National Research Foundation

AN INVESTIGATION INTO AN OPTIMAL MODEL FOR THE ESTABLISHMENT OF A SOUTH AFRICAN POLAR RESEARCH ENTITY

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EXECUTIVE SUMMARY

South Africa's research activities in the Southern Oceans and Antarctica are a direct consequence of its obligations as a signatory of the Antarctic Treaty Systems. In addition, though there are a number of Agencies of Government with a direct interest in Antarctica and the Southern Oceans, with the latter defined in the Terms of Reference as embracing the oceans to the south of the mainland. Taken together the following four categories of stakeholders of a new Polar and Southern Ocean research entity can be identified:

1. Those that have, traditionally, been part of the South African National Antarctic Programme (SANAP) and whose activities have by and large been in support of adherence to the principles of the Antarctic Treaty Systems. This work is virtually exclusively been undertaken by researchers at universities with the research topics approved on the basis of peer review and availability of logistic support.
2. Those whose work is carried out by virtue of a statutory mandate and includes the activities of Marine and Coastal Management (MCM) of the Department of Environmental Affairs and Tourism (DEAT) and the South African Weather Service (SAWS).
3. Those that have a statutory mandate of conducting investigations in South African territory of the Southern Oceans such as South African National Biodiversity Institute (SANBI), the Council for Geoscience (CGS) and the Petroleum Agency of South Africa (PASA) but have not been part of the activities of SANAP.
4. Those will participate in the Global Change Grand Challenge (GCGC) of the Department of Science and Technology's (DST) ten year plan, an activity identified as one of the highest priority for South Africa to understand climate change and the impact this will have on South Africa.

In considering the mandate of a new Antarctic and Southern Ocean research entity, due cognisance was taken of the mandates of various other Antarctic and polar research entities internationally, the present range of activities and responsibilities vested in the Directorate Antarctica and Islands (DAI), the research being conducted under the auspices of the SANAP, the needs and expectations of the research community and that of other South African statutory agencies with a mandate in the Southern Oceans, and the recommendations contained in the 2000 and 2007 reviews of the SANAP. Based on this, the mandate of a new research entity is considered to include the following:

- To set the strategic direction for South African Antarctic and Southern Ocean research;
- To undertake and facilitate world-class scientific research that addresses key issues of global and fundamental importance;
- To coordinate South African Antarctic and Southern Ocean research;
- To facilitate cooperation with national and international institutions and the integration of activities with global networks;

- To facilitate scientific work of practical, economic and national significance (this relates specifically to the needs of SANBI, the CGS, PASA and the SAWS);
- To provide state-of-the-art equipment, key infrastructure and logistic as well as technical support;
- To enable South Africa to discharge its responsibilities under the Antarctic Treaty System and other conventions and agreements by providing sound, evidence-based policy advice to Government;
- To provide reliable and independent advice to the South African Government on other matters pertaining to Antarctica and the Southern Oceans; and
- To build the required capacity in research, with due cognisance of the need for racial and gender equity.

Within the context of the South African National System of Innovation (NSI) three governance models can be considered, viz.:

- A National Facility as defined in the System Wide Review of 1998 and to become part of the National Research Foundation (NRF) which has the mandate of managing National Facilities in terms of the NRF Act;
- A division within an existing statutory Science Council such as the CSIR; and
- A separate statutory Science Council reporting to the Minister of Science and Technology.

Of the three models the National Facility option is the preferred model, although there are compelling reasons to use such a National Facility as platform to pave the way for an expanded facility or even an independent Science Council in years to come. In view of this a name such as the “South African Marine and Polar Research Institute (SAMPRI)” or alternatively the “South African Marine and Antarctic Research Institute (SAMARI)” are preferred over a too narrowly defined name such as “South African Antarctic and Southern oceans Research Institute”.

It is estimated that the total annual recurring expenditure for a National Facility as envisaged amounts to R152.5 million which implies an additional annual recurring amount of R56.5 million for all the core functions of the Institute in addition to logistics which presently vests in the DAI. Furthermore provision will need to be made for some core research equipment of the Facility, estimated at R55 million, as well as an increase in the agency funding for research to at least R25 million annually.

A phased approach over three years is proposed to establish the Research Institute and to be fully operational when the new research vessel is commissioned. In addition, an estimated R18.5 million will be required in the first year for the refurbishment of the first floor of the Waterfront offices of the DAI in Cape Town, the preferred location for the Research Institute, plus a further R1.6 million for the IT requirements of new staff and the National Antarctic Data Centre (NADC).

1 INTRODUCTION

The decision to establish a South African polar research entity de-linked from direct operational control of any government department has its roots in a number of parallel developments over the past decade.

- First and foremost is the recognition of the Southern Oceans and the adjoining Antarctic continent as a priority area for research within the National Research and Development Strategy (2002), from the perspective of geographical advantage and the principle that such areas of geographical advantage are best exploited by supporting globally competitive large scale research.
- Second is the adoption of new principles regarding the governance of science in South Africa by Cabinet on 31 March 2004 (Adam, 2004). This places the responsibility of the so called "*type I capacity*", i.e. large scale, broad based science and technology platforms primarily under the Department of Science and Technology (DST), with mission driven research as either a joint responsibility with other government departments or exclusively under the respective line departments. The broad scope of the South African National Antarctic Programme (SANAP) involving several different disciplines should therefore by definition fall under the jurisdiction of the DST.
- Thirdly, two reviews over the last decade (2000 and 2007) have recommended that a new research entity be established outside the present departmental structures but closely aligned with Government. In response to the 2000 review a due diligence process undertaken in 2002 recommended the establishment of SANAP as a National Facility under the National Research Foundation (NRF). This was never implemented, although the scientific research function was transferred from the Department of Environmental Affairs and Tourism (DEAT) to the DST in 2003, with the DEAT retaining the responsibility of logistics and infrastructure. The NRF was appointed by the DST as agency responsible for allocating research grants to researchers primarily at universities. Similar recommendations were made by the 2007 review team without specifying under whose jurisdiction such a National Facility should reside and also a year earlier in a study on the Required Physical Infrastructure to attain the Vision of the National System of Innovation (NSI) conducted on behalf of the National Advisory Council on Innovation (NACI).

In response to the recommendations of the 2007 Review by an expert international review panel that an Antarctic Research and Logistics Centre be established as a National Facility, and the recommendations contained in the NACI infrastructure report, where the creation of a National Facility for Marine and Antarctic Research was identified as a first order priority, an understanding was reached between the Directors-General of the DST and of the DEAT to investigate the feasibility of establishing a South African polar research entity. This report, commissioned by the NRF at the request of the DST in response to this agreement, is the outcome of an investigation into an optimal model for the establishment of a South African polar research entity. The Terms of Reference which guided this investigation is attached to this report as Appendix III, whereas all the stakeholders interviewed during the investigation are listed in Appendix IV.

Important in the interpretation of a "South African Polar Research Entity" is the definition of "Antarctic" as provided in the Terms of Reference, viz. *"For the purpose of this document the "Antarctic" refers to the region south of Africa. This includes the Prince Edward Islands, over which South Africa exercises undisputed sovereignty, and comprises the Southern Ocean and sub-Antarctic islands (including Gough Island) as well as the Antarctic continent."* Although this definition is vague and open to interpretation, for the purpose of this report "Southern Ocean" is taken as the marine environment south of Africa including the continental shelf areas south of the mainland, i.e. in essence south of 35^{o} parallel, but excluding the near shore environments and the marine environments to the east and west of the mainland.

Comprehensive overviews of the history of South Africa's involvement in Antarctic and Southern Oceans research are provided in the web pages of the SANAP and the South African National Antarctic Expedition (SANAE), in Chown and de Beer (2007)[1], and in the Antarctic Research Strategy (ARESSA)[2], and will therefore not be repeated here.

The report commences with a chapter that provides an overview of the legal and policy context within which a polar research entity will have to operate. This includes firstly the

[1] Chown, S L and De Beer J H, 2007. Commissioned Report for the 2007 Review of the South African National Antarctic Programme, 91+ pages.
[2] Department of Science and Technology, 2007. Antarctic Research Strategy for South Africa, 28pp.

international context, primarily South Africa's obligations in terms of the Antarctic Treaty System of which South Africa is a signatory, and secondly the national context from the perspectives of

- Antarctic and Southern oceans research within the (NSI),
- The National Environmental Management Acts, and
- Statutory organisations with a mandate to conduct investigations within the influence sphere of the proposed new research entity.

The following chapter outlines the present status of the SANAP. It commences with a due diligence of the Directorate Antarctica and Islands (DAI), followed by a review of the present grants management and science outreach activities and concludes with a number of current constraints of the SANAP.

Five strategic initiatives of importance to the proposed research entity are highlighted in the next chapter. The first relates to the replacement of the SA Agulhas, the second to the Cape Town Antarctic Gateway concept, the third to the replacement of the base on Gough Island, the fourth to the proposed Prince Edward Islands (PEIs) Environmental management Plan, the proposed PEIs Marine Protected Area (MPA) and initiatives to have the PAIs declared a World Heritage Site, and the fifth to discussions regarding a India-Brazil-South Africa Ocean Alliance. Chapter 5 on Science, in turn, summarises extensive discussions with the SANAP research community with emphasis on present shortcomings, opportunities, challenges for and expectations of a new research entity. This is followed by a brief overview of the mandates and governance of other Antarctic and Southern Ocean research organisations inasmuch as such information could be accessed from their respective web sites.

With all the information in the previous chapters as background Chapter 7 provides an outline of the mandate, governance scenarios, functions, staffing and infrastructure requirements, budgetary implications and management structure of a new research entity. The final chapter contains a number of recommendations regarding the name and scope of the entity, a phased implementation plan and also highlights the potential benefits of such a research entity to the NSI.

2 INTERNATIONAL AND NATIONAL CONTEXT

This chapter deals mostly with the international and national legal and policy environment within which a new polar and southern ocean research entity will need to operate. This is considered to be particularly important as this will impact directly on the mandate of such an entity and ultimately also on the preferred governance and management models of such an entity.

2.1 International Context

2.1.1. The Antarctic Treaties System

According to the Antarctic Treaties Act, Act 60 of 1996 the following Antarctic Treaties form part of the law of South Africa:

- The Antarctic Treaty of 1959
- The Protocol on Environmental Protection to the Antarctic Treaty of 1992
- The Convention for the Conservation of Antarctic Seals, and
- The Convention on the Conservation of Antarctic Marine Living Resources of 1980

From this it follows that South Africa is not only obliged to adhere to these treaties by virtue of being a signatory thereto, but also by virtue that these treaties have in effect been adopted as Acts of Parliament by South Africa. The Act stipulates that the Minister of Environmental Affairs and Tourism is the custodian of this Act and hence also responsible for its enforcement. The implications in terms of research are briefly summarised below.

The Antarctic Treaty binds all contracting parties to the peaceful use of Antarctica. It provides for the freedom to conduct scientific investigations and encourages international cooperation towards this end. In addition, the Treaty obliges signatories to

- the exchange of information regarding scientific programmes,
- exchange scientific personnel between stations and expeditions, and
- exchange and free access to scientific observations and results,

inasmuch as this is practicable and feasible.

It is furthermore of interest to note that the participation in Antarctic Treaty Consultative Meetings (ATCM) is subject to the contracting parties demonstrating their “interest in Antarctica by conducting substantial scientific research activity there.”

The Convention of the Protection of Antarctic Seals (CPAS) was agreed upon in 1972 in response to the vulnerability of Antarctic seals to commercial exploitation and the adverse effects on Antarctic ecosystems. It recognises the need for research to improve scientific knowledge on Antarctic seal populations in order to ensure exploitation on a rational basis and the formulation of appropriate regulations in this regard. The Scientific Committee on for Antarctic Research (SCAR) was invited as an independent organisation to conduct the required research and to provide the required scientific information and recommendations regarding regulatory matters to achieve the objectives of the Convention.

The Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR) of 1980 is an outflow of the Antarctic Treaty promulgated because of the need to establish measures and protocols for the preservation and conservation of the living resources of the Antarctic. It creates mechanisms for the implementation of decisions, co-ordination of activities and scientific research required to ensure the conservation of Antarctic marine living resources. In order to give effect to this, the Convention makes provision for

- a Commission whose function among others is to facilitate research and comprehensive studies of Antarctic marine living resources and of the Antarctic marine ecosystem, i.e. their relation to other living organisms and the physical environment, and
- a Scientific Committee to advise the Commission.

The Scientific Committee, constituted of suitably qualified representatives of member states of the Convention, is tasked to undertake various studies in pursuance of the objectives of the Convention, and is expected to develop co-operative working relationships with the Scientific Committee on Antarctic Research (SCAR) and the Scientific Committee for Oceanic Research (SCOR).

For the purpose of meeting the objectives of CCAMLR, the Convention includes the oceanic regions around the Prince Edward Islands, Crozet Island and Kerguelen Islands

Each member state is expected to contribute to the budget of the Commission and that of its Scientific Committee. For South Africa this is being provided by MCM of DEAT.

The Protocol on Environmental Protection to the Antarctic Treaty of 1992 is a supplement to the Antarctic Treaty aimed at strengthening this Treaty by designating the area to which this Treaty applies as a natural reserve devoted to peace and science. It makes provision for the protection of the Antarctic environment and its ecosystems, and to this end lists a number of binding stipulations to give effect to the protocol. It re-emphasises the need to accord priority to scientific research in the Antarctic treaty area in order to preserve the value of Antarctica as an area to conduct research, including research essential to understand the global environment, and the need to promote co-operative programmes in this regard. Its activities are coordinated by the Committee for Environmental protection (CEP).

A *Council of Managers of National Antarctic Programmes* (CMNAP) was established in 1988 to develop and promote best practice in managing the support of scientific research in Antarctica, by:

- Serving as a forum to develop practices that improve effectiveness of activities in an environmentally responsible manner;
- Facilitating and promoting international partnerships;
- Providing opportunities and systems for information exchange; and
- Providing the Antarctic Treaty System with objective and practical, technical and non-political advice drawn from the National Antarctic Programs' pool of expertise.

In summary, the South African Government, as signatory of the Antarctic Treaty, recognises by way of policy amongst others:

- The global and national importance of safeguarding the environment of the Antarctic and Southern Ocean and protecting the integrity of ecosystems, both marine and terrestrial, in the regions.

- The important role played by the Southern Ocean in global climate processes, including climate change, and its implications for South Africa and the African continent as a whole.
- The uniqueness of Antarctica as a region for coupling phenomena in geospace and the atmosphere and their interactions.
- The urgency of ensuring the protection of the Antarctic and Southern Ocean environments and the conservation of their resources.
- The essence of increasing knowledge of Antarctic and Southern Ocean ecosystems and their components so decisions on their management can be based on the best scientific information available.
- The need for international co-operation in scientific research of all involved states in the protection of the Antarctic and Southern Ocean natural environments and the conservation of their resources.
- The responsibility of signatories of the Antarctic Treaty for the protection and preservation of the Antarctic environment and, in particular, their responsibility for the preservation and conservation of living resources in Antarctica.

2.1.2 Comprehensive Nuclear Test Ban Treaty

South Africa is a signatory to the Comprehensive Nuclear Test Ban Treaty and contributes to the activities of this organisation among others by participating in its International Monitoring System (IMS) programme. Within the context of this programme South Africa through its Council for Geoscience (CGS) has a cooperation agreement with the Alfred Wegner Institute (AWI) of Germany to locate a seismological station at SANAE in Antarctica as part of the IMS. The equipment largely belongs to the AWI whilst the CGS is responsible for maintenance and operations, to which effect it contributes to the salary costs and trains the technician who is assigned to operate the facility among other tasks. The intention of locating a radionuclide monitoring station on Marion Island as part of South African contribution to the IMS referred to in the 2007 Review does not seem to have materialised.

2.1.3 The Scientific Committee on Antarctic Research of ICSU

The Scientific Committee on Antarctic Research (SCAR) is an inter-disciplinary body of the International Council for Science (ICSU). SCAR is charged with initiating, developing, and coordinating high quality international scientific research in the Antarctic

and providing independent scientific advice to the Antarctic Treaty System. In this regard it coordinates several major science programmes such as e.g. on

- Past Climate: Antarctic Climate Evolution (ACE)
- Modern Climate: Antarctic in the Global Climate Systems (AGCS)
- Biological systems: Evolution and Biodiversity in the Antarctic (EBA)
- Space Physics: Sun-earth interactions and the connection between upper and lower atmosphere

Several other programmes deal with diverse topics such as on oceanography, meteorology, permafrost and periglacial environments, ice drilling technologies, Antarctic neotectonism, geodesy and geomagnetism. Several of these programmes are operated in conjunction with other organizations, the most notable for the purpose of this report being the SCAR/SCOR Expert Group on Oceanography which aims to:

- Encourage an interdisciplinary approach to Southern Ocean observation, modeling and research given the interdependence of physical, chemical and biological processes in the ocean,
- Coordinate the development of a Southern Ocean Observation System (SOOS) for sustained observations and to identify the mix of observations required to address science and policy questions, and
- Encourage the exchange of information.

2.1.4 Degree to which South Africa meets international obligations

Antarctic Treaties

Discussions with stakeholders have echoed the conclusions reached in the 2007 Review that participation and contributions to ATCM and the Committee on Environmental Protection (CEP) established in terms of the Protocol on Environmental Protection to the Antarctic Treaty are not up to standard, primarily with respect to continuity of leadership representation and limited numbers of papers presented by South African delegates at ATCM meetings. The inability of South Africa to perform at these meetings has also been noted with a degree of dismay by our key international counterparts. This is considered to be a serious shortcoming as it can be perceived by delegates of other states to the ATCM as a lack of interest or inability to demonstrate continued interests in Antarctica by South Africa which is a prerequisite for continued membership of the ATCM. It was also noted in the discussions that virtually all countries represented at ATCM meetings had attractive displays on their activities in Antarctica which hardy ever

was the case for South Africa. The situation seems to have improved somewhat in recent years as a result of assistance provided by the NRF in soliciting scientific contributions from researchers funded by SANAP for presentation at ATCM meetings.

In like vein, the 2007 Review recognised that South Africa is in a position to make a more substantive contribution to the deliberations of the ATCM and the Scientific Committee of CCAMLR, particularly in view of the deliberations at present regarding the establishment of a Marine Protected Area in the oceans surrounding the Prince Edward Islands. Presently the MCM depends to a large extent on the outcomes of the research activities of SANAP funded researchers to meet South African obligations as member of CCAMLR.

The recommendations contained in the 2007 Review to address these shortcomings have been incorporated by and large in the proposed governance and management models (see Chapter 7 below)

SCAR

South Africa has had National Scientific Committees for both SCAR and SCOR for many years. By virtue of the fact that both of these are ICSU committees, the activities of the National Committees are coordinated by the NRF, the adhering body to ICSU. From stakeholder discussions it is apparent that the National Committees of SCAR and SCOR are virtually dysfunctional at present and play no role whatsoever in influencing the agenda of Antarctic and Southern Oceans research. This is a serious shortcoming where a proposed new research entity can play an important role in ensuring that these committees are revitalized.

Although some South Africa scientists have and are playing major roles within SCAR structures, e.g. Professor Dave Walker, recently retired Vice-President, and Professor Steven Chown as Chair of the SCAR Standing Committee for the ATCM, South African participation in large SCAR programmes have been limited to the biosciences and space physics. This is primarily due to the fact that a higher visibility in other disciplines would require better access to logistics, particularly in oceanography and the geosciences.

