,002	835	1,119	929	955	1,000
Sale of goods and services other than capital assets	305	730	378	609	369	375	400
of which:							
Sales by market establishments	305	730	378	609	369	375	400
Other non-tax revenue	239	272	457	510	560	580	600
Transfers received	4,048	4,960	8,602	12,587	14,645	15,196	15,809
Total revenue	4,592	5,962	9,437	13,706	15,574	16,151	16,809
Expenses							
Current expense	4,743	5,957	8,167	13,706	15,574	16,151	16,809
Compensation of employees	1,702	2,065	2,785	4,922	5,267	5,593	5,912
Goods and services	3,016	3,869	5,352	8,746	10,264	10,512	10,847
Depreciation	25	23	30	38	43	46	50
Total expenses	4,743	5,957	8,167	13,706	15,574	16,151	16,809
Surplus / (Deficit)	(151)	5	1,270	–	–	–	–
Statement of financial position							
Carrying value of assets	173	169	139	219	240	262	284
of which: Acquisition of assets	117	84	–	118	64	68	72
Cash and cash equivalents	5,104	4,337	5,275	6,330	4,807	4,797	4,782
Total assets	5,277	4,506	5,414	6,549	5,047	5,059	5,066
Accumulated surplus/deficit	3,695	3,700	4,970	6,549	5,047	5,059	5,066
Trade and other payables	1,582	806	444	–	–	–	–
Total equity and liabilities	5,277	4,506	5,414	6,549	5,047	5,059	5,066
Accumulated Surplus, Capital & Reserves	3,695	3,700	4,970	6,549	5,047	5,059	5,066

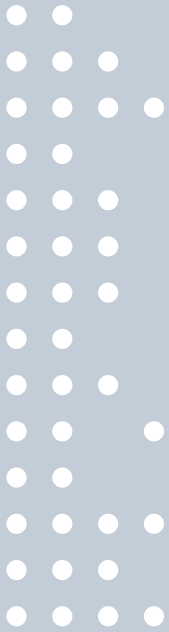
8. THE DST ORGANOGRAM



ABBREVIATIONS

AISA	Africa Institute of South Africa
AsgiSA	Accelerated and Shared Growth Initiative of South Africa
ASSAf	Academy of Science of South Africa
AU	African Union
BioFISA	Southern Africa Network for Biosciences
BRIC	Biotechnology Regional Innovation Centre
CERN	European Organisation for Nuclear Research
CHPC	Centre for High Performance Computing
CoC	centre of competence
CoE	centre of excellence
CPA	Consolidated Science and Technology Plan of Action
CSIR	Council for Scientific and Industrial Research
DST	Department of Science and Technology
EU	European Union
FCoC	Fluorochemicals Centre of Competence
FESTOC	Federation of Engineering, Science and Technology Olympiads and Competitions
GDP	gross domestic product
HSRC	Human Sciences Research Council
ICT	information and communication technology
IKS	indigenous knowledge system
IPR Act/Bill	Intellectual Property Rights Act/Bill
KAT	Karoo Array Telescope
MTEF	Medium-term Expenditure Framework
MTSF	Medium-term Strategic Framework
NEP	National Equipment Programme
NEPAD	New Partnership for Africa's Development
NIKSO	National Indigenous Knowledge System Office
NIPF	National Industrial Policy Framework
NIPMO	National Intellectual Property Management Office
NRDS	National Research and Development Strategy
NRF	National Research Foundation
NSI	National System of Innovation
OECD	Organisation for Economic Cooperation and Development
PCT	Patent cooperation treaty
R&D	research and development
RDI	research, development and innovation
S&T	science and technology
SADC	Southern African Development Community
SAEON	South African Environmental Observation Network
SAFIPA	South Africa-Finland ICT Knowledge Partnership
SALT	Southern African Large Telescope
SANAP	South African National Antarctic Programme
SANReN	South African National Research Network
SARCHI	South African Research Chairs Initiative
SARS	South African Revenue Service
SKA	Square Kilometre Array
SET	science, engineering and technology
SMMEs	small, medium and micro-enterprises
STI	science, technology and innovation
TBP	technology balance of payments
TIA	Technology Innovation Agency
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UNIDO	United Nations Industrial Development Organisation
WMN	Wireless Mesh Network





DEPARTMENT OF SCIENCE AND TECHNOLOGY

Building 53, Meiring Naude Road, Scientia Campus, (CSIR) South Gate Entrance, Brummeria, Pretoria, 0001, South Africa,
Tel. +27 (12) 843 6300, Fax. +27 (12) 349 1030