2.2 National Context

2.2.1. The System Wide Review of 1998

This review, conducted in response to the 1996 White Paper on Science and Technology *"Preparing for the 21st Century"* entailed a fundamental investigation into the government and management structures of government-funded science and technology institutions in order to establish how these could be restructured or reconfigured to meet broad national goals. The Antarctica and Islands Survey, as SANAP was referred to at the time, was included in this review and investigated by a panel commissioned to review all potential national facilities. The panel assessed all identified potential facilities against a number of criteria and recommended in the end that the activities of the Antarctica and Islands Survey continue operating under the prevailing conditions at the time. Important for this report though is to note the recommendations accepted by the System Wide Review panel regarding National Facilities. This panel identified the following criteria that need to be met to qualify for a National Facility:

- "The facility or network of facilities should have a unique position in South African science, engineering and technology;
- The core technologies, research methods, or data pools should live up to international standards;
- The goals for establishing the National Facility should be well aligned with the overall objectives of the South African system of innovation, especially with regard to diffusion of new knowledge;
- Critical mass of equipment, skills, and users, especially with regard to researchers from universities and technikons, but also from Science, Engineering and Technology Institutions (SETIs) and (where appropriate) from industry;
- The potential for networking and for attracting international collaborators to South Africa;
- Prospects and opportunities for human resource development; especially with regard to efforts being made to get disadvantaged researchers involved."

The System Wide Review also highlighted the right of access by the research community to National Facilities on a competitive basis and in accordance with merit and relevance of research needs, and that this principle should also apply to the National

Facility's own research staff, except in those areas where research is needed for maintaining or upgrading the facility.

2.2.2. The National R&D Strategy of 2002 and the Antarctic Research Strategy of 2007

The National R&D Strategy adopted the principle that, with limited resources, the country's best chances of success in attracting young people, particularly women and from previously disadvantaged groups to science is the "ability to focus on potential strengths while staying well connected internationally". Two broad category of focus were identified in the strategy, viz.:

- Scientific areas where there is an obvious geographic advantage. Antarctica and the Southern Oceans was identified as one, with space physics having emerged subsequently within the context of a South African Space Agency and in this context clustered together with astronomy and satellite technology.
- Scientific areas where there is an obvious knowledge advantage.

The DST has over the years since Cabinet's approval of the National R&D Strategy developed a number of sector specific strategies in accordance with the priorities identified in the National R&D Strategy. These include an "Antarctic Research Strategy for South Africa", which was developed after taking on the responsibility for the scientific research function of SANAP. The vision of this strategy is to create a demographically balanced Antarctic research programme that strives for internationally competitive research, promotes inter-disciplinarity and the creation of links with other African countries. The latter is of some political significance as South Africa is the only African voice in the Antarctic Treaty System.

This strategy document provides an interesting summary review of previous supported SANAP activities as well as some international programmes within which South African researchers have been or are collaborating. It identifies in the last few pages the following focus areas of research which have guided resource allocation within the SANAP programme in recent years:

- Antarctica: A window into Geospace
- Climate variability: Past, present and future
- Biodiversity responses to Earth System variability

- Engineering and sustainable presence in Antarctica
- The history, sociology, politics and culture of Antarctic research and exploration.

The document was identified by the 2007 Review to have some serious shortcomings in providing guidelines to revitalise SANAP and to exploit opportunities for research and for international collaboration within the context of the Antarctic Treaties System requirements.

2.2.3. DST's Ten Year Plan 2008 - 2018: Innovation Towards a Knowledge-based Economy

This ambitious yet visionary plan was developed to ensure that Government investments in scientific research not only strengthens the effectiveness and efficiency of our NSI, but also yields tangible socio-economic benefits for our country. It recognizes that efforts need to focus on areas with the best chances of yielding tangible benefits and in this regard identifies five "Grand Challenges", two of which are of direct relevance to a polar research entity. It correctly identifies that delivery within the context of these challenges is critically dependant on the availability of human capital to undertake the required research and the knowledge infrastructure vested in universities, Science Councils, state-owned enterprises and global projects.

The proposed polar research entity would be exceptionally well positioned to make major contributions to the following two challenges:

The Global Change Grand Challenge has a strong focus on climate change and recognizes that South Africa is well positioned to make major and globally leading contributions to understanding climate change, given its proximity to the Antarctic, the Southern Ocean and the importance of the Agulhas and Benguela Currents in this regard. It envisages among others the following as critical outcomes:

- An internationally recognised centre of excellence focused on the Southern Ocean and its contribution to global change processes, and
- Strengthened research and global monitoring capabilities on Marion Island, Antarctica and the Southern Ocean in partnership with other nations.

The Space Science Grand Challenge on the other hand recognizes the importance of space physics, particularly in our ability to monitor and understand Earth Systems, which by implication includes the near Earth space environment. Many of these studies are best conducted from ground based observations in the polar regions because of the geometry of the geomagnetic field and which involve international efforts to understand space weather and its impact on modern space technology.

2.2.4. The National Environmental Management: Biodiversity Act, Act 10 of 2004

This Act makes among others provision for:

- the management and conservation of biological diversity within the Republic, including its territorial waters and the exclusive economic zone, and of the components of such biological diversity;
- Giving effect to ratified international agreements relating to biodiversity which are binding on the Republic;
- Co-operative governance in biodiversity management and conservation; and
- A South African National Biodiversity Institute (SANBI) to assist in achieving the objectives of this Act.

According to the objectives of this Act SANBI has a very specific role which makes distinctions between what SANBI must do and what SANBI may do. From the perspective of biodiversity in the territorial areas of South Africa, both terrestrial and marine SANBI must e.g.:

- monitor and report regularly to the Minister on:
    - the status of the Republic's biodiversity;
    - the conservation status of all listed threatened or protected species and listed ecosystems; and
    - the status of all listed invasive species
- collect, generate, process, coordinate and disseminate information about biodiversity and the sustainable use of indigenous biological resources, and establish and maintain databases in this regard,

whereas it may e.g.:

- undertake and promote research on indigenous biodiversity and the sustainable use of indigenous biological resources.

- for the purpose of performing its duties obtain the services of any person or any organ of state.

In order to fulfil its mandated tasks the institute "may consult any appropriate organ of state or other institution which has expertise in that matter."

Since the inception of this Act, SANBI, previously known as the National Botanical Institute (NBI) with activities confined to terrestrial plant biodiversity, has adopted a "managed network" approach to its considerably broadened mandate, i.e. SANBI works with other institutions and organisations that have the skills and capacity to assist it in fulfilling its new mandate. However, to develop some in house expertise in marine biodiversity, SANBI has commenced with a marine programme with an initial focus on integrating biodiversity considerations with economic activities in the marine environment and works closely with industry in this regard. It is also in the process of identifying priorities to fulfill its mandated activities and will be in a sound position to interact meaningfully with a new research entity in terms of SANBI priorities once this process is completed. There is an agreement between MCM and SANBI whereby SANBI monitors the biodiversity within MPAs. SANBI staff joins MCM on voyages to undertake this task.

2,2.5. National Environmental Management: Protected Areas Act, Act 57 of 2003

This Act makes provision for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and the management thereof. The Prince Edward Islands are declared a Special Nature Reserves under the provisions of this Act, with very strict access criteria primarily for the purpose of monitoring and research. In accordance with Section 38(1) the Minister must assign the responsibility of managing Special Nature Reserves to a suitable person, organisation or organ of state, with Section 42 stipulating that the management authority may enter into an agreement with another organ of state, local authority, an individual or another party for the co-management of the area and also for the delegation of powers to the other party of the agreement. Section 38 (4) stipulates that marine and terrestrial protected areas with common boundaries must be managed as an integrated protected area by a single management authority.

The relevance of this is elaborated further in Chapter 4.4 below

2.2.6. South Africa's National Biodiversity Strategy and Action Plan of 2005

South Africa, as a signatory to the Convention on Biological Diversity of 1995 is obliged to develop a National Biodiversity Framework which calls for the development of national strategies that guide the integration of conservation and the sustainable use of biological diversity. In response to this obligation a National Biodiversity Strategy and Action Plan was developed by the DEAT. This comprehensive plan identifies a number of strategic objectives and outcomes, several of which rely on research and monitoring of the environment to inform conservation policies and procedures. It identifies SANBI by virtue of its statutory obligation relating to biodiversity, including marine ecosystems, as the lead agency in most of these, but recognises the need to tap into competencies and skills vested in a large number of other organisations such as agencies and universities to achieve its objectives. Included here is the development of a national biodiversity research strategy which should be used to direct the allocation of research funding.

2.2.7. South African Weather Service

According to the SAWS Act, the SAWS is obliged to undertake weather observations and establish and maintain observation networks for this purpose on land and the oceans surrounding South Africa. This it is required to do among others to provide information on weather in terms of international obligations such as the Safety of Life at Sea Convention of which South Africa is a signatory under the Department of Transport. In accordance with this obligation South Africa is responsible for the Meteorological Area 8, i.e. the areas surrounding South Africa and which extend from the Equator to Antarctica. The SAWS is also obliged to provide weather forecasts for the purpose of safeguarding operations of ships and planes to and from South Africa in terms of the convention of the World Meteorological Organisation (WMO) and the Chicago Convention of the International Civil Aviation Organisation.

The SAWS also actively participates in the activities of the Global Atmospheric Watch (GAW) and maintains one of 24 acknowledged GAW stations at Cape Point. The station is linked to a regional monitoring network that also extends to SANAE. Activities focus on atmospheric parameters in order to monitor long-term trends in characteristics of the atmosphere that can be associated with Climate Change.

Facilities at SANAE include a Teco instrument for surface ozone measurement, which forms part of a network of similar instruments in Droning Maud Land and a SOAZ instrument to measure atmospheric ozone concentrations. Data is relayed on a regular basis to the Cape Point GAW station and then further on to collaborators. The information is used by the WMO to report on the state of the Antarctic Hole and the general state of ozone concentrations.

Present arrangements between the SAWS and the DAI are elaborated upon in Chapter 3.1.5.

2.2.8. Council for Geoscience (CGS)

According to the Geoscience Act, Act No. 100 of 1993, it is among others the task of the Council for Geoscience (CGS) to compile and develop knowledge and to serve as national custodian of all geoscientific information relating to the terrestrial and marine environments of South African territory. This therefore includes all the marine environments covered by the Exclusive Economic Zone (EEZ) around South Africa and the Prince Edward Islands and in the future any additional areas to be added within the context of an extended continental shelf claim presently under negotiation within the United Nations. These territories cover an estimated area twice that of the land surface of South Africa.

The CGS has never been able to effectively operate in the marine off shore areas and activities have of necessity been restricted to the near shore and coastal environments. The CGS has therefore shown great interests in the establishment of a Polar and Southern Oceans research entity and the anticipated replacement of the SA Agulhas, as these facilities may enable the CGS to actively engage in a process aimed at fulfilling its mandate regarding the marine environment.

2.2.9. The Petroleum Agency of South Africa (PASA)

In terms of the Minerals and Petroleum Resources Development Act, Act No 28 of 2002, PASA, the designated agency referred to in section 70 of the Act, may in accordance with section 71 (g) " Advise and recommend to the Minister on the need to by itself, through contractors or through any other state enterprise carry out on behalf of the State reconnaissance operations in connection with petroleum". This PASA is empowered to

do in order to assess areas of oil resource potential on the continental shelf and thereby promote interest in oil exploration by the private sector (section 71 (a)).

In line with this objective PASA contemplates to conduct a large survey at an estimated cost of about R40 million every two years for the foreseeable future. The first of these is contemplated for 2010 and for this purpose access a vessel with the desired capabilities, ideally one that will be in the vicinity anyway in order to avoid mobilisation expenses.

The potential expanded territorial claim by South Africa under the extended continental shelf claim programme, includes a very large area around the PEIs. This claim as well as that surrounding the mainland will in all likelihood only be considered within the next 3 to 5 years, at which stage it is highly likely that more information will be required to substantiate the claim.

The claim area around the PEIs is not continental shelf, with the claim itself being based on other criteria. The likelihood of this area becoming a target for oil exploration is therefore very small. PASA will however retain an interest in the area from a basin development perspective, i.e. of more academic interest. In this regard they plan to collaborate with the French in studying this area further and with whom PASA has developed a sound working relation in the past.

The situation is, however, very different over the continental shelf to the south of the mainland, as it would seriously consider utilising a South African research vessel to conduct their planned bi-annual surveys referred to above. The advantage for PASA would be a considerable savings in cost, as it would not need to budget for the mobilisation costs to bring a foreign vessel to the shores of South Africa. Additional advantages would be that the funds would be spent locally, it could involve South African scientists and the entire PASA involvement would contribute to capacity building in local marine geoscience.

2.2.10 Conclusion

From the above it becomes very evident that there are four categories of users or potential users of a polar research entity.

Firstly, those who have, traditionally, been part of the SANAP programme and whose activities have by and large been in support of the principles of the Antarctic Treaty Systems. This work is virtually exclusively been undertaken by researchers at universities with the research topics approved on the basis of peer review and availability of logistic support.

The second is the work carried out by virtue of a statutory mandate and includes the activities of MCM of DEAT and the South African Weather Services. MCM obligation is to manage the marine living resources within South African territorial waters, and as part of the responsible Government department, adherence to the Antarctic Treaties Act. In meeting this obligation MCM is relying to large extent on the outcome of the research supported by the SANAP. The South African Weather Services relies on the facilities of the DAI by virtue of its statutory tasks to provide weather forecasts for the nation and for the safe passage of air and ships in terms of South Africa's commitment to the WMO.

The third category of users include those that have a statutory mandate of conducting investigations in the southern oceans such as SANBI, the Council for Geoscience and the Petroleum Agency of South Africa. Of these only PASA seems to have resources at its disposal to fund expensive surveys, with the budget of the other two of a nature that is hardly sufficient to cover existing activities, let alone any substantial ventures into the marine territories of the country.

The fourth category of users are those who plan to participate in the GCGC of the DST, an activity identified as one of the highest priority for South Africa to understand climate change and the impact this will have on South Africa (see Chapter 5.4).

3 CURRENT STATUS

3.1 Directorate Antarctica and Islands - Due diligence issues

3.1.1 Infrastructure and accommodation

Accommodation:

This is provided for by the Department of Public Works (DPW) which is responsible for the accommodation of Government Departments. The offices of the DAI are located in buildings which belong to the Waterfront Company. The cost of the lease amounts to R537 533 per month as from 1 April 2009 and includes 6733 sq m of floor space and 130 m of quay (East Peer 1) for berthing of the SA Agulhas. The DAI presently occupies the second floor of the building for offices and the ground floor as storage space and preparation areas for the various expeditions of the SA Agulhas. The first floor is essentially an open area occupied for some activities of MCM, but could readily be vacated to accommodate any additional staff and activities a polar research entity may require.

SA Agulhas:

This vessel is over 30 years old and very close to the end of its life which makes insurance on the vessel very expensive and consequently reluctance by insurers to provide the necessary cover. Plans are in an advanced stage to replace the SA Agulhas with a new research and supply vessel (see Chapter 4.1 below).

Research Bases:

The fixed infrastructure at the three research stations, SANAE, Marion and Gough belong to the DPW which is also responsible for their maintenance and upkeep. The amount the DPW budgets under SANAP support for this is as follows for the current financial year:

- Antarctica: R1.5 million for maintenance plus R562 000 for staff.
- Marion: R1.2 million for maintenance plus R211 000 for staff
- Gough: R1.2 million for maintenance plus R246 000 for staff

The total expense of R5 million (R3.9 for maintenance plus R1.02 million for staff) would become an expense of the new research entity if it does not have access to DPW support.

There is a joint technical committee between DEAT and DPW to decide on replacements, e.g. generators, fuel tanks and such like. For this DEAT has to budget and receives an allocation based on the budget submission from Treasury, but has to work through DPW for installation.

3.1.2 Financial

The financial section of the DAI comprises essentially a procurement section and one finance person responsible for payments. All payments are verified by the office of the Chief Financial Officer of DEAT in Pretoria. The audit function is also handled by DEAT staff in Pretoria. Total procurement and finance staff amounts to 9. They are responsible for the procurement of all the supplies for the bases (excluding maintenance which is done by DPW). Procurements in excess of R200 000.00 are handled through a tender committee of DEAT. DAI is obliged to report on Black Economic Empowerment spend in their procurement of supplies.

The baseline allocation to DAI, excluding the operational costs of the SA Agulhas is R42 million for the 2009/10 financial year. The total budget of the Directorate including the operational costs of the SA Agulhas but excluding maintenance of the bases is about R79 million for this financial year. Cost escalations of operating the SA Agulhas increased from R42 million in 2008/09 to R47 million in 2009/10. A shortfall of R5 million in the budget allocation by Treasury to DAI last year was recovered from surplus funds in DEAT. It is anticipated that the shortfall of R10 million in this financial year will be recovered from income generated by outsourcing the vessel during the year.

3.1.3 Human Resources

The D:A&I has an approved permanent staff complement of 38, which includes a few vacancies at present, and a total salary budget for permanent staff of about R15.5 million.

DEAT staff are public servants and belong to the Government Pension Fund, which is a defined benefit fund. Should a new research entity be established with a defined contribution pension fund as is widely the practice today, staff from DAI to be transferred to the new research entity will have the option of retaining membership of the Government Pension Fund.

All HR and industrial relation issues are handled corporately by the DEAT human resource section in Pretoria except for two personnel officers on the DAI staff engaged solely with the contract appointments for over-wintering staff. This involves up to 34 contracts annually given overlaps of up to 6 months for relief/replacement teams. Of these 10 are at SANAE, 16 at Marion and between 6 and 8 at Gough. Generally these spend between 14 to 15 months on the bases. Of these DAI pays for support staff, which includes a medical doctor, mechanics, etc. whilst NRF and SAWS reimburses DAI for any scientific and weather staff respectively that over-winter at the bases.

The primary consideration for appointment of these as public servants is to provide assistance in the case of emergencies. As public servants the state takes responsibility and covers any emergency evacuation costs. For non-public servants the state will provide assistance but costs will need to be recovered. DEAT has in past used the navy for emergency evacuations and also applied to Treasury for unexpected expenditure related to such incidents and for which DAI did not have the budget.

In addition to the above, the South African Navy provides up to ten drivers and operators for the heavy machinery at SANAE. They normally spend two weeks prior to departure for Antarctica for training at Barlows and DAI and subsequently 72 days during the relief voyage on ship and at SANAE. Salaries for the close to three month period are paid for by the SA Navy, with DAI covering overtime and a daily allowance only.

Five of the 38 staff members are still based in Pretoria. This includes the two personnel officers responsible for contract staff. Also in Pretoria is a Deputy Director who is in charge of the two personnel officers, International liaison and Environmental Impact Assessment issues. The latter, inasmuch as it relates to Antarctica and Islands has to be referred for approval to the appropriate section within DEAT. All decisions and resolutions taken at the Antarctic Treaty meetings are binding on its members. These

have to be conveyed to the Minister who has to endorse these to become part of our commitments. It is for these reasons that it is convenient to have someone in the Pretoria office.

3.1.4 Contractual obligations

The following contracts are in place at present as part of the operations of SANAP. The implications of transferring these to a new research entity will need to be considered by legal counsel.

- A 20 year lease contract between the DPW and the Waterfront Company for accommodation of the DAI (See above).

- An agreement with the United Kingdom concerning access to Gough Island, a World Heritage Site which is managed jointly by the UK and South Africa by virtue of a South African weather station on the island. The agreement with the UK stipulates that a South African ship travels via Tristan da Cunha to Gough Island and back annually, makes a specified amount of cargo space and passenger berths available for Tristan and takes UK conservation officers to the base on Tristan once per year to Gough to meet their oversight obligations.

- A contract with Smith Amandla Marine regarding the operation (manning and management) of the SA Agulhas. This contract expires a year from the end of April 2009 and DEAT must notify Smith Amandla of its intention to terminate the contract. In accordance with procurement policy DEAT must call for tenders publicly. It is important to note that DEAT has one contract for the manning and management of its entire fleet, of which the SA Agulhas is part. The costs of servicing the SA Agulhas is budgeted for and constitutes part of the Medium Term Expenditure Framework (MTEF) allocation to DEAT, whereas the servicing costs of the other vessels of MCM is recovered largely but not totally from the Marine Living Resources Fund. Such an arrangement of negotiating a management contract for all the vessels should continue after establishment of a research entity to effect savings based on economies of scale.

Smith Amandla insures the vessel to provide the service. This cost is factored into the contract. The contract makes provision for the vessel to be leased to third parties and that a certain percentage of the profits will accrue to the DEAT.

- Contract with Titan Helicopters, a BEE company, regarding the availability of helicopters on the SA Agulhas. This is a 4 year contract presently near the end of year 2. The total contract price is R49 million for the four years and is paid from the DAI budget, i.e. ~R12 million a year but with an escalation component built in.
  The contract makes provision for the following:
  - For annual trip to SANAE: availability of two helicopters over 90 days and 120 hours of flying.
  - For Marion, 40 hours of flying time; of which 35 hours are normally used for logistics
  - For Gough, 30 hours of flying time

  As the SA Agulhas now uses the ice shelf at Neumayer, the large, expensive helicopter is no longer required and smaller helicopters (Jet Bell Rangers) can be used at about 2/3 of the cost in future, allowing more flying time for science under the prevailing contract price. Considerably more flying could be done during the stay of the ship at the respective bases if a bigger budget were available.

  The range of the helicopters is such that science operations can take place up to 300 km from the base without refuelling. If depots are placed at 300 km the range of scientific operations could extend up to 600 km from the base.

- The contract with Barlows entails a preventative management plan of the vehicles at SANAE. One technician goes down for the summer and services all the vehicles. In addition every vehicle only stays in Antarctica for three seasons at a stretch, is then returned and completely overhauled and redeployed for a further three seasons. This is part of the contract. Total contract price is ~R1.2 million and to some extent dependent on the number of vehicles to be refurbished and the extent of the repairs.

3.1.5 Movable Capital Assets at SANAE IV

This includes 13 Caterpillars, 20 skidoos and 45 sledges of various types and makes, diesel tanks, cranes, cabooses, pumps and generators of a total replacement value of close to R50 million. Of these the replacement value of the caterpillars alone amounts to R35 million. The DAI replaces one caterpillar and two skidoos on average every two years and requests an additional budget allocation of R5 million from Treasury for this purpose.

3.1.6 Obligations towards the South African Weather Service

Apart from servicing the various weather stations located at the three bases, the SA Agulhas spends 25 days annually to deploy weather buoys at sea; 9 days south of Gough Island and 16 days northward from SANAE in the Antarctic. These weather buoys are supplied by a consortium of countries as they supply data to several counties on their floating voyage around the Southern Ocean. South Africa therefore has an obligation to deploy these.

There is no contract with the SAWS and they do not pay for the logistics. This is based on the principle that when SANAP moved from the Department of Transport to DEAT, a budgetary component to cover the logistics was transferred as well. Since then, all logistical support provided to SAWS was on the basis of negotiations but with no further expense to the SAWS.

It is essential that a proper service level agreement be entered into between the SAWS and the new research entity that spells out exactly what logistic service is provided on the basis of present understanding and the cost implications for any additional logistical support SAWS may require from time to time in the future.

3.1.7 Information and Communication Technologies

IT support is provided at corporate level. The only exception here is the broadband that has recently been installed and allows for the submission of real time data from all the three stations. Cost of installation of such a facility was shared on a 1/3 : 2/3 basis between DAI and DST, with the former taking responsibility for the operations (there is a post for this but DAI has not managed draw a suitably qualified person), whereas DEAT and DST share the cost for the transfer of the data (bandwidth) with DEAT paying for 1/3

and DST for 2/3 of the bandwidth costs. DEAT component costs about US$ 9 500.00 per month with an escalation of 7% per annum, which together with the DST portion adds up to a cost of about R3 million per year. DAI has a licence from ICASA and bypasses the Telkom system, and it is now possible to dial any one of the bases directly for the cost of a local call.

3.2 DST – NRF management of research and science outreach

3.2.1 Grant Management of SANAP

Applications for grants within the SANAP are called for annually and applicants generally request funding for projects of three to five year duration. All the applications are sent out for national and international peer review by the NRF programme management and subsequently assessed by a panel of experts for quality and feasibility. This panel, chaired by the responsible NRF programme manager, consists of experts chosen on the focus of disciplines of the applications, a representative of DST, the Director of Antarctica and Islands of DEAT, and in recent years also an international expert form one of the Antarctic research institutions. Although this panel focuses primarily on the scientific quality of the application, the representative of the DEAT also makes input from the perspective of the logistical implications, so that those requests that require unfeasible levels of logistic support are also turned down at this stage.

All Applications dealing with research on the Prince Edward Islands are referred to the Prince Edward Island Management Committee which scrutinised these on the basis of impact on the environment and the nature of the permit required, given the Special Nature Reserve status of the PEIs, as well as in some more detail the logistic requirements. Sound requests are then recommended for approval by the DEAT (on behalf of the Minister), a procedural requirement in accordance with Section 45 (3) of the National Environmental Management, Protected Areas Act.

All requests for marine research and research at SANAE are subject to final approval by the Director DAI, pending the availability of the required logistic support.

At present the activities of SANAP are largely confined by the availability of the logistics (see above), with the bulk of the logistic funding used to service the bases on Marion, Gough and Antarctica, as well as the deployment of weather buoys for the South African Weather Services. Scientific activities funded through SANAP largely have to fall into this logistic pattern.

It is important to note though that not all SANAP grant holders make use of the SANAP logistics. Some of grant holders collaborate with researchers in New Zealand to conduct their research in Antarctica from the New Zealand base with others collaborating with researchers from the United States and of the Alfred Wegener Institute (AWI) particularly for marine research. The reason for this is in the first instance that SANAE has little to offer the researcher in biosciences because of the location of the base, and in the second instance the unavailability of logistic support (ship time) to conduct surveys in the areas of interest to the researcher.

3.2.2 Research budget

The DST has taken over full funding of the science activities form the financial year 2005/06 onward and appointed the NRF as its agent to manage these funds on its behalf for a small management fee. These funds are allocated to a large extent to researchers on a competitive, peer reviewed basis in accordance with the focus areas identified in the Antarctic Research Strategy of 2007 (see above). Some of the funds are reserved for special “Development Grants” and a special grant category to boost the Social Science, Law and Humanities dimension of Antarctic research.

The science budget has shown a significant growth from R 5 million in 2005/06 to R16 million in the current financial year. The budget requirements are reviewed annually by the NRF based on longer term commitments and approved new applications, and submitted annually, after the peer review process to the DST, normally in September for approval. Successful grant holders are usually informed of the outcome of their applications by December.

3.2.3 Current grant-holder and student profile

The grant holder profile is still very much dominated by white males (27 in total) with only 5 white females and 3 black males currently being supported.

The number of students participating in SANAP research has more than doubled over the past four years, with 61 the total number of reported for 2008. An analysis of race and gender breakdown of the reported student numbers demonstrates that as in 2007, the majority of 2008 grantholder-linked bursaries were awarded to Black male MSc students (n=11), representing 18% of the total student complement. Black students represent just under 50% of the total student numbers across the different study levels (30 of 61) and female students represent 33% of the student numbers (20 of 61)

Table 1. Number of supported students 2008

Study Level	**BM**	**BF**	**WM**	**WF**	**TOTAL**
Assistantship	0	2	0	0	**2**
Honours	4	1	3	2	**10**
Masters	11	3	9	5	**28**
Doctorate	8	0	4	3	**15**
Post Doc	0	1	2	3	**6**
TOTAL	**23**	**7**	**18**	**13**	**61**

3.2.4. Science outreach and awareness

Antarctic and Southern Oceans research is one of the five science missions based on South Africa's geographical advantage. According to the National R&D Strategy, identification of these areas was among others based on their potential to attract young people into science. To what extent this has met with general success is questionable, as initiatives in popularising Southern Oceans and Antarctic research has to date been managed totally divorced from the SANAP. Over the past few years, the DST has made available dedicated awareness funding to the South African Agency for Scient and Technology Advancement (SAASTA) of the NRF for four "platform months" annually, with Antarctica being one of these four, usually in June every year. The total amount allocated per platform amounted to R600 000.00 per year, with funding used by SAASTA for activities leading up to June and main activities taking place during this month. The focus has been largely on students and the general public, with little efforts on learners. In recent years the SANAP grants management team has made some inputs through its direct links with the scientists it supports. This funding has come to an end in 2008, with no indications of DST's approach in the future, suffice it to say that the

DST is in a process of reconceptualising its approach to science outreach activities and a desire that scientists themselves become more involved in these activities.

Science outreach linked to the International Polar Year (IPY) was, for unknown reasons, handled very differently by the DST, as this event was, both in terms of special grant funding and science awareness, managed separately by a committee with no NRF, i.e. neither SANAP grants management nor SAASTA, involvement.

Separate from these efforts have been some very successful high quality features on Antarctica, marine research and the IPY in Quest, the popular science journal of the South African Academy of Science. This journal targets primarily learners in secondary schools but is also of considerable interest to students and the general public alike.

3.3 Current constraints of the programme

3.3.1 Management of SANAP

The biggest problem at present is that the programme is being driven by logistics and not by science. Logistics must support the science and scientists are at present hamstrung by their inability to influence logistical issues. Scientists are not only frustrated by the lack of transparency and communication regarding logistics with enquiries frequently resulting in no or unsatisfactory feedback, but also by rigidly fixed routines during the season with no flexibility to accommodate specialised needs to obtain optimal information during short field seasons. This can to some extent be ascribed to the substantial growth in the science budget which has not been matched by the growth of the logistics budget. By implication DAI is expected to do more with less; a possible reason for the frustration experienced by scientists.

The situation is exacerbated by the fact that the Steering Committee of the SANAP had no decision making authority, as the DAI responsible for logistics is accountable to the Ministry of Environmental Affair and Tourism and not to the Steering Committee.

The implications of this are, apart from the quality and impact of the science, that:

- The scientists are often left to sort out logistical issues regarding preparation for fieldwork and having to find their own field operators as part of the science activities,

rather than part of the logistical support provided by the base which seems standard practice at bases elsewhere.

- NRF is presently operating beyond its mandate to make grants, in that scientists often approach NRF as a contact point to resolve logistic related issues. This coordinating task NRF does to the best of its ability although it is not part of its mandate.

There is a clear cut case for better integration and seamless interaction between science and logistics which can only be achieved if both are managed within one organisation, a shortcoming also highlighted in the 2007 Review report.

3.3.2 Science

One of the biggest draw-backs of the present situation is the non-availability of ships to study seasonal variations. This is essential to undertake internationally competitive research and to fully understand conditions in seasons other than the present logistic driven trips.

At present, research by geoscientists on the continent is not attractive as too much time is spent on the ship. There would be much more interest if scientists and students could fly in, spend the season in the field and fly out at the end of the season. In addition some field based research projects have become too expensive in terms of logistics and access given the limitations of both the science and in the logistics budgets. This kind of research also requires the availability of skilled field operators as seems to be standard at most Antarctic bases. These are people with lot of experience of Antarctic conditions, and apart from providing professional training to scientists also accompany them on deep field excursions. Without these kind of skilled support staff deep field excursions are impossible; a prerequisite not only for fieldwork by geoscientists, but also for ornithologists and entomologists.

Presently oceanographers are totally dependent on MCM for basic equipment such as for CTD Rosettes (for Conductivity, Temperature and Depth recording) and ADCP (Acoustic Doppler Current Profiler), both in terms of availability and in terms of technical skills, such as pre- and post-cruise calibration of such equipment. Support for instrumentation and technical staff from MCM cannot be guaranteed as their availability

is prioritised for MCM work and not for research work on the SA Agulhas, and hence scientists can never be certain that equipment and technical support are actually going to be available when planning a scientific cruise. In the past this has resulted on the one hand in scientists without the necessary experience to operate winches and other machinery on board the vessel, and on the other hand in wasted planning and abortion of planned activities.

3.3.3 Occupational Health and Safety

There is an urgent need to review Occupational Health and Safety procedures at the bases. Several expeditions in the recent past to Antarctica have experienced a lack of experienced expedition members who can provide behavioural and safety training under the harsh conditions in the field. Cases were reported of inappropriate behaviour of staff in position of authority including lack of management skills and people skills, as well as of alcohol abuse and the flaunting of agreed upon rules without due disciplinary action.

The latest (2008/09) summer expedition to Antarctica seems to have gone much better than in previous years. The team worked well, the team leadership was experienced and understood the environment, everybody knew whether they were on or off, and lots more attention was paid to safety issues.

On Marion safety is also compromised by

- lack of training in basic navigation techniques and search and rescue procedures, and
- outdated radio communication facilities. Research teams, often students, should be able to report regularly back to the base station for safety reasons.

3.3.4 Coordination and contextualisation

The extent to which South African Southern Oceans and Antarctic research is coordinated with and contextualised within larger global research efforts is, apart from the space physics efforts, limited. The focus on Marion has strongly influenced how the programme has developed with prevailing logistic limitations. Programmes of other nations are structured in a way that allows for movement of scientists between bases and on research vessels, resulting in cross linkages and wider contextualisation of the research. Several South African researchers have made use of such opportunities with

hardly any opportunity to respond in kind for foreign researchers to participate in South African expeditions.

3.3.5 The profile within the Antarctic Treaty System

There is widespread concern that South Africa's profile at Antarctic Treaty System meetings, including SCAR is not what it should be. Many of the participating countries use the opportunities of these meeting to showcase their respective activities in the Antarctic which hardly ever happens in the case of South Africa. There is also concern that Government officials attending these meetings stay at the best hotels, often where the meetings are being held, whereas the scientists mostly have to make do with the cheapest accommodation available in order to make ends meet with limited grant resources.

3.3.6 Antarctic Data Management

Although the free access to data and information on Antarctic research is one of the basic tenets of the Antarctic Treaty, there is as yet no obligation for any SANAP funded researcher to lodge data in a central repository. The DST has recently attempted to rectify this by commissioning an investigation and subsequently soliciting a proposal from the South African Environmental Observation Network (SAEON) to establish a National Antarctic Data Management Centre (NADC), but nothing has come of this as yet.

3.3.7. Conclusion

The above highlights some of the shortcomings of the prevailing SANAP which all need to be addressed in addition to the challenges and opportunities listed under Chapter 5 on Science below, for SANAP to become a true flagship science programme of the country as envisaged in the National R&D Strategy. In addition, considerably more attention needs to be given to science outreach and awareness activities aimed at policy makers, learners and the general public that justifies South Africa's investment in a programme of this nature.

4 STRATEGIC INITIATIVES

4.1 Replacement of the SA Agulhas

Although the new vessel is being equipped as a multi-purpose research vessel it can not do everything and it will require collaborations with other nations to access research facilities that will not be an integral part of the design of the new vessel. The estimated cost of the new vessel is R1.1 billion, which includes some integrated research instrumentation and equipment, such as e.g. a facility for seismic surveys and soft sediment coring. The acquisition of a new research vessel has been approved and factored into the MTEF with 2012 as the anticipated delivery date.

Although the new vessel will cost less to operate because of technological advancements, i.e. fewer ship staff and lower fuel costs than the SA Agulhas, annual running expenses are estimated to be 30 % more than the present annual operational cost of the SA Agulhas due to the need for more highly qualified staff, and also the need to have the ship at sea for at least 300 days per year to meet the demand of scientists, compared to the present 185 days. Present operating expenses budgeted for of R47 million cover the costs of 185 days at sea and the remainder of the time moored in the harbour. It is anticipated that these costs will increase to more than R50 million under a new contract which will have to be negotiated before the end of April 2010.

A 30% increase in the manning and management of the ship at present prices negotiated with Smith Amandla will require an additional ~R14 million annually to bring the total operating costs to ~R61 million.

Consideration needs to be given now to assign a scientist(s) capable of signing off on the research equipment that will constitute part of the vessel. Someone will need to take responsibility that the equipment with an estimated value of R30 million is installed properly and fully operational on delivery, and arrangements are in place for technical support staff to be trained in operating such equipment. This will need to happen before the vessel is commissioned and needs to be budgeted for well in advance.

4.2 Cape Town Antarctic and Southern Oceans Gateway

Discussions regarding the development of an Antarctic Gateway in Cape Town have been ongoing for some time, with little advances until 2006 when the DST contracted KPMG Services (Pty) LTD to conduct a pre-feasibility study into an Antarctic Gateway facility in Cape Town.[3] This study concluded that the formalisation of an Antarctic Gateway facility in Cape Town is long overdue and that this can lead to significant benefits in terms of economics, education, awareness and the profile of Antarctic research. Cape Town's strengths as an Antarctic Gateway lies therein that

- it is conveniently situated in relation to all Antarctic activities in Droning Maud Land,
- it is a city that has significant industrial capacity, dry docks and ship repair industry,
- the ability to supply and equip and provide logistic support to Antarctic expeditions,
- impartiality and neutrality relating to territorial claims, and
- a world class stopover for Antarctic personnel in terms of accommodation, leisure and recreation.

Important though is also its location relating to marine research in the oceans south of Africa as not all research expeditions using Cape Town have Antarctica as destination. The report recommends that a special purpose vehicle be established essentially to facilitate the development of the gateway concept by means of an integrated strategy that will among others create a supply and support network for the provision of goods and service expertise pertinent to all requirements relating to operations in Antarctica and the Southern Oceans. According to the KPMG report the Western Cape Department of Economic Development and Tourism has indicated its willingness to assist in establishing a suitable Special Purpose Vehicle, also referred to as the Cape-Antarctic Gateway Company in the report.

The proposed model differs to some extent to that of Tasmania, where "Antarctic Tasmania" is a business unit within the Department of Economic Development and Tourism of the Tasmania State Government. Antarctic Tasmania's mission is "to promote Tasmania as a centre for Antarctic, sub-Antarctic and temperate marine activity

[3] Department of Science and Technology, 2007. Final Report on a Pre-feasibility Study into an Antarctic Gateway facility in Cape Town. KPMG Services (Pty) Ltd. 103 p.

and ensure that national and international communities recognize and use Tasmania as a gateway to the Antarctic and Southern Ocean".

The Tasmania Polar Network on the other hand is a virtual organization of essentially businesses in Tasmania that can provide a range of services to vessels and research teams on their way to or from Antarctica or the Southern Ocean, such as resupplying polar vessels, a wide range of specialized equipment and services, expert advice and industries that provide a variety of manufacturing, engineering, logistics, shipping support services.

The "Hobart Antarctic Gateway" on the other hand is a web portal that provides users with online access to specialist support services, facilities, research organisations, information and resources for Antarctic operators and visitors.

The best known Antarctic Gateways, viz. those of Hobart, Tasmania and Christchurch in New Zealand have well developed science education and awareness facilities. In Cape Town the Two Oceans Aquarium was, according to the KPMG report, planning the establishment of a comprehensive Antarctic exhibit. It is not known whether this has come off the ground, but the aquarium would be an ideal venue for such an exhibit and certainly a preferred option to developing a separate exhibit as also proposed in the report.

Of considerable interest is the information supplied by representatives of the CSIR that Norwegian scientists attached to the Bjerkenes Centre for Climate Research and the Nansen Environmental and Remote Sensing Centre, both located in Bergen Norway have apparently indicated an interest in locating some of their science activities in the Cape because of proximity to some of their areas of research interest.

It is important to note though that in the absence of an "official Gateway" initiative the Antarctic Logistics Centre International (ALCI) was formed due to an increase in the activities of Antarctic operators and agencies utilizing Cape Town as their gateway to Antarctica. This Centre has been operational since September 2001. The Antarctic Logistics Centre in Cape Town is a sister company of INTAARI St. Petersburg, founded in 1989, a well established Arctic and Antarctic Logistics Operator in Russia and Europe. ALCI in Cape Town has access to specialised vessels and aircraft required in the

Antarctic and claims to have the necessary infrastructure and facilities to provide, maintain and service specialised Antarctic vehicles and equipment in Cape Town.

Transport to and from the Antarctic is also facilitated through DROMLAN, a commercial airlink between Cape Town and some of the bases in Dronning Maud Land, and DROMSHIP, a supply vessel that services bases of several nations in this area.

What would make the city even more attractive as a Gateway if an Antarctic and Southern Oceans research entity were located there as this would be an additional incentive for researchers to utilise Cape Town as a gateway to their respective research destinations. This particularly so in view of an expressed interest by certain Nordic research institutes to locate some of their science activities in Cape Town. In view of this, the new research entity could certainly look into the specialised and longer term support facilities, particularly if the entity is successful in negotiating longer term collaborative ventures with polar and marine research institutions of the North and within the context of IBSA collaboration in the South (see below).

4.3 Replacement of the base on Gough Island

The base on Gough Island is in a very poor state of repair and the South African Weather Bureau is motivating its replacement to Treasury within the next MTEF. The estimated costs of replacing the weather station is about R86 million and the timeframe for replacement is between 2011 and 2012. There seem to be little advantages of moving the weather station to Tristan as proposed by the 2007 SANAP review. Costs will essentially be the same, given that the old base would have to be dismantled completely and the site restored to its original state in accordance with the agreement with the UK. It would seem, from past experience, as if there is little interest among the Tristan population to be employed by the SAWS.

The general opinion seems that the UK would in all likelihood not wish to close the base on Gough as this would make it difficult to manage the island as a World Heritage Site. Presently the UK manages Gough Island within the context of an agreement with South Africa by which its conservation officers join the annual trip to the island by the SA Agulhas. A cost benefit analysis would need to factor in the advantage for the UK of

having a base on Gough from the perspective of conservation management of the protected area as a World Heritage Site.

The planning of a new base on Gough will take quite a while as an Environmental Impact Assessment would involve several authorities in the UK. It is unlikely that permission will be given for a "new footprint" on the island and that the buildings of a new base will have to be on the present site. The construction of a new base would place a considerable demand on the SA Agulhas or the new vessel if this base is to be built after 2012, and would require the use of helicopters as all building material would have to be airlifted onto the island, whereas any material from the demolishing of the old buildings would have to be airlifted off the island. These costs have apparently been factored into the R86 million construction estimates.

The SAWS uses the base among others to obtain upper atmosphere data and for this purpose launches a balloon on a daily basis, which is essential for weather forecasts in South Africa. Consumables for upper air work on Gough are funded by the UK meteorological office at about R 2 million per year, and according to the SAWS, the UK meteorological office would in all likelihood not wish to see the weather station on Gough Island close.

The base on Gough Island is primarily a weather station operated by the SAWS with logistic support provided by the DAI. As research activities play a comparatively minor role within the SANAP context, the replacement of the base is therefore in the first instance in the direct interest of the SAWS, which will need to take the lead in driving a process to renew the base.

4.4 Prince Edward Islands revised Management Plan and the Prince Edward Islands Marine Protected Area

4.4.1 Prince Edward Islands Marine Protected Area

The rampant and illegal fishing activities mainly for Patagonian Toothfish in the Exclusive Economic Zone (EEZ) around PEIs, prompted the Minister of Environmental Affairs and Tourism to announce in 2004 the intention of developing one of the largest MPAs around these islands. He was obliged to take this course of action in terms of both

the CCAMLR and the 1982 United Nations Law of the Sea Convention, which places the responsibility of not only managing marine resources in the EEZ but also protecting and preserving the marine resources on coastal states.

The process of establishing a MPA around the PEIs is in an advanced stage with a significant amount of preparatory wok having been reported in Nel and Omardien[4] (2008). This report concludes among others that the declaration of "a MPA around the PEIs will greatly advance South Africa's progress towards meeting its international legal obligations and policy commitments", including the sound conservation and management of the marine resources under its jurisdiction. The proposed MPA consists of several different conservation zones. The innermost zone is the proposed extension of the Special Nature Reserve status of the PEIs to include the 12 nautical mile territorial sea. Access to this area would be prohibited except for scientific purposes and monitoring. Four restricted zones designed to protect representative proportions of all habitat types in the PEIs EEZ where resources are to be fully protected and disturbances limited to scientific monitoring. These four areas are linked to each other by broad corridors of conservation which will be managed as low-impact exploitation zones.

The design of the PEIs MPA and the identification of four restricted zones representing different marine habitats that will be protected from disturbances in future, represent ideal opportunities for targeted research and long term observation supported by the facilities at the disposal of a future research entity. Traditionally DEAT has relied to a large extent on the SANAP supported research and monitoring activities at PEIs to meet its obligations in terms of the CCAMLR. This will need to continue with the potential of expanding activities to take in these restricted zones in ways that will also enable SANBI in fulfilling its mandate.

4.4.2 Prince Edward Islands Environmental Management Plan

The PEIs were declared a Special Nature Reserve in 1995 in terms of the now repealed Environmental Conservation Act, Act 73 of 1989. Its status as a Special Nature Reserve is upheld under the provisions of the NEMPA. The Environmental Management Plan

[4] Nel, D and Omardien (Eds), 2008 Towards the Development of a Marine Protected Area at the Prince Edward Islands. WWF South Africa Report Series – 2008/Marine/001, 180p.

(EMP) for the Special Reserve compiled in 1996 is now under revision.[5] Such a plan is required under Section 11(2) of the National Environmental Management Act, Act 107 of 1998, which sets out the legal, regulatory and practical framework of protecting the Islands. The draft EMP outlines in great detail the research requirements to manage the PEIs as a Special Nature Reserve and identifies a range of research and monitoring activities presently vested in the SANAP and the DAI.

4.4.3 World Heritage Status for the Prince Edward Islands

Continued research and monitoring activities for a prolonged period ever since the PEIs were declared sovereign territory of South Africa has yielded a wealth of findings which highlighted the unique terrestrial and marine biodiversity of these islands. It is as a result of these insights that the PEIs were declared a Special Nature Reserve by the Minister of Environmental Affairs and Tourism in 1995. To emphasise the global uniqueness and importance of the biodiversity a process is underway to submit an application for "World Heritage Site" status of the PEIs. Should this application succeed, then the South African World Heritage Act, Act 49 of 1999, prescribes the appointment of a management authority that will oversee the management of the World Heritage Site and develop an integrated management plan for the site. This function can readily be assumed by the PEIs Management Committee or a successor committee to manage both the PEIs and the MPA in an integrated fashion as prescribed in the NEMPA.

4.4.4 Conclusion

It is most likely that after establishment of a Southern Ocean and Antarctic research entity, the only regular visits to the PEIs will be the relief trips primarily for researchers and maintenance staff undertaken by the SA Agulhas and its replacement vessel. It is therefore conceivable that the research entity could enter into an agreement with the PEI Management Authority responsible for the integrated management of both the terrestrial and marine components of the Special Nature Reserve, to co-manage the Special Nature Reserve in accordance with Section 42 of the NEMPA and in compliance with the a possible future World Heritage Status of the PEIs.

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[5] Department of Environmental Affairs and Tourism, 2006. Prince Edward Island Environmental Management Plan, Version 1.0

4.5 India – Brazil – South Africa (IBSA) Ocean Alliance

A first workshop of an IBSA Ocean Alliance in March 2008 brought together leading scientific representatives from the three IBSA countries to formulate a strategic initiative for cooperative ocean research between India, Brazil and South Africa. The primary drivers identified for this research collaboration are:

- *Regional Consequences of Climate Change*; establishing the understanding of key ocean processes required for progress.
- *Regional Ocean Observation Systems*; providing the necessary ocean observations and tools for analysis.
- *Dissemination Networks*; getting the knowledge to the user community and realizing the benefits.

Although the focus is on the oceans separating the partners to this agreement, the Alliance recognises the importance of the Southern Oceans in achieving the objectives of the Alliance. There also seem to have been discussions within this group of extending this research collaboration to Antarctica as all three participating nations operate research stations on that continent. It is for these reasons that it will be important of a new research entity to become part of these discussions as it may well become an important partner in contributing and facilitating some of the planned activities.

5 SCIENCE

5.1 Introduction

The primary reasons for a brief assessment of the science component of the present SANAP in the conceptualisation of a new research entity were the comments by the 2007 review panel that:

- Individual scientists or groups are pursuing their own fields of interest and there appears to have been little interest so far in bringing much of this research together in an Earth System Science approach as has been done successfully in other countries;

- There is a major disparity between biology and all other sciences and that this needs to be addressed in order to ensure a healthy distribution of Antarctic research disciplines; and
- A careful review of which disciplines are needed for a modern systems approach to Antarctica and Southern Ocean Science is required.

In this regard the panel highlighted some disciplines whose presence in SANAP had declined or totally disappeared, such as oceanography because of lack of ship time, marine geosciences and marine chemistry.

The following subchapters provide a brief overview of the issues raised in discussions with scientists from the main disciplines involved in SANAP research, inasmuch as these pertain to research opportunities within the context of a new research entity, as well as expectations and challenges in this regard. These provided some important pointers as to the desired nature of a research entity.

5.2 Biosciences

5.2.1 General Comments

The sphere of interest of South Africa in the biosciences has some limitations in that the focus for many years on Marion Island has strongly influenced how the programme has developed. Strictly speaking, Marion is sub-Antarctic and, in comparison, very little work has been done on continental Antarctica as SANAE is not a good target to study biodiversity and unlikely to generate much interest in future. To get around this, wider collaboration with groups that have access to other, more interesting exposed areas would be required, as scientists working on Marion can readily expand their work and apply their considerable expertise to Antarctica and other sub-Antarctic islands. This is already happening to a limited extent, and some South African researchers are collaboration among others with researchers from New Zealand and the British Antarctic Survey (BAS).

The strength of the South African contributions in the biosciences is the long period of research, observations and monitoring, particularly on Marion Island. The resulting research publications in the international literature have been widely acclaimed as

documenting an unparalleled knowledge of the biodiversity of the Prince Edward Islands and its near shore environments. This was made possible through an integrated approach to ecosystem functioning from which it also became clear that climate was changing at the islands. Clearly this work has to continue unabated and even expanded as the Prince Edward Islands Environmental Management Plan and proclamation of the proposed MPA surrounding the Prince Edward Islands demands considerably deeper understanding of the biodiversity and the various ecosystems for conservation purposes. In order to do this, ways should be found to ensure longer term funding support, as present SANAP research grants are of a short term nature.

To overcome this shortcoming, several researchers as well as the 2007 Review Panel, consider that SAEON should be tasked with the long term monitoring by way of the PEIs becoming a node or a sub-node of an existing SAEON node in order firstly to curate, archive and ensure the availability of important data sets, but also to ensure that South Africa continues to meet its obligations as members of CCAMLR and ACAP.

Research on Gough Island is undertaken by South African Scientists in collaboration with colleagues from the UK and funded by the UK. The island is a protected area with World Heritage Status with future activities largely conservation research driven, among others to mitigate the impact of introduced species on the island. Future research will largely depend on the continuation of the weather station on the island, which needs to be replaced urgently. This will need to be decided by the SAWS in conjunction with the appropriate authorities in the UK. Should it be decided that a new base is to be constructed on Gough Island, then a more formalised agreement should be entered into with the most appropriate authority in the UK regarding research on both Tristan da Cunha and Gough Island.

Interestingly, these islands do not resort under the British Antarctic Survey (BAS) as they are located too far north.

5.2.2 Challenges and expectations

Scientists are frustrated by the delays in completing the new base on Marion which was supposed to be commissioned in 2008. This impacts negatively on research as scientists have to make do with the old base which is falling apart and is too small to

accommodate all the scientists that are being funded. Much work still needs to be done at the new base, including basic fittings in the laboratories, appropriate floors etc. a detailed report in this regard was submitted to the DEAT and NRF in April 2008, after a visit to Marion by senior scientists. It would seem as if this is now receiving the urgent attention of both DPW and the DEAT and that an agreement has been reached by both parties to send a DPW team to Marion in November 2009 to complete all tasks for handover of the new base during April/May 2010.

The new base on Marion has been designed as a state-of-the-art facility that will require high quality technical support staff for the maintenance of the infrastructure such as electrical systems as well as water supply and reticulation systems. Laboratories have been designed to be of a multi-user nature, rather than of the old discipline specific ones, which will require space to be assigned for usage by researchers. The new base will need to be operated like a “science hotel” in terms of checking in, assigning laboratory space, etc. on the basis of a schedule planned well in advance. This implies the need for a science manager on site, particularly during “season” when demands on facilities are highest.

Some uncertainties exist as to the financing of equipping the laboratories of the new base. In earlier discussions representatives of DST indicated that the DST would take on the responsibility of financing such laboratory equipment, but it would seem as if this has not been budgeted for by the DST. This will require urgent attention to ensure that the laboratories are appropriately equipped when the construction of the base has been completed. The estimated costs of basic laboratory equipment for routine on site laboratory investigations is about R2 million.

As part of the construction of a new base, DEAT apparently agreed to place a greenhouse facility at Marion. This disappeared from the infrastructure list and it is not known who took the decision not to have it built. Such a facility would be extremely useful, even though it would be a very expensive venture, probably in the order of several R million and will need to be pursued as a matter of urgency.

It would be very advantageous if more trips to Marion could be arranged as this would considerably enhance flexibility to plan and execute research. The possibility of staying

for shorter periods would make research on the PEI very attractive for scientists, international collaborators and research students, increase research productivity and the status of the PEI internationally as a prime research destination.

5.2.3 Student participation

Most participating universities seem to have no problems in attracting students, including Black students to participate in SANAP activities.

5.3 Geosciences

5.3.1 General Comments

Activities in the geosciences within SANAP have come to a virtual standstill in recent years. This can primarily be ascribed to the high costs of undertaking fieldwork in Antarctica at large distances away from the SANAE base. The need to revitalise geosciences research within the context of a polar and Southern Oceans research entity, as was recommended in the 2007 Review, would have two attributes, viz. terrestrial geosciences primarily on mainland Antarctica and to a lesser extent on Prince Edward Island, and marine geosciences.

5.3.2 Terrestrial geosciences

Terrestrial geosciences on mainland Antarctica would require extensive helicopter and other logistical support to allow for field work in unmapped areas of Western Droning Maud Land stretching distances of up to 600 km southwest and east of SANAE IV. The importance of this area for South African geology lies therein that it is postulated to have been juxtaposed with South Africa and Mozambique prior to the break-up of Gondwana. There also seems to be a piece of Archaean craton in the SANAE area that has not been studied in any detail and in this regard we have something of great importance to offer that others on the continent do not have. Important to bear in mind is that Antarctic geology can not be viewed in isolation from Southern Africa. The evolution of the Southern Ocean and the climate changes in the recent past can to a large extent be ascribed to continental drift, hence the need to look at both sides of the “break-up event”. Such an approach could constitute the framework of a new geology programme and would involve both terrestrial and marine (continental shelf) work.

Collaboration with earth scientists of countries that have bases in this area with much better exposures than near the South African base, needs to be explored.

There is, however, also a need for a proper synthesis of geological work funded by SANAP which has not been done in several years. This would be essential in compiling geological maps from existing data of the area, which could be undertaken by the CGS, and by identifying critical gaps in our knowledge and thereby assist to direct the focus of research in the future. Part and parcel of this would be an assessment of the work that has been done, both published and unpublished, and the collections available that need further investigation. There seems to be lots of scope to more fully exploit information vested in the existing collections of Antarctic rocks gathering dust in stores of universities and in the national core and sample storage facility operated by the CGS. These must be regarded as a national heritage and be curated as such, and be part of a synthesis of geological activities. South Africa has an obligation in terms of the Antarctic Treaty to curate these properly and make material available to others for further study. Consideration should be given to making some seed moneys available to academics in order to enable them to continue working on the collections that they have, to involve students at honours level for their projects and as research assistants and in this way get them interested in staying on for master's and doctoral projects and even spend time in Antarctica.

There also seems scope for research on Antarctic geology to become part of Inkhaba ye Afrika; in fact, students in this programmes have participated in five cruises on the Polarstern of the AWI in the recent past.

South Africans are involved in research on periglacial geomorphology and weathering on Marion Island and Antarctica. Important recent insights in the reconstruction of weathering and denudation processes have been by means cosmogenic dating. This is a new, though expensive dating technique that provides information on the period of exposure of rocks. There seem to be several glacial pavements in Antarctica that may be linked to periodic, comparatively recent, mantle related uplifts of the continent worthy of dating with this and fission track techniques. As cosmogenic dating involves specialised mass spectrometers and clean laboratory facilities, these could possibly be accessed by way of exploring opportunities for collaboration with researchers in other countries. Likewise, South Africa has not been part of any substantive ice-coring

projects, which yield some of the most exiting information on palaeo-climates over the past one million years, including some very conclusive information on the relationship between CO_2 and temperature.

The availability of a refurbished Optical and Thermal luminescence facility at the University of the Witwatersrand, opens up new possibilities in dating late Quaternary events (>300 000 years) such as soft sediments on the ocean floor and sedimentary processes on the Antarctic continent. This is of particular relevance in dating of palaeo-climate changes in the recent past.

5.3.3 Marine geosciences

Pursuit of marine geosciences (geology, geochemistry and geophysics) of the Southern Oceans is, akin to oceanography, critically dependant on ship time as well as proper advance planning of traverses across the Southern Ocean and or areas to be covered. Multi-beam swath bathymetry, seismic surveys, coring of soft sediments, as well as dredging and grab sampling would be the key tools. Although the new research vessel will not be equipped with a multi-beam echo-sounder, it is designed as a platform to accommodate a variety of different modern mobile research instruments including multi-beam echo-sounders. A seismic system will however be part of the new ships “package” and of particular interest to geologist would be on-shore – off-shore seismic lines across continental margins of both South Africa and Antarctica to understand the opening of the Southern Ocean between South Africa and Antarctica. Soft sediment coring is considered to be of particular importance as the systematic study of such sediments, their dating with luminescence techniques (see above) and the microfossils within them will provide much evidence of climatic changes in the recent past and hence also changing habitats for marine life at fixed localities within the ocean.

5.3.4. Challenges and Expectations

Of great concern is the lack of marine geoscientists. The few within academia and the CGS are insufficient to work on the continental margins, let alone the Southern Oceans. South African marine scientists would be spreading themselves extremely thin, given the vastness of the area.

Geological work on the continent is not attractive at present as too much time is spent on the ship. There would be much more interest of scientists and students could fly in, spend the season in the field and could fly out at the end of the season.

A seismic system on board of the new research vessel will require a highly skilled operator as well as a professional geophysicist on the staff of the new polar research facility to justify this kind of equipment.

Multi-beam swath bathymetry is an essential piece of equipment to map topographic features on the sea floor which are not only dependant on the geology, but often also display very distinct smaller scale geological structures. These are in many instances decisive in determining the habitat of for organism living on or close to the ocean floor. The naval survey vessel, the SAS Protea, is equipped with such a facility, but it is apparently not in use because of the lack of specialised skills within the navy to operate the system.

5.3.5. Student participation

Of great concern is the traditional shortage of students in the geosciences given their high market value in industry, particularly those from the previously disadvantaged sectors of our community consequently reluctant to pursue higher degrees. The economic downturn at present may result in more students staying on to pursue higher degrees. Present NRF scholarships are totally inadequate to attract students in the geosciences to stay on for postgraduate study at master's and doctoral level. A new "flagship earth sciences programme" launched and facilitated by a new research entity would go a long way in attracting suitable students to participate.

5.4 Atmospheric and Space Physics

5.4.1 General comments

Space physics in Antarctica relies on the continuous monitoring of space phenomena and submission of data, compared to many shorter term projects/observations in the earth and biosciences. By implication, one cannot operate a space physics programme in Antarctica on short term project grants. The instrumentation at SANAE constitutes a space physics observation platform as part of an international network of similar

platforms. Some of the basic instrumentation required is in place, some not and some is archaic and will need to be replaced. Instrumentation concerned that is in place includes

- Magnetometers
- Pulsation magnetometer
- Imaging riometer
- HF radar antennae, recently reconstructed
- Outdated aurora cameras and recording equipment. This is considered to be an essential component of a research station in polar regions and must be considered as part of the well-found laboratory. Two of these are located at SANAE of which one needs to be replaced urgently at a cost of ~R450 000.00.

It would be ideal if an ionosonde were placed at SANAE to complement the Aurora equipment, ionospheric scintillation, riometer and High Frequency radar work. There are currently only four ionosondes in Antarctica (at Italian, British, Australian and Chinese bases). An ionosonde would cost approximately R3 million. Existing technical over-wintering staff would be able to look after this.

Much of the data provided by the smaller instruments provides the context for participation in big international science programmes like SuperDARN. There is considerable scope to expand research activities based on a platform of instrumentation at SANAE including participation in satellite borne programmes/experiments.

It would be ideal if there were a few space physics observing stations (magnetometer and riometer) between SANAE and the South Pole, as this would add great value to the Radar at SANAE that looks south. It would be difficult to do service these from SANAE but could possibly be done in collaboration with BAS and AWI.

A further requirement is a central time server which would provide time with micro-second precision to all instruments. The server would require a single GPS antenna and receiver, and would provide time data via the network. Presently many experiments operate their own GPS time source, which has lead to a proliferation of GPS antennas on the roof of the base and much redundant instrumentation. For internationally competitive research the data from all experiments running at the base should have the same time source.

VLF radio wave and GPS antennae have been approved for space physics observations on Marion and these experiments are currently monitored by the DEAT radio officer who is not always suitably qualified to perform this task. There would be great interest in doing more space physics on Marion, particularly if one were to create facilities to complement current ionospheric and magnetospheric observations. These may however require antennae which would in all likelihood not be acceptable from an environmental perspective. It would also require a scientist to over-winter in order to monitor the equipment and data, note drifts and make timely corrections to instrumentation.

The proximity of Gough/Tristan Island to the South Atlantic Anomaly should be exploited by e.g. the placement of a HF radar facility on Tristan looking west into the anomaly. Ionosphericists may also be interested in exploiting these islands for their research, by placing instrumentation there.

5.4.2. Challenges and Expectations

Maintenance of scientific infrastructure at SANAE is essential and provision needs to be made for long-term appointments of technical staff to facilitate continuity of projects. Overwintering staff need to be properly trained technicians rather than scientists. New installations need to be overseen by competent technical staff, capable of ensuring that instrumentation is installed professionally and conforms to the required standards. Redundant installations also do not get removed and SANAE is rapidly turning into a dumping ground.

The bandwidth for the transmission of real-time data is satisfactory at present, but this may well need to increase as technology of instrumentation improves and the number of instruments at the bases increases.

5.4.3. Student participation

The situation regarding the availability of research students has eased in recent years and there is potential of attracting several students per year for the physics programme. The fact that HMO provides some funds to top up the bursaries has helped greatly in this regard and made the bursaries more competitive. Although not oversubscribed, students

involved in the programmes are primarily from Forth Hare, Venda, Rhodes, University of Kwazulu-Natal and North-West University.

The new research entity should have funds to top up standard SANAP/NRF bursaries to attract students. If the new research entity promotes flagship science programmes then students will be attracted, irrespective of bursary values.

5.5 Oceanography, Atmospheric Sciences and Climate Change

5.5.1 General comments

South Africa's geographical location in the ocean dominated southern hemisphere and its key infrastructure both on the mainland and the weather stations and research bases on Marion Island, Gough Island and Antarctica, gives it a unique comparative advantage in Climate Change research. This is amplified among others by

- the availability of long term data sets on climate at the SAWS
- its proximity to the intersection of three pathways of the "Global Ocean Conveyor Belt", which plays a vital role in the heat and CO_2 balance of the Earth and hence its climate,
- the region being considered as a key anthropogenic CO_2 uptake zone, accounting for about half of the total ocean uptake of the CO_2 generated by human activity every year, and
- ideal opportunities for the study of climate changes in the past by means of biogeochemical investigations of ocean floor sediments as these are vital in elucidating the atmospheric concentrations of CO_2 over the interglacial cycles of the past 2.5 million years.

Given this competitive advantage it is of concern that South African scientists play a relatively minor role in internationally led initiatives dealing with climate change, such as e.g. the Southern Ocean Observing System and the International Ocean Carbon Coordination Project. This is so because South Africa does not have the capability as a major role player because of a weak observational capacity (logistics) and outdated technology.

It is for these reasons, but also because of Africa's predicted vulnerability to climate change that the DST's Ten Year Plan: Innovation for a Knowledge-based Economy, has highlighted Global Change as one of the five Grand Challenges that require special attention in future years. An outflow of this has been the development of a National Science Plan for the Global Change Grand Challenge, which highlights the importance of the oceans south of Africa in climate change research and the potential of South Africa in becoming a major role player globally as a result.

The Egagasini node of SAEON has been established to address the need for long term environmental observations in the marine environment. To achieve this objective, three types of data gathering systems should ideally be in place:

- Argo Floats and to participate in international data gathering initiatives in this regard. This would also be of great interest to the SAWS as these buoys of this nature also have the capability to submit weather relevant information on a continuous basis.
- To identify in collaboration with other stakeholders at the University of Cape Town (UCT), CSIR and Rhodes University (RU) a number of key transects where monthly observations can be made and data be gathered for prolonged periods. From SAEON's perspective this should be ecosystems based. This would not necessarily be restricted to the Southern Oceans.
- A number of fixed moorings, possibly at the termination points of the transects with continuous recording capabilities of some key parameters. This would also be of great interest to the SAWS, particularly those that were located to the southwest of the mainland.

5.5.2 Challenges and expectations

Essential for oceanographic research is the availability of ship time. Advances in oceanography by South African scientists in recent years was not so much based on data accessed with the aid of the SA Agulhas, but more as a result of collaboration with other nations active in the Southern Oceans. One of the biggest present limitations with the present budgetary constraints is that the SA Agulhas has virtually no flexibility in cruise schedules apart from its fixed cruises to service the needs of the bases in Antarctica and the Islands, as well as the needs of the SAWS. Also, the existing vessel does not lend itself to modern biogeochemical studies such as iron fertilisation, which will become an opportunity with the new research vessel. The soft sediment coring

facility with which the new ship will be equipped provides ideal opportunities for collaborative work on palaeo-climates and palaeo-ecology between biogeochemists, geologists and marine biologists.

For meaningful, internationally competitive oceanographic work, biogeochemical, physical and biological is the availability of a research vessel to study seasonal variations. Opportunities for growing the marine biosciences research are linked to studying seasonal variations and to explore the open oceans, i.e. distant from the islands and Antarctica. Of interest is to study the southward migration of species because of warming of the oceans. In this regard South African scientists should not try and compete with others operating in this space such as AWI and BAS, but rather identify their own unique niche programme that others may wish to join.

Dedicated state-of-the-art equipment and technical support is essential for oceanographic work. The new research entity must be totally self-sufficient in this regard, which will entail firstly equipment on the new vessel and secondly also the technical support staff to handle the equipment. However, given the urgency to commence as soon as possible with meaningful climate change research, an urgent case has been made by the CSIR on behalf of the research community to the DST to commence immediately with a phased approach to acquire the essential research equipment, and not to wait for the replacement of the SA Agulhas. According to this proposal the cost implications of the equipment needs are as follows:

Phase 1 (2009/10): Water column profiling and underway systems	R6 million
Phase 2 (2010/11): Sampling equipment, moorings etc.	R15 million
Phase 3 (2011/12): Additional sampling platforms	R20 million

Linked to this is the need for skilled technical support staff, two for appointment during Phase one and a further two during Phase two to service the equipment and train others in the usage thereof.

Presently oceanographers are totally dependent on MCM, firstly for basic research tools such as CTD and ADCP and secondly regarding availability technical skills for handling the equipment and for pre- and post-cruise calibration of such equipment. Access to these skills and the equipment will be lost when a new research entity is established outside DEAT. Even at present support for instrumentation and technical staff from MCM

cannot be guaranteed as their availability is prioritised for MCM work and not for research work on the SA Agulhas. This will remain problematical both in terms of equipment and support staff even in the transitional years until the new ship arrives in 2012.

The new vessel has the flexibility of working in warmer climates as well and hence need not be restricted to the Southern Oceans. It was designed so that it could operate in other environments. South African marine scientists would welcome flexibility in this regard, as lots of interesting and relevant research needs to be done in the southern Indian and Atlantic Oceans.

Capacity in oceanographic research has been very limited until very recently, with UCT and RU the only universities with some capacity. The situation has improved somewhat with the establishment of an Ocean Systems and Climate Research Group within the CSIR at Stellenbosch and the Egagasini node of SAEON in Cape Town. UCT and RU work closely together on virtually all Southern Ocean projects. The lack of critical mass at universities implies that initiatives often hinge on too few individuals with teaching and administrative duties which also impacts negatively on the continuity of research and training in research.

There is furthermore also a need to upgrade the SAWS's SAOZ ozone measuring instrument at SANAE to submit real time data to the Global Atmosphere Watch station in Cape Town in order to become part of the of the WMO real-time Antarctic ozone monitoring network. This will enable SANAE data to be shared in the weekly World Meteorological organisations bulletins that reporting on the state of the ozone hole over the Antarctic and the general state of ozone concentrations.

Additional instruments to measure trace gas concentrations in the atmosphere at the weathers stations at SANAE, Gough and Marion, would be of great value and has not been possible due to capacity and costs. However SAWS still envisages that these extended monitoring projects will in future become a reality, but it is dependent on the approval of the SAWS longer term re-capitalisation plan of its overall scientific programs.

5.5.3 Student participation

Researchers in the marine biosciences have reasonable access to students, even though there is some competition with other programmes. Some difficulties are experienced with Black students in this regard as they are not interested in going to sea for any prolonged period. There is a reluctance of students pursuing higher degrees in oceanography, though, as they do not see employment opportunities with such qualifications.

5.6 The Earth System Science approach

The 2007 Review of the SANAP highlighted the fact that at the time "each individual scientist or group is pursuing their own field of interest and there appears to have been little interest so far in bringing much of this research together in an Earth System Science approach as has been done successfully in other countries." The Review Panel recommended that a "new scientific leadership of SANAP should take careful review of which disciplines are needed for a modern systems approach to Antarctic and Southern Oceans science." In emphasizing the importance for such a holistic Earth Systems approach the panel went further and recommended the establishment of a new department or institute at a relevant university or group of universities devoted to Antarctic Earth Systems Science.

The need for such an institute has to some extent been overtaken by the decision in principle by the DST to establish an African Centre for Climate and Earth System Science (ACCESS) Centre of Excellence within the context of the Global Change Grand Challenge. In addition, the African Earth Observation Network hosted by the Department of Geosciences at UCT has been adopting an Earth System Science approach for a number of years, so that there is some expertise in this regard on which to build capacity in the country.

For a successful approach research proposals in future should be contextualised from the onset in a more integrated fashion by interrogating the relationship of observations is in the broader context. Ideally, researchers must be encouraged to conceptualise projects in a way that makes the research more relevant to the understanding of Earth Systems. This approach should become an integral part of the strategy of a new research entity given the urgency of the challenges brought about by climate change.

5.6 General comments

Representatives of the main disciplines interviewed were unanimous that a new research entity for polar and Southern Ocean research requires a core of scientists and technical support staff to facilitate and coordinate research undertaken by staff and students at universities. All commented very positively on the various “Antarctic Officers”, essentially 5-year post doctoral fellows, deployed by SANAP many years ago at universities to assist with the coordination and implementation of research projects in the various disciplines. These officers, all of whom spent several seasons conducting research in Antarctica and or the islands provided continuity in research effort in addition to some important training regarding safety under harsh field conditions in polar and sub-polar regions. In view of the sub-critical mass of researchers in several of the disciplines of relevance to polar and Southern Ocean research, a new research entity should consider placing some of their research staff and or post-doctoral researchers at universities to strengthen efforts and stimulate research in these fields.

Researchers were generally very positive about the increase in funding for research from the DST in recent years. This growth in funding could however not be optimised in many instances as a result of the restrictions placed on researchers by lack of logistical support, funding for which had evidently not increased concomitantly to meet the needs of the researchers. A situation therefore prevails where logistics largely dictates what research can and can not be done, rather than science driving the research agenda.

A shortcoming at present is that available research funding does not allow for the appointment of salaried staff, i.e. scientists can not employ technical assistants or field officers to assist them in fulfilling their research tasks. It seems to be standard practice that Antarctic bases have access to field operators. These are people with lot of experience of Antarctic conditions, and apart from providing professional training to scientists also accompany them on deep field excursions. Without these kind of skilled support staff deep field excursions are impossible; a prerequisite not only for geological and geomorphology fieldwork, but also for ornithologists and entomologists.

The result is that the scientists are often left to their own devices regarding preparation for fieldwork and having to find their own field operators as part of the science activities,

rather than part of the logistical support provided by the base. Presently this kind of support staff is considered a science responsibility and not of logistics.

6 SOME OTHER POLAR RESEARCH ENTITIES

In an attempt to benchmark a proposed South African Antarctic and Southern Ocean research entity against other similar organisations globally, information was accessed on the web pages of a number of institutions active in Antarctica and the Southern Oceans. The review in the following pages concentrates primarily on their respective mandates and the governance and management systems adopted for them by the respective countries, inasmuch this information was available on the web.

6.1 Alfred Wegener Institute (AWI) for Marine and Polar Research

The AWI, located at Bremerhaven, Germany, coordinates polar research in Germany and provides state-of-the-art equipment and key infrastructure for polar expeditions and interdisciplinary investigations of global climatic, biological and geological systems of the Earth. Scientists of the AWI co-operate extensively with numerous national and international institutions, through which the AWI is integrated into a global research network.

Understanding global changes of the environment and the biosphere, either natural or caused by humans, is the primary goal of its research and thereby fulfilling an important role in providing the federal government with updated competent advice for the development of environmental policies. Together with the German Research Foundation and several universities the AWI also funds talented young scientists to participate in its research efforts.

The AWI is governed by a Board, chaired by the Minister for Education and Research with other members being high profile representatives from the Government, the Federal States, eminent scientists and persons from public life. The board takes decisions on general policy and financial matters and is supported in this regard by a Scientific Board.

The latter is constituted in accordance with the statutes of the Institute, by heads of various German research institutions, the German Research Foundation, and eminent scientists from both Germany and beyond its borders.

A Scientific Advisory council, comprised of the Section heads of the AWI and elected scientists advises the Directorate on matters relating to the research programme.

The Institute has 3 Divisions, one each for Geosciences, Biosciences and Climate Sciences and a fourth Division for Infrastructure and Administration. The latter contains functions such as logistics, procurement, the library, ICT support and scientific computing. Functions such as International and National scientific relations, Communications and Media Relations, Innovation transfer, Legal advice, Safety and Internal Audit report directly into the Directorate which consists of four Directors.

6.2 The Australian Antarctic Division

The Australian Antarctic Division, based in Kingston, Tasmania, is a division of the Department of the Environment, Water, Heritage and the Arts. It is responsible for coordination of the Australian Antarctic scientific research program, and for providing the logistics for transportation and accommodation as well as for much of the field support. Its research programme has four goals, viz.:

- Promoting and enhancing Australia's influence in the Antarctic Treaty System
- Protecting the Antarctic environment
- Understanding the role of Antarctica in the global climate system, and
- Undertaking scientific work of practical, economic and national significance

It furthermore has the responsibility of:

- Administering the Australian Antarctic Territory and the Territories of Heard Island and McDonald Islands
- Promotion of Antarctic research in universities through grants and the provision of logistic support
- Developing policy proposals and providing advice on Australia's Antarctic interests

- Maintaining a continuing presence in the region through permanent stations, the establishment of field bases and the provision of transport, communication and medical services

The Division has a staff of over 300 working in the following operational units:

- The section for *science* is responsible for science planning and coordination, provides scientific technical support, manages the data centre and is responsible for the research programmes on Southern Ocean ecosystems, environmental protection and change, glaciology, atmospheric science and climate. some key programme staff located at the University of Tasmania.
- The *policy and communication* section handles all issues related to the protection and conservation of the Antarctic and Southern Oceans, and experts from this unit also attend all Antarctic Treaty Consultative Meetings and its Committee for Environmental protection.
- *Corporate support* is, apart from finance, HR issues and IT, also responsible for supply chain and facilities management.
- *Operation* deals with all air link and shipping operations, engineering support as well as the recruitment and training of expeditioners.
- Three Australia based medical doctors are responsible for the medical screening of all expedition members, the training of medical officers and the provision of medical supplies.

Its base in Kingston houses laboratories for science, electronics and electron microscopy, mechanical and instrument workshops, a krill research aquarium, a herbarium, equipment stores, communications and other operational and support facilities.

The scientific direction of Australia's Antarctic Science Programme is set by the Antarctic Scientific Advisory Committee, a committee whose chair and members are drawn from the wider Australian scientific community. The committee also has the task of annually reporting scientific highlights to the Minister, as well as regular evaluations of the programme.

The Antarctic Divisions total grant funds available to Australian University researchers is $750,000, with grants of up to $30,000 available for individual projects. Only those projects that pass the science assessment process receive logistic support. Collaborative research programs are also conducted with other Australian agencies, research institutions and international bodies.

6.3 British Antarctic Survey

The British Antarctic Survey (BAS) in Cambridge is a component of the Natural Environment Research Council. It employs over 400 staff and has budget for 2009-2010 of £47.1 million of which £11.1 million is spent on the science programme, and £36 million spent on supporting the science, which includes the costs of running the ships, aircraft and research stations.

The BAS provides a national capability for Antarctic science and logistics by carrying out scientific research, long-term observations and surveys. Its mission statement includes among others the following objectives:

- To undertake a world-class programme of scientific research, survey and long term observations addressing key issues of global or fundamental importance that can best be dealt with by research requiring access to the Antarctic or related regions.
- To sustain for the UK an active and influential regional presence and a leadership role in Antarctic affairs.
- To assist in the discharge of the UK's international responsibilities under the Antarctic Treaty System and with the administration of the British Antarctic Territory.
- To provide reliable and independent advice to the UK government and other stakeholders.
- To provide a focus for national and international co-operation, and for the co-ordination of major research programmes, especially those addressing complex scientific problems or requiring significant technology or infrastructure.

Responsibility for the leadership and management of British Antarctic Survey (BAS), including the direction, balance and detail of its science programme, and the allocation of resources and logistics support, lies with the Director advised by the senior management who comprise the BAS Board. The Science Board, in turn, advises the

BAS Board on science strategy and investments, and setting of priorities and consists apart from the Board members also of senior staff of the BAS.

6.4 The New Zealand Antarctic Institute

The New Zealand Antarctic Institute, a public entity also known as Antarctica New Zealand ANZ), was established in 1996 under the *New Zealand Antarctic Institute Act 1996.* It is responsible for developing, managing and administering New Zealand's activities in Antarctica and the Southern Ocean, particularly the Ross Sea region. ANZ is also responsible for facilitating New Zealand scientific research, and providing sound environmental stewardship. In addition to supporting scientific research through logistics planning, and scholarships, it also has media and youth programmes to increase public awareness and appreciation of Antarctica and its conservation values.

ANZ is governed by a six-member Board appointed by the Minister of Foreign Affairs in consultation with the Board Chair. Members are collectively accountable to the Minister of Foreign Affairs for the performance of ANZ. Specific functions within this overall role include:

- Setting the strategic direction of ANZ and developing policy, in a manner consistent with the organisation's statutory framework.
- Ensuring compliance with the law, accountability for the performance and management of the organisation including financial responsibility.
- Appointing the Chief Executive
- Monitoring the performance of ANZ and the Chief Executive; and
- Maintaining appropriate relationships with the Minister, Parliament and the public.

ANZ, located at the International Antarctic Centre in Christchurch has a permanent staff of 30 and between ten and fifty temporary staff depending on the time of year and the level of activity. The CEO is responsible for the staffing and management of ANZ and is supported by a management team of five, responsible for the following functions:

- Science and information, including science planning and the scientific programmes
- Environment which provides policy support for New Zealand's involvement in the

Antarctic Treaty System and in particular the Antarctic Treaty's Committee for Environmental Protection, manages protected areas within the Ross Sea region, and environmental impact assessments for activities on the Antarctic environment

- Antarctic Programme responsible for planning and organising the annual "on-ice" programme, the base support staff, infrastructure and maintenance
- Antarctic Support is responsible for logistics and re-supply, ship-based programmes, capital projects and the Antarctic geological drilling programme
- Corporate Services such as finance, accounting, audit, HR, and IT support

Significant logistic support is provided annually by the New Zealand Defence Force. This include intercontinental air link, cargo handling services in Christchurch and in Antarctica and communications staff support at Scott Base. Air cargo and personnel transport to Antarctica forms part of a combined logistics pool for the New Zealand, United States and Italian Antarctic programmes. Marine observation flights are also provided by the defence force as part of New Zealand's commitment to the CCAMLR.

6.5 The Norwegian Polar Institute

The Norwegian Polar Institute (NPI), an Agency of the Norwegian Ministry of the Environment, is the environmental administrative authority for Bouvet Island just north of the Antarctic Treaty Area, and for Norwegian activity south of the 60th parallel. The NPI has a staff of 150 and is the Norwegian authorities' principal advisor with respect to implementation of the Antarctic Treaty System.

Today, the main objective of the Norwegian Antarctic research expeditions is to collect information to increase our understanding of natural and human induced global climate change. The research projects focus on biology, glaciology, past climates, physical oceanography and environmental monitoring. Most of these activities take place in the South Atlantic sector of Antarctica, i.e. on Bouvet Island, in the eastern part of the Weddell Sea and in Dronning Maud Land.

6.6 The United States Antarctic Research Programme

The U.S. Antarctic Program carries forward the Nation's goals of supporting the Antarctic Treaty, fostering cooperative research with other nations, protecting the Antarctic environment, and developing measures to ensure only equitable and wise use of resources. The National Science Foundation (NSF) funds and manages the program.

The programme has three goals, viz.

- to understand the region and its ecosystems;
- to understand its effects on (and responses to) global processes such as climate; and
- to use the region as a platform to study the upper atmosphere and space.

The Office of Polar Programs (OPP) manages and initiates National Science Foundation funding for basic research and its operational support in the Arctic and the Antarctic. The funds are provided as NSF grants to institutions (mainly U.S. universities), whose scientists perform the research at the institutions or in a polar region. Organizationally, OPP has two science divisions — one each for the Arctic and the Antarctic. A third division manages the provision of logistics and support operations including field stations, camps, and laboratories. OPP has cooperative agreements with the U.S. military to provide air logistics to and from Antarctica, whilst helicopters, flown by a contractor, provide support for the research teams on site.

A programme Advisory Committee comprising of experts who are familiar with polar operations, issues and research reports to the Director of the Office of Polar Programs and advises the Office on polar research programmes and policy.

Environmental, health and safety issues are handled by the Office of Polar Environment, Health and Safety.

6.7 Conclusion

From the above it can be seen that although the mandates of the various entities in terms of the purpose and broad topics of research, facilitating access to the Antarctic and Southern Oceans to researchers at universities, promoting international collaboration and providing the necessary logistics and other support are broadly similar, their governance models differ substantially. The Australian Antarctic Division on the one extreme is located in a government department and reports to the Minister responsible for environmental affairs, whereas the US Antarctic Programme is part of the main research funding agency in the US, the NSF and by implication has no active scientists in its employ with all research being conducted by researchers located mostly at universities and or other research institutions.

Of the other entities, the BAS constitutes part of a research council, whereas the AWI the ANZ and the NPI are statutory entities established by an act of parliament. The latter two differ though in that the former is accountable to a Governing Board chaired by the Federal Minister responsible for Education and Science, whereas the ANZ reports to a Board appointed by the minister responsible for foreign affairs and trade. In all instances though, the entities have some form of scientific advisory boards or committees, mostly consisting of eminent scientists. The conclusion to be reached is that there seems to be no internationally best practice approach to the governance of research entities responsible for Antarctic and Southern Oceans research, although the agency approach either as part of a larger entity such as the BAS or with some statutory independence from direct Government control seems the most common.

7 A NEW RESEARCH ENTITY

7.1 A Mandate for the New Research Entity

With due cognisance of the mandates of various Antarctic and polar research entities and given the present range of activities and responsibilities vested in the DAI, the research being conducted under the auspices of the SANAP, the needs and expectations of the research community and that of other statutory organisations with a mandate in the Southern Oceans as defined in the Terms of Reference, and the recommendations contained in the 2000 and 2007 reviews of the SANAP, the mandate of a new Antarctic and Southern Ocean research entity can be conceptualised as follows:

- To set the strategic direction for South African Antarctic and Southern Ocean research;
- To undertake and facilitate world-class scientific research that addresses key issues of global and fundamental importance;
- To coordinate South African Antarctic and Southern Ocean research;
- To facilitate cooperation with national and international institutions and the integration of activities with global networks;
- To facilitate scientific work of practical, economic and national significance (this relates specifically to the needs of SANBI, the CGS, PASA and the SAWS);
- To provide state-of-the-art equipment, key infrastructure and logistic as well as technical support;
- To enable South Africa to discharge its responsibilities under the Antarctic Treaty System and other conventions and agreements by providing sound, evidence-based policy advice to Government
- To provide reliable and independent advice to the South African Government on other matters pertaining to Antarctica and the Southern Oceans.
- To build the required capacity in research, with due cognisance of the need for racial and gender equity, to meet its mandate.

7.2 The Governance of a New Research Entity

As pointed out by the 2007 Review, the complexity in governance of a South African Antarctic and Polar research entity arises from the wide range of stakeholders in Southern Ocean and Antarctic science and logistics. The dependencies of the various stakeholders on a new research entity are summarised in the table below.

Table 2: Dependency of stakeholders on the research entity

Stakeholder	Requirements
Universities	• Logistic and other support to researchers and research students • Coordination of research programmes • Facilitate national and international collaboration
SAEON	• Long term ecological marine observational data as part of Egagsini node activities • Potential future involvement in long term observations on the PEIs
CSIR	• Research and information on ocean-atmosphere systems pertaining to climate change • Earth System Science modelling to assess impact of climate change as part of ACCESS activities

DEAT	Information and assistance to discharge its responsibilities in terms of:
	• The Antarctic Treaties Act, Act 60 of 1996, including:
	  o The Environmental Protection Protocol to the Antarctic Treaty
	  o CCAMLR
	  o The Convention of the protection of Antarctic Seals
	• Various international commissions, conventions and treaties such as:
	  o The Convention on Biological Diversity (CBD)
	  o The International Whaling Commission
	  o The Intergovernmental Oceanographic Commission
	• Executing its authority over the EEZ and the PEIs in terms of the National Environmental Management Acts, both Biodiversity and Protected Areas.

DST	• Unique research platform aligned with objectives of National R&D strategy in terms of
	  o Geographical advantage
	  o Leading internationally competitive research
	  o Human capacity development with focus on redress and equity
	  o Science education and awareness
	• International science collaboration and coordination
	• Essential instrument in achieving objectives of Global Change and Space Science Grand Challenges

SAWS	Continued access to • the weather stations at SANAE and on Marion and Gough Islands • the Southern Oceans for deployment of weather buoys

	• automated weather stations on Bouvet and the South Sandwich Islands to meet statutory responsibilities and obligations in terms of the international SOLAS and WMO conventions.
DFA	• Antarctic Treaty obligations for strategic reasons • Information and assistance to participate meaningfully in Antarctic Treaty Consultative Meetings • Africa's voice on matters Antarctica and the Southern Oceans
SANBI	Statutory responsibility to monitor and report regularly on the • status of the Republic's biodiversity, • conservation status of listed threatened or protected species and listed ecosystems • status of all listed invasive species
CGS	• Statutory responsibility to compile and develop knowledge and to serve as national custodian of all geoscientific information relating to terrestrial and marine territories of the Republic
PASA	• Statutory responsibility to carry out reconnaissance operations to assess oil resource potential of continental shelf areas

Given the diverse interests of all these stakeholders, the 2007 Review proposed the establishment of a management structure that brings all elements of South African Antarctic activities into a unified single system. This was proposed to improve the decision making process, transparency of information flow as well as allowing for the representation of all interests in a structured framework. In the light of this a body referred to as the South African Antarctic Policy and Research Committee (SAAPRC) was proposed to be chaired by the Director-General of the Government Department responsible for the proposed new research entity, with other members drawn from the various stakeholder communities. Within the South African science system, such an approach is operationally only feasible if the research entity were to become a new statutory organisation with SAAPRC, the proposed management structure, its statutory Board and hence the accounting authority of the entity. If, on the other hand, the entity were to become a National Facility within the NRF, as proposed by the 2000 Review, then a body such as SAAPRC can only be an advisory structure as the accounting responsibility of the entity would then vest in the NRF Board. Under such a scenario it would also not be appropriate for the committee to be chaired by the Director-General of the responsible line Department.

Within the context of the South African NSI three governance models can be considered, viz.:

- A National Facility as defined in the System Wide Review of 1998 and to become part of the NRF which has the mandate of managing National Facilities in terms of the NRF Act;
- A division within an existing statutory Science Council such as the CSIR; and
- A separate statutory Science Council reporting to the Minister of Science and Technology.

The pros and cons of each option can briefly be summarised as follows:

Table 3: Comparison of different governance options

A National Facility managed by the NRF	
Pros	• Full compliance with the criteria of a National Facility as adopted in the System Wide Review of 1998. • The entity can be declared as a National Facility immediately by way of a notice in the Government Gazette by the Minister of Science and Technology in terms of Section 5(1) of the NRF Act, Act 23 of 1998. • The NRF already manages a number of national research facilities that serve a spectrum of different stakeholders. • The NRF has appropriate HR and financial management systems in place and can provide support at corporate level in a variety of spheres. • The existence of three National Facilities in or near Cape Town, the most likely location of the new research entity, with high quality electronic and mechanical workshops that could readily provide specialised technical support to the new entity. • SAEON, a facility managed by the NRF, can readily assist with the establishment and maintenance of a National Antarctic Data Centre. • SAASTA, another facility of the NRF, in terms of providing policy guidelines and facilitating science outreach and awareness activities • A direct interest in the new entity by the Egagasini node of SAEON, some of the activities of SAIAB, including management skills of large marine programmes such as African Coelacanth Ecosystem Programme and the Agulhas and Somali Current Large Marine Ecosystem Project
Cons	• Stakeholders will not have a direct say in the operation of the research entity as the governance authority vests in the NRF Board with little direct involvement in matters relating directly to Antarctica and Southern Oceans. • The interests of various stakeholders, such as the SAWS and MCM of DEAT will have to be safeguarded by way of agreements
A division within the CSIR	
Pros	• The CSIR manages a number of national facility-like entities, e.g. the National Laser Centre and the Satellite Applications Centre. • Appropriate HR and financial management systems and corporate support structures are in place.

	• A direct interest by virtue of its Ocean Systems and Climate Research Group and the establishment of ACCESS within the CSIR in Stellenbosch • Expertise relating to the establishment of a National Antarctic Data Centre through the South African Data Centre for Oceanography and the Meraka Institute.
Cons	• The establishment of a Division within the CSIR will need to be negotiated and may require an amendment of the CSIR Act. • Other cons similar to those relating to the NRF.
A separate statutory Science Council	
Pros	• Governance Board can be constituted of representatives of stakeholders, thereby having a direct say in the strategic direction of the entity. • Stakeholder interests can be captured and safeguarded in the statutes of the entity. • Visibility and standing within the community
Cons	• Time delays on drafting a Bill and launching it through Parliament. • Considerable costs in developing management systems and procedures. • Costs related to corporate governance support structures such as audit functions, industrial relations, communications, etc.

Although a number of stakeholders are of the opinion that a separate statutory entity would be their preferred option, the cost and timing constraints of such a scenario make the National Research Facility option under custodianship of the NRF the more attractive one at this stage. This does not rule out the possibility to work towards a separate statutory science entity in the future.

7.3 Functions and core competencies

The functions and competencies are dictated by the mandate of the facility and include the following:

7.3.1 Research

The research function should ideally have capacity in all major domains of relevance to Antarctic and Southern Ocean research. This includes oceanography, atmospheric and space physics, biosciences and the geosciences with emphasis on an Earth System Science approach in order to understand the forces and impact of climate change on the environment in general but Africa in particular, and to advice policy makers accordingly.

7.3.2 Facilitation and coordination of science

The bulk of research should ideally be undertaken by universities and other research institutions in collaboration with universities, e.g. Hermanus Magnetic Observatory (HMO), SAIAB and the CSIR. A major role of the research entity must be to facilitate such research in accordance with strategic research priorities by way of enabling access to the research infrastructure vested in the research entity, strengthening of the research efforts within universities by the placement of research staff or post-doctoral researchers within academia for specified periods of time, and fulfilling a coordinating role to add value to the research endeavours within universities, research institutions and the entity itself.

7.3.3 Liaison, nationally and internationally

The national and international liaison function has several dimensions.

- Firstly, liaison nationally and internationally to ensure that the nation meets its statutory obligations in terms of signed treaties and conventions, and as member of international commissions. It is e.g. envisaged that senior staff of the research entity will be part of delegations to meetings of the Antarctic Treaty System.
- Secondly, international liaison with the purpose of enhancing the quality and impact of research through scientific collaboration, participation in international networks and scientific committees such as SCAR, SCOR and several others, to leverage resources for research and to regain South Africa's standing as leading research of relevance in the geographic areas of direct interest to the research entity.
- Thirdly, international liaison with other polar and marine research organisations to understand their respective research agendas in order to engage with them at a policy level to identify complementarities and value-add dimensions through collaboration and the leveraging of resources for collaborative research.
- Fourthly, liaison nationally with all organisations that have a direct or indirect interest in the activities and the facilities of the research entity by virtue of their respective mandates, such as PASA, CGS, SANBI and others.
- Lastly, liaison to involve scientists from other African states in Southern Ocean and Antarctic research.

7.3.4 Logistics

The logistic function deals on the one hand with the planning and organising the operation and re-supply of vessels and support required for ship-based research cruises for oceanographic research, and on the other hand, research base support in terms of planning and organising the “on-land” programmes, support staff, supply, safety, maintenance and upkeep and capital projects.

7.3.5 Science outreach and awareness

This is a function that should in future be managed by dedicated staff within the research entity, rather than a separated from it through grants by the DST as is the case at present. The science awareness and outreach activity must be undertaken in close collaboration with SAASTA, an agency within the NRF with considerable expertise, not only to provide guidance on strategy but also to assist with implementation and the assessment of outcomes and impact.

7.3.6 HR, Finance and Administrative support

The facility requires basic HR and finance management abilities that can apply and implement corporate policies and procedures in accordance with well established and tested systems. On the HR side these include feeding information into the corporate payroll system, employment procedures such as advertising recruiting and screening of applicants, performance management and personnel administrative functions. Similarly on the financial side, competent staff to act in accordance with financial policies and procedures by implementing these with the aid of the systems provided. Strict accountability regimes have been developed at corporate level and are being applied rigorously to ensure that public funds are being spent judiciously.

7.3.7 Corporate support functions

Systems, policies and procedures to be followed have been developed at corporate level and are being imposed and monitored from the corporate office. Assistance from the corporate office will be particularly intensive during the first year as this will involve in depth negotiations to align conditions of service, transfer of DEI staff to the NRF medical scheme and the migration from DEAT financial and HR systems and procedures to those of the NRF.

Institutional performance and reporting measures to comply with the PFMA have been identified corporately and the interface with government (reporting regime, such as annual reports, business plans, shareholder compact) is handled corporately. Relevant performance information and key performance indicators will need be identified for the new agency and systems will need to be put in place to extract this information and supply it at regular intervals to the corporate office.

High level technical issues, industrial relations, service conditions are handled by experts at corporate level in addition to providing advice, guidance and assistance with specific problems that may arise from time to time.

7.4 Requirements of a new Research Entity

The requirements identified in this sub-chapter are based on a national facility that operates a research vessel at sea for at least 300 days a year, the functions referred to above and other infrastructural and research equipment requirements for the research entity to function optimally as a national facility. It is very clear though that potentially the demands on the facility can considerably outweigh the available infrastructure, particularly if resources become available for institutions such as the CGS, PASA and SANBI to address their respective mandates in relation to the Southern Oceans as defined. This eventuality will be addressed in the chapter on recommendations below.

7.4.1 Logistics

As was shown in the section on the replacement of the SA Agulhas above, the estimated costs to keep the SA Agulhas, and in future also the replacement vessel, at sea for 300 days per year instead of the present 185 days, will add about 30 per cent to the operating costs of the vessel. This will amounts to an increase of about R14 million to the annual operating budget of the new research entity.

As the SA Agulhas now mores along the ice shelf near the Neumayer base in Antarctica, large expensive helicopters to off load heavy equipment onto the ice are no longer required, as was the case with the high ice shelf near the SANAE. The use of smaller helicopters cuts the expense of present flying time at the three bases by about one third. This implies that with the present helicopter budget of about R12 million annually, a

significant number of additional hours of flying to meet the needs of researchers becomes possible at no additional expense. This will make it possible to conduct scientific activities at considerable distances from the base which will make SANAE attractive to revitalise geosciences research.

7.4.2 Staffing requirements

Staff required in addition to the present 38 staff members of the Directorate Antarctica and Islands to constitute a viable National Research Facility, includes the following (Estimated costs to company is given in brackets).

The Executive Director

This will need to be an experienced, visionary scientist drawn from one of the disciplines relevant to the research entity, with sound management and people skills. Support for the running of his office will be provided by a Personal Assistant. (R1 100 000.00)

Research staff

- 5 Scientists one of whom the Chief Scientist who will head the Science Division of the entity. The five scientists should among them cover the key science domains of relevance to the research facility. Apart from conducting their own individual research programmes in collaboration with local and international researchers, it will be their responsibility to ensure the proper functioning of the research equipment required for their respective research domains, to coordinate research in their field nationally and facilitate access by researchers both nationally and internationally to the research programmes of the entity. (R2 800 000.00)
- Ten Technicians, two of whom at a senior level, responsible for the maintenance, repair and calibration of research equipment including that which is an integraf part of the new research vessel (essentially electronic and mechanical skills) and who will also perform duties as field officers for Antarctic research teams. It will also be their duty to provide in service training of technical students from Further Education and Training Colleges and Universities of Technology. (R3 600 000.00)
- One scientist responsible for data management of the research entity management of the National Antarctic Data Centre with two support staff. This function could conceivably be outsourced. (R1 000 000.00)

- Five secretaries/administrative assistants, one of whom will be the secretary of the Chief Scientist, two to support the scientists, and one each for administrative assistance to the technical staff and to the NADC. (R1 000 000.00)

Liaison and Outreach

This section includes the functions of Marketing and Communication, Science awareness and education, a Library and Information Centre, and Stakeholder liaison. The latter function is designed among others to support the Director in liaising with stakeholders in Government regarding its obligations in terms of treaties and conventions. The section would consist of one head plus three new additional staff members. (R1 500 000.00)

Administration

The entity will in all likelihood require two additional staff members dealing with the HR issues as outlined above. These are in addition to the two personnel officers of the DAI dealing with contract staff. For the finance function of the entity two staff members will in all likelihood be required in addition to the one finance person of DAI dealing with procurement related payments. The security function is presently provided by the Waterfront Company as part of the lease agreement with the DPW. (R1 000 000.00)

7.4.3 Infrastructural requirements

Accommodation

On the assumption that the research entity will be housed in the same building on the Waterfront in Cape Town as the DAI, then the first floor of the building will need to be refurbished for offices and some laboratory space of the new entity. Laboratory space will need to cater on the one hand for an electronic and mechanical workshop to service, repair, calibrate and develop research instrumentation used primarily for oceanography, and on the other hand also for the needs of full time and visiting researchers of the research entity. If it is assumed that about 2/3 of the floor space will be occupied by offices for permanent staff, visiting scientists and research students, the NADC, a library and information centre, and the remaining 1/3 for research laboratories and technical workshops, then a first order estimate of the refurbishment of the second floor of the building will be in the order of R18 million. This is based on ~1430 sq m office space at a cost of R6000/sq. m, i.e. R8.6 million and ~720 sq m laboratory space at R13 000/sq.

m., i.e. R 9.4 million. Prevailing cost estimates were provided by an architect involved with the refurbishment of buildings in a research environment. An additional amount of about R 500 000 will have to be provided for furnishing the offices.

National Antarctic Data Centre (NADC)

In 2006 the DST requested SAEON to submit a detailed proposal regarding the establishment of a data management centre for SANAP. Such a proposal was submitted early in 2007 with a detailed breakdown of systems to be used, license and management fees and other cost implications. This proposal was never implemented, yet a NADC will need to be an integral part of the activities of the new research entity among others also to be compliant with the spirit of the Antarctic treaty regarding the sharing of data and information. For the purpose of this report, the costs to establish and maintain such a data centre are taken from this report. A once off cost of establishing such a centre are estimated to be about R800 000.00 with annual running expenses, excluding staff costs, which are already factored into the section of staff requirements above, amounting to an estimated R1 400 000.00.

Library and Information Centre

This will essentially entail the subscription to the most appropriate journals, mostly in electronic format, books, remote sensing imagery, acquisition of unpublished information such as theses and reports, maps, etc. for usage by researchers both of the research entity and those at universities and other research entities. An estimated annual running expense, excluding staff is R600 000.00

Capital requirements

The need for dedicated oceanographic research equipment has already been referred to above and an urgent request for such equipment was recently submitted by the CSIR to the DST. This request amounts to R41 million in total and a proposed phased acquisition as follows:

Phase 1 (2009/10): Water column profiling and underway systems	R6 million
Phase 2 (2010/11): Sampling equipment, moorings etc.	R15 million
Phase 3 (2011/12): Additional sampling platforms	R20 million

Other immediate capital requirements linked to the establishment of a research entity would be IT equipment to service the entity. It is assumed that all computers, printers, copiers, scanners, etc. presently used by the DAI will be transferred to the new entity under the "going concern" principle. It is estimated that IT equipment for 30 additional staff to be employed by the entity, including servers but excluding the needs linked to the NADC, will amount to about R800 000.00.

Other capital items will be those linked to equipping the electronic and mechanical workshops as well as the research laboratories of the research entity. The potential costs of these was not ascertained but could well amount to R10 000 000.00 spread over a period of three years during the formative years of the research entity. This amount includes some urgent replacement and upgrading of equipment for space physics at SANAE. Available more expensive specialised research equipment should wherever possible be accessed at universities close by.

7.4.4 Running expenses

Running expenses in addition to those listed under the DAI in Chapter 3 relate to the additional functions identified above. Some have already been identified, such as for the NADC and the Library and Information Centre. Other running expenses are estimated as follows:

Research

This will include in addition to the NADC all standard office expenses, conference attendance, travelling, maintenance of laboratories and technical workshops, some limited research funding for strategic research linked to the maintenance and operation of research equipment, coordination and facilitation of research, etc. Included is also the expense of maintaining and servicing the research equipment, both laboratory and ship based. Although this has not been investigated in any detail, the following seem realistic amounts:

Table 4: Estimated running costs for the science function

Item	Cost
Office expenses:	
• CEO	500 000

• 5 Scientists @ R250 000	1 250 000
• 10 Technical support staff @ R50 000	500 000
Research equipment @ ~5% of purchase price	4 000 000
Coordination and facilitation of research (workshops)	1 000 000
Restricted research budget	2 750 000
NADC	1 400 000
Total	**11 400 000**

Other Running Expenses

Other running expenses would be those linked to:

- the Liaison and Outreach function, which would require in addition to the Library and Information Centre, an estimated amount of R 3 000 000.00 for Science Awareness and Education, Marketing and Communication and Stakeholder Liaison.
- Administrative Support, i.e. HR and Finance are estimated to be in the order of R1 500 000.00, and
- Corporate Overheads, estimated at about R2 000 000.00 per year.

7.5 Budgetary implications

The budgetary implications of operating a research entity as envisaged above amount to about R156.6 million annually, excluding any provision for research equipment. This includes the present operational budget of the DAI of R92 million (including the projected shortfall of R10 million on the operation of the SA Agulhas) and an amount of R11.5 million presently spent by the DPW on accommodation of the DAI and maintenance of the bases. An additional R60.6 million will therefore be required annually to operate the facility as envisaged. In addition provision will need to be made for the acquisition of essential research equipment during the first three years. This is estimated at R 10 million in year 1, R19 million in year 2, and R26 million in year 3, whereafter a smaller amount will be required annually for equipment renewal and replacement. A detailed breakdown of the projected annual income and expenditure is provided in Appendix I with a summary of the estimated requirements assuming a phased implementation of the research entity over three years in the table below at constant rand values (i.e. not inflation adjusted).

Table 5: Summary of budgetary requirements for the next four years

Cost item	Financial Year			
	Year 1 2010/11	Year 2 2011/12	Year 3 2012/13	Year 4 2013/14
DAI logistics	82 000 000	82 000 000	82 000 000	82 000 000
SA Agulhas shortfall	10 000 000	10 000 000	10 000 000	10 000 000
SA Navy seconded staff	500 000	500 000	500 000	500 000
DPW lease and maintenance	11 500 000	11 500 000	11 500 000	11 500 000
DST 2/3 of Broadband	2 000 000	2 000 000	2 000 000	2 000 000
New functions	22 500 000	35 000 000	46 500 000	46 500 000
Total recurring	**128 500 000**	**141 000 000**	**152 500 000**	**152 500 000**
Research Equipment	10 000 000	19 000 000	26 000 000	10 000 000
IT equipment NADC & new staff	1 200 000	200 000	200 000	-
Total for Research Entity	**139 700 000**	**160 200 000**	**178 700 000**	**162 500 000**
NRF/DST Research Funding	16 000 000	20 000 000	25 000 000	25 000 000
Total: Antarctic and S Oceans	**155 700 000**	**180 200 000**	**203 700 000**	**187 500 000**

To this will need to be added the once-off expenses of converting the existing first floor of the Waterfront Building into offices and laboratory space estimated at R18 million and R500 000 to furnish the offices in year 1

The above approach makes provision for a phased implementation of the research entity over three years (see line item New Functions and research equipment in Table 5 above), so that the entity will become fully operational during the third year of its existence, i.e. close to the expected delivery date of the new research vessel. Total amount of new funds required to establish the research entity will therefore be (at constant R value):

Year 1	R43.7 million plus R18.5 million for accommodation
Year 2	R64.2 million
Year 3	R82.7 million and
Year 4 onwards	R66.5

These amounts include the R10 million present shortfall in operational cost of the SA Agulhas. The provision for research equipment of R10 million per year from Year 4

onwards is primarily for depreciation in order to enable replacements and or upgrades in years to come.

Concomitant with such a phased approach in the establishment of the entity there should also be a growth in the research budget as shown in Table 5 above to make provision for research projects of staff of the entity as well as an increase in researchers and research students at universities as a result of the facilitating role of the entity.

7. 6 Important Considerations with Impact on the Budget

7.6.1 Emergency evacuations

The primary considerations for appointing over-wintering personnel at the bases as DEAT staff is the expense in the eventuality of emergency evacuations for medical or other reasons. Such costs are then borne by the state. Insurance cover for expedition members not on the government payroll to cover such eventualities would be exorbitant and beyond the reach of grant-holders. With the establishment of a new research entity, the opportunity of appointing expedition members as public servant falls away and any evacuation expenses in cases of emergencies will become the responsibility of the research entity. Emergency evacuations are by implications very high as this would involve either the dispatch of a ship to the bases or by plane from Antarctica. Such unbudgeted expenses are beyond the means of the DAI at present and hence also of the new research entity in future. Presently the DAI has recourse to Treasury for such additional expenses. With the establishment of a new research entity it will be essential for the DST to guarantee the provision of financial support for emergencies of this nature.

7.6.2 Vulnerability considerations

Research facilities of this nature are comparatively expensive ventures with a growth in expenditure, particularly those linked to the operation of ships, helicopters and fuel beyond the control of the entity. These costs are largely determined by international market trends which not only dictate the fuel price but also the remuneration packages of pilots and sailors, because of their high degree of mobility internationally. The sustainable operation of a research facility of this nature can therefore not be allowed to become trapped in unrealistic MTEF growth scenarios. This is not only the case with

many of the National Facilities at present, but also the DAI whose MTEF allocation for the operation of the SA Agulhas has not increased from the previous to this financial year with a resultant shortfall of R10 million which will need to be found from somewhere to meet fixed obligations to service the bases and the needs of the SAWS. There is a need to ensure institutional robustness to overcome such detrimental limiting conditions. A strong stakeholder commitment is therefore most important, in this case the agencies with a direct interest and their respective line departments, the DST, DEAT and DME, and whose individual voices can be mobilised to collectively overcome the vulnerability concerns.

7.6.3 The DPW dilemma

Experience with the transfer of the National Zoological Gardens as a National Facility of the NRF has shown that the future role of the DPW in the ownership, maintenance and construction of the bases, as well as the lease of the Waterfront Building must be resolved before finalising the establishment of a research entity. The two possible scenarios in this regard are as follows:

- That the DPW continues to provide for the maintenance and the lease of the building in accordance with the Government Immovable Asset Management Act, Act 19 of 2007. This Act stipulates that the custodial function of all immovable assets of national government vests in the Minister of Public Works, whereas the users are the national departments that use these assets in support of their respective service delivery objectives. The Ministers of the respective user departments are responsible for the performance of the functions assigned to them by this act, i.e. the proper management of immovable assets by way of User Immovable Asset Management Plans as part of their strategic plans and submission of these to Treasury with a copy to the "custodian". These asset management plans must be compiled in accordance with principles, standards and regulations as stipulated in the Act and must include needs assessments and true costs of maintenance.

- The costs incurred by the DPW are transferred to the new research entity as part of its core grant from government. In the latter case the research entity would have to take on the responsibility of managing the maintenance programme through sub-

contractors, which may on the one hand be more expensive, but on the other hand could result in gains in terms of efficiency and effectiveness

7.7 Management

The following principles will need to be adopted in the design of the management of the new research facility.

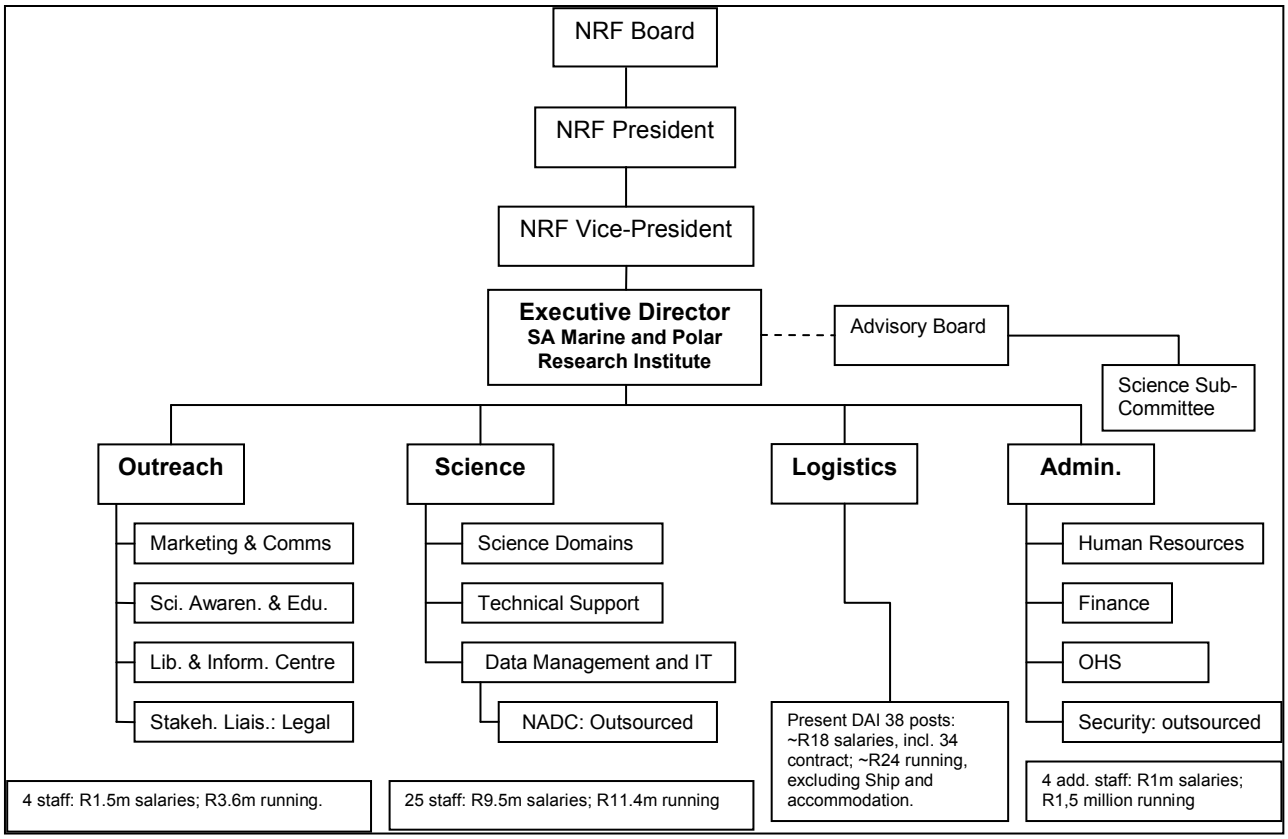
- The facility should be fully funded and there should not be a need to contract the new research vessel out to generate funds in order to keep it afloat.
- The building of capacity in certain weak areas of polar and southern ocean research must not be done at the expense of those disciplines where strength has been built over the years.
- Funding for research should primarily be accessed from a separate budget managed by an agency on a competitive basis.
- The facility must have in house research capacity to facilitate research, coordinate activities and to maintain research equipment.
- Some research funding should be part of the budget of the facility, primarily linked to projects of research staff of the facility responsible for the proper maintenance and functioning of the research equipment, and to initiate projects of strategic importance where capacity needs to be built but is lacking in universities. Such research projects must however also be subjected to peer review.
- Research projects by staff of the facility must in all instances promote collaboration nationally and or internationally and wherever possible involve postgraduate research students.

A management model based on the preceding subchapters is diagrammatically depicted in Figure 1. According to this model, the National Facility is headed by a Director with a strong science background and sound management skills. He is supported in his task by a management team consisting of the Chief Scientist who is also the Deputy Director of the Facility, the Divisional Director responsible for Logistics, the Head of the Liaison and Outreach section and the Head of the Administrative section. An Advisory Board, appointed by the President of the NRF and consisting of representatives of all

stakeholders with a direct interest in the operations of the facility advises the Director and the NRF Executive on:

- The strategic direction and policy matters inasmuch as these impact on the responsibilities of stakeholders and on government as identified in Table 2 above ,
- International and national cooperation and liaison
- Promotion of research at universities, and
- The scientific programme of the facility

Figure 1: Organisational Structure of a S A Marine and Polar Research Institute



The Advisory Board should therefore consists of representatives from DST, DEAT, DFA, SAWS, CGS, PASA, SANBI, and three members of the National Committee of SCAR one of whom should be the chairperson of this committee, and that the Advisory Board is chaired by the responsible line Vice-President of the NRF.

It is furthermore proposed that a Scientific Subcommittee of the Advisory Board be established whose exclusive task it will be to interrogate the scientific programme of the

Facility and its alignment with the strategic research direction, and also to annually assess the outcome of the research undertaken and facilitated by the Institute and report its findings and recommendations for further attention to the Advisory Board. This subcommittee should consist, in addition to the three members of the national committee of SCAR referred to, of a further four members, one of whom nominated by the national committee of SCOR and the remainder appointed by the responsible Vice-President of the NRF in consultation with the Director of the Institute. This committee must be constituted with due cognisance of representation of all the relevant disciplines, with the chairperson of the national committee of SCAR chairing this subcommittee.

Funding of the research should be provided from a ring-fenced allocation by the DST to the NRF. Grant proposals by researchers from universities, Science Councils and National Facilities, as well as from the new Institute, must be submitted to the NRF for peer review. Decisions for funding will vest in a committee of experts chaired by the NRF and convened in consultation with the chairpersons of both the National Committees for SCAR and SCOR. Both the Chief Scientist and the Divisional Director for Logistics of the new Institute will be *ex officio* members of this committee and it will be their task to assess the applications in terms of the aims and objectives of the overall strategic direction of the programme and implications of the logistic requirements.

8 RECOMMENDATIONS AND CONCLUSIONS REGARDING A POLAR RESEARCH ENTITY

8.1 Name

In considering a suitable name for a research entity of this nature some consideration must be given to the broader needs of the country particularly, regarding marine research. The geographic sphere of interest as defined in the terms of reference as stretching south of the mainland to Antarctica, excludes, by definition involvement in programmes relating to the east and west coast of the country. It is furthermore noted that the other three research vessels under jurisdiction of MCM are also not optimally deployed and that there is a considerable amount of spare capacity available. This, seen in the light of the vastness of South African territorial waters which is due to expand even further with the present continental shelf claim process, the statutory responsibilities of the CGS, PASA and SANBI, regarding geoscientific information of the marine environment, the oil potential of the continental shelf areas and biodiversity assessment and conservation respectively, then there is a huge potential demand on all available research vessel for many decades to come. Very serious consideration therefore needs to be given to a facility where all research vessels are pooled and operated as a national facility. This would greatly enhance flexibility of use by all, as long as availability for MCM can be secured at certain times when MCM require them traditionally for their surveys.

Although such a broader entity is beyond the scope of this investigation, the new National Facility should be conceptualised as a platform that could pave the way for an expanded facility for all marine research and not restricted to the Southern Oceans in years to come. It is for this reason that Marine rather than Southern Ocean in its name is preferred. There was also some discussion around Antarctica vs. Polar in the name and although Antarctica very specifically defines the geographic area of interest, some prefer “Polar” in the name as researchers will invariably wish to become involved in comparative studies of both polar regions in order to better understand Earth System processes globally and hence also the interpretation of research findings in the Antarctic region.

For the above reasons a name akin to the “South African Marine and Polar Research Institute (SAMPRI)” is recommended. However, should such a broad definition not be acceptable a more narrowly defined facility could be referred to either as the “South African Marine and Antarctic Research Institute (SAMARI)”, or even more narrowly as the “South African Antarctic and Southern Oceans Research Institute (SAASORI).”

8.2 Preferred Location of the Research Institute

There is no doubt that Cape Town is the obvious choice for the location of the Research Institute, with the present Waterfront offices of DAI as a prime location with more than enough space for offices of staff and visiting scientists and students, laboratories, technical workshops, library and Information Centre and the NADC. This is supported by the presence of many SANAP researchers at UCT, US and UWC, as well as ACCESS and the Climate and Marine Research Group of the CSIR at Stellenbosch, the Space Physics group of the HMO, the MCM research office in Cape Town, the marine unit of SANBI at Kirstenbosch, the Egagasini node of SAEON at MCM in Cape Town, the offices of PASA in Parow and the marine geosciences unit of the CGS in Bellville. The proximity of virtually all the stakeholders will considerably ease coordination and interaction of activities. Some concern has been expressed by researchers physically removed from this hub of Marine and Antarctic research and that researchers close by will stand to benefit more from the Institute than others who will feel marginalised. This the Institute will need to manage very carefully, and could be overcome e.g. by the strategic placing of post-doctoral researchers and thereby strengthening the research efforts of the more remote centres of expertise.

A further advantage of Cape Town is the proximity of three other National Facilities of the NRF which could create some economies of scale by sharing of expertise and facilities, specifically technical knowhow and skills.

8.3. Implementation Strategy

As already indicated above, a phased implementation approach over a period of three years is recommended.

Preparatory phase

- First and foremost would be an agreement at Cabinet level of the establishment of such an Institute. However, prior to the Minister of S&T declaring such an Institute as a National Facility by way of a notice in the Government Gazette, the Minister will need to apprise the Board of this decision and solicit its comments. The affected staff of DAI will also need to be informed.
- Secondly the DST will need to prepare a budget submission to Treasury whereby the phased implementation of the Institute over the next MTEF is outlined and motivated.
- Thirdly, once a budget has been secured from Treasury, the NRF can proceed with the appointment of the Director of the Institute.

Phase 1 of the Implementation (Year 1)

- Transfer of DAI as a going concern to the NRF
- Adaptation of policies and procedures
- Staff negotiations to align conditions of employment
- Development of strategic plan for the new Research Institute by the Director in consultation with stakeholders
- Appointment of key staff
- Refurbishment of first floor of the Waterfront Building
- Supervision of the construction of the new research vessel

Phase 2 of the implementation (Year 2)

- Appointment of further staff
- Equipping research laboratories and workshops
- Appointment of the Advisory Board
- Development of Business Plan based on the Strategic Plan and MTEF budget allocation
- Commence with establishment of NADC
- Supervision of construction of the new research vessel.
- Training of technical staff in use of research equipment on the new vessel

Phase 3 of the implementation (Year 3)

- Appointment of remainder of staff

- Establishment of Library and Information Centre
- Development of science education and outreach programmes
- Commissioning of new research vessel and research equipment

8.4 Benefits of the National Facility for the Country

8.4.1 South Africa's impact on the Antarctic Treaty System

There is widespread concern that South Africa's role in the Antarctic Treaty System and its participation and contributions to the deliberations to the ATCM, CEP and CCAMLR are not commensurate with its position as a key southern hemisphere stakeholder. South Africa is widely expected to assume a much higher profile and exert considerably more influence in these deliberations, given its:

- geographic location,
- status as an original signatory of the Antarctic Treaty, and
- Africa's voice in this strategically important and environmentally significant sector of the globe.

A National Facility as envisaged will greatly enhance South Africa's voice and political standing within the member community of the Antarctic Treaty Systems as it will

- enhance appropriate research to contribute knowledge of relevance to the deliberations at the ATS meetings,
- enable South Africa to speak with considerably greater authority on issues of relevance concerning the Southern Oceans and Antarctica, and
- showcase South Africa's research contributions and involvement in Antarctica and the Southern Oceans.

8.4.2 Southern Oceans and Climate Change

As our knowledge of the body of ocean between South Africa and Antarctica increases, it is becoming increasingly more apparent that this body of water has a significant influence on the climate of the Earth in general and Southern Africa in particular. South Africa is uniquely positioned to play a significant part in expanding knowledge and understanding of coupled ocean-atmosphere processes in this area and how they change over time. Ironically though, scientific investigations in this area are led virtually exclusively by international consortia where South Africa plays a very minor role.

A new Research Facility will change this. It will facilitate a South African science led approach to understand climate change processes and their impact on South Africa as envisaged in the Global Change Grand Challenge of the DST and become an essential component of a nationally coordinated effort to understand the processes of climate change and to prepare the nation for the impact thereof. The National Facility will furthermore facilitate cooperation and networking with several international efforts in this regard, thereby adding considerable value to our own initiatives.

8.4.3 Conservation of our biodiversity

The SANAP has traditionally played a significant part in the conservation of the unique biodiversity of the PEIs and the quality and significance of the research that has underpinned this is acclaimed internationally. This will not only continue under the auspices of a new National Facility, but will need to expand considerably as the revised Environmental Management Plan for the PEIs Special Nature Reserve becomes operational and the Minister declares the envisaged large MPA around these Islands in the near future. Considerably more ship based research and monitoring activities to study the protected ecosystems and their biodiversity with specialised infrastructure, equipment and staff will however be required than available at present, which a National Facility with improved resources than presently available will be able to provide. Important also is that the knowledge gained from this kind of research on and the monitoring of the biodiversity can contribute substantially in terms of South Africa's commitments to CCAMLR, CEP and other conventions.

8.4.4 Improved weather predictions

The quantity and quality of weather observations in the Southern Oceans and the Antarctic impacts directly on the accuracy and reliability of forecasting and weather warning service over Southern Africa in general and South Africa in particular. This is of direct socio-economic significance, as correct warnings both short-term (expressed in days) and longer term (expressed in seasons) enable the nation to take measures aimed at mitigating the impact of severe weather conditions. Access to improved infrastructure, such as strategically located moored buoys, upgrading of weather stations on islands west and south of Gough Island, access to information from Argos buoys etc. would enable this and could be facilitated by a National Facility with more flexibility in logistic support than is the case at present.

8.4.5 Statutory obligations of other State Agencies

At least three other state agencies have a direct interest in South Africa's territory of the Southern Ocean by virtue of their respective mandates, but to date never had the opportunity nor the resources to pursue their respective mandates in these terrains to any extent. A National Facility will certainly change this, although the potential needs of these agencies outweigh by far the capacity vested in the National Facility as conceptualised. This situation could change though, if all research vessels presently under the jurisdiction of MCM are pooled in an expanded National Facility and either resourced optimally to operate throughout the year, or the respective agencies are funded appropriately to access the required infrastructure. Reference here is made to the following:

- SANBI whose mandate in terms of the NEMBA is among others to report regularly on the country's biodiversity status with particular reference to threatened or protected species and listed ecosystems. It has only recently commenced with building some capacity in marine biodiversity and has adopted an approach of "managed networks" to achieve its objectives. However, given the expanse of marine environments involved, a considerably enhanced effort will be required to make some inroads in our understanding of these in the Southern Oceans.

- The CGS whose function it is to gather geological information and insights of South Africa's territories, including the marine environment, to stimulate development and contribute knowledge in a broad area including environmental geosciences, palaeo-climates and minerals development. Activities to date have been restricted to the near shore environment, and they are very interested in expanding their activities to the Southern Oceans.

- PASA's interest focuses particularly on those areas of the continental shelf with potential to host oil resources. It is mandated to undertake assessments of areas with oil resource potential in order to stimulate exploration by the private sector and has plans to undertake substantive surveys every two years for the foreseeable future for which it seems to have access to resources. PASA would prefer to utilise a

South African facility for these surveys in order to spend money locally and to build expertise in marine geophysics in the country.

8.4.6 Global Science Impact

Antarctica and the Southern Ocean is one of the few science platforms where South Africa enjoys a considerable geographic advantage over other nations. It is an area recognised in the National R&D Strategy where we need to focus our strengths, where we can make substantial contributions to the global knowledge pool, where we can function as a respected and equal partner in the international science community, where we can nurture international cooperation and where our investments can leverage considerable benefits in terms of access to resources, to knowledge and to technologies. It is an area that lends itself to the popularisation of science that ignites the imagination and attracts the youth to become involved and to choose science as a career. But it does require a National Facility to achieve these objectives, to facilitate the revitalisation of essential disciplines that have been in decline, to pursue international collaboration, to leverage the benefits and to stimulate the youth through outreach programmes.

8.4.7 Technology Development

A competitive national programme focussing on the Southern Ocean and Antarctica will require access to an array of commercially available state-of-the art technology for the wide spectrum of scientific endeavours. Access to such technologies will be provided by a National Facility in addition to the development of skill to access and use these technologies. With maturation of the National Facility programmes can be initiated and facilitated that focus on technology development of relevance to instrumentation of importance to the mandate of the Facility but with wider potential applications, such as control systems, power sources for remotely operated instruments, sensors and such like. This in itself can have a variety of spin offs, such as advanced technical training, commercialisation of the developed technologies, and showcasing of South Africa's technological capabilities.

8.5 Concluding Remarks

The present management structure of the SANAP across two departments is an untenable arrangement that cannot do justice to the strategic importance of the Southern

Oceans and Antarctica to South Africa. There is no doubt that South Africa has much to gain by the establishment of an Institute for Marine and Antarctic Research as a National Facility and the return on the proposed modest investment is quite substantive when considering the gains to be achieved in the wide sphere of endeavours outlined in Chapter 8.4 above. In addition the Institute will become the portal or point of entry for many in the North wishing to partner South Africa in its ventures in the South, as it is such an institute that will be able to speak most authoritatively on the country's collective scientific endeavours and initiatives in the Antarctic and the Southern Ocean. It is this insight as well as a sound knowledge of the scientific endeavours of other nations that will also enable the Institute to provide quality policy advice to Government on the key issues affecting the region.

APPENDIX I: Operational Budget, Capital Requirements and Capital Assets of a proposed South African Marine and Polar Research Institute (Excluding Agency funds for research)

EXPENDITURE

Salaries, full-time permanent:		R27.0 million
Existing DAI	R15.5 million	
Seconded Navy staff	R 0.5 million	
Science	R 8.5 million	
Administration	R 1.0 million	
Liaison and Outreach	R 1.5 million	
Running expenses:		R43.5 million
Existing DAI	R27.0 million	
Science	R11.4 million	
Administration	R 1.5 million	
Outreach	R 3.6 million	
NRF Levy Allocation		R 5.0 million
Direct costs:		
Internal and External Audit fees	R 1.0 million	
Insurance and Licences	R 1.2 million	
Data-line charges (Internet)	R 0.8 million	
Indirect costs:		
Corporate Overheads	R 2.0 million	
Movable Asset Replacement		R 2.5 million
Existing DAI (R5 million every two years)		
Lease Agreements		
Waterfront offices (DPW)		R 6.5 million
Ship operating costs		R61.0 million
185 days per year (existing)	R47.0 million	
Additional 120 days	R14.0 million	
Broadband costs (DST component)		R 2.0 million
Maintenance of Bases (DPW)		R 5.0 million
Total estimated expenditure of research entity		**R152.5 million**

INCOME

Existing DAI Budget		R 82.0 million
Existing DPW		R 11.5 million
Existing Broadband costs (DST)		R 2.0 million
Existing Navy staff		R 0.5 million
Additional annual income required for a research entity		**R 56.5 million**

Additional Capital Expenses (Research Equipment)

Year 1		
Science Equipment for Marion		R 2.0 million
Instrumentation for Ocean Carbon Observation (Year 1)		R 6.0 million
Trawling nets		R 2.0 million
Year 2		
Science Equipment for Labs in Cape Town		R 4.0 million
Instrumentation for Ocean Carbon Observation		R 15.0 million
Year 3		
Science equipment for labs in Cape Town		R 6.0 million
Instrumentation for Ocean Carbon Observation		R20.0 million

Additional once-off expenses

Refurbishment, first floor of Waterfront Building.		R18.0 million
~1430 sq m office space @ R6000/sq m	R 8.6 million	
~720 sq m laboratory space @ R13 000/sq m	R 9.4 million	
Furnishing of offices		R 0.5 million
IT Infrastructure for new staff and NADC		R 1.6 million

Capital Assets: Fixed

SA Agulhas replacement (2012)	R 1 100.0 million
Marion base	R 110.0 million
Gough base replacement (SAWS, 2012)	R 85.0 million
SANAP	R 230.0 million
Total Estimated Fixed Assets	**R1 525.00 million**

Capital Assets: Movable

Caterpillars, Skidoos, sledges, tanks, etc. (replacement value)	**R50.0 million**

APPENDIX II: ABBREVIATIONS

ACCESS	African Centre for Climate and Earth System Science
ADCP	Acoustic Doppler Current Profiler
ALCI	Antarctic Logistics Centre International
ARESSA	Antarctic Research Strategy for South Africa
ATCM	Antarctic Treaties Consultative Meetings
AWI	Alfred Wegener Institute for Marine and Polar Research
BAS	British Antarctic Survey
BEE	Black Economic Empowerment
CCAMLR	Convention for the Conservation of Antarctic Living Resources
CEP	Committee for Environmental Protection
CGS	Council for Geoscience
CMNAP	Council of Managers of Antarctic Programmes
CPAS	Convention for the Protection of Antarctic Seals
CSIR	Council for Scientific and Industrial Research
CTD	Conductivity Temperature Depth
DAI	Directorate Antarctica and Islands
DFA	Department of Foreign Affairs
DEAT	Department of Environmental Affairs and Tourism
DPW	Department of Public Works
DST	Department of Science and Technology
EEZ	Exclusive Economic Zone
EMP	Environmental Management Plan
GAW	Global Atmospheric Watch
GCGC	Global Change Grand Challenge
GPS	Global Positioning System
HMO	Hermanus Magnetic Observatory
IBSA	India Brazil South Africa
ICSU	International Council for Science
ICT	Information and Communication Technologies
IPY	International Polar Year
IMS	International Monitoring System
MCM	Marine and Coastal Management
MPA	Marine Protected Area
MTEF	Medium Term Expenditure Framework
NACI	National Advisory Council on Innovation
NADC	National Antarctic Data Centre
NPI	Norwegian Polar Institute
NSF	National Science Foundation
NSI	National System of Innovation
OPP	Office of Polar Programmes
PASA	Petroleum Agency of South Africa
PEIs	Prince Edward Islands
RU	Rhodes University
SAAPRC	South African Policy and Research Committee
SAASTA	South African Agency for Science and Technology Advancement
SAEON	South African Environmental Observation Network
SANAE	South African National Antarctic Expedition
SANAP	South African National Antarctic Programme

SANBI	South African National Biodiversity Institute
SAWS	South African Weather Service
SCAR	Scientific Committee for Antarctic Research
SCOR	Scientific Committee for Oceanic Research
SETI	Science Engineering and Technology Institution
SOOS	Southern Oceans Observation System
UCT	University of Cape Town
WMO	World Meteorological Organisation

APPENDIX III: TERMS OF REFERENCE

AN INVESTIGATION INTO AN OPTIMAL MODEL FOR THE ESTABLISHMENT OF A SOUTH AFRICAN POLAR RESEARCH ENTITY

1. ASSIGNMENT TITLE

An investigation into an optimal model for the establishment of a South African Polar Research entity

2. ASSIGNMENT PRINCIPAL

The Assignment Principal is the Vice President and Managing Director, Research and Innovation Support and Advancement (RISA), the National Research Foundation (NRF).

The role of the Assignment Principal will be to:

- approve the terms of reference;
- approve the budget;
- receive the final report from the Service Provider/consultant.
- liaise with the Departments of Science and Technology (DST) and Environmental Affairs and Tourism (DEAT) on matters relating to the principle decisions and the way forward

3. PROJECT MANAGER

The National Research Foundation (NRF), represented by the NRF Executive Director: Knowledge Fields Development (KFD) will be the Project Manager of the investigation.

The role of the Project Manager will be to:

- appoint the Service Provider/consultant.
- source necessary resources for conducting the investigation
- facilitate the service provider's access to relevant document and stakeholders
- ensure that the Service Provider completes the assignment on time and within the budget.

4. SERVICE PROVIDER

An appointed consultant will act as the service provider. The responsibilities of the service provider will be to:

- develop a programme for the investigation, including a budget;
- submit the draft programme and budget for approval by the Assignment Principal
- manage, coordinate and administer the process, including logistics of the investigation;
- source the necessary information from all relevant sources and stakeholders with the assistance of the South African National Antarctic Programme (SANAP) management team
- prepare and submit the report of the investigation

5 BACKGROUND

5.1 General

South Africa's geographic location and its status as an original Antarctic Treaty Consultative Party (ATCP) govern the nation's strategic involvement in Antarctica* matters. This involvement endorses the Antarctic Treaty System (ATS) and underpins national sovereignty over the Prince Edward Islands. It aims to keep the region free of international discord (as per Antarctic Treaty Article I) and ensures that national interest is served through informed decision-making as well as meaningful international engagement.

The SANAP**:**

- Maintains a presence on Marion and Gough Islands.
- Maintains a base on the Antarctic Continent (SANAE IV):
  In terms of the Antarctic Treaty Articles II, III & IX.
- Undertakes scientific research in the Southern Ocean and Antarctica:
  Research ensures participation in international decision-making as a credible ATCP and also addresses scientific and economic issues of importance.
- Aims to meet ATS obligations:
  As some ATS instruments impact on national sovereignty (e.g. Prince Edward Islands).
- Aims to ensure that decisions are made in the national interest:
  Given the expansion of the Antarctic region under international control/influence. Aimed at avoiding exclusion without participation.
- Assumes a role of responsible political leadership:
  South Africa plays a leading role and is the only African ATCP, and the *only* original southern hemisphere non-claimant ATCP. South Africa is also an aligned nation.
- Accounts for geographic considerations:
  South Africa is "downstream" and adjacent to any likely consequences of human or environmental effects occurring in Antarctica and the Southern Ocean. This is particularly important in terms of shared resources and possible environmental

** For the purposes of this document the "Antarctic" refers to the region south of Africa. This includes the Prince Edward Islands, over which South Africa exercises undisputed sovereignty, and comprises the Southern Ocean and sub-Antarctic islands (especially Gough Island) as well as the Antarctic continent.*

impacts on the African sub-continent.

SANAP is a multi-disciplinary programme, which facilitates national participation in research on global climate change, space physics, earth sciences, oceanography, biology and potentially exploitable resources and also socio-economics and history. It alsocontributes to fulfilling obligations to a number of international treaties and conventions. Together these considerations ensure that in the nation's best interest:

- Antarctica remains free of international discord;
- South Africa meets its legal obligations under the various international treaties, conventions and agreements pertaining to Antarctica to which it is party;
- South Africa retains access and remains party to international-decision making in the region;
- Foreclosure of potential economic options, including access to living and non-living resources is avoided and the promotion of such options is preserved;
- Regional and local weather forecasting is augmented by high quality weather monitoring and predictive capabilities through direct observation, remote monitoring from various locations and weather buoy deployment in the Antarctic region; and
- Antarctic scientific endeavour is promoted to address strategic, environmental, technological and educational considerations, and scientific information continues to be freely exchanged amongst the parties.

5.2 Key strategic considerations

Key strategic considerations underpinning SANAP include:

- Emphasis of South Africa's geographic location, sovereignty over the Prince Edward Islands and the principle of non-advancement of any claim to territory south of 60^0 S; an area which South Africa views as *terra nullius;*
- Promotion of South Africa's status as an African, non-aligned and regional-political power in the exercise of control and administration of the Southern Ocean and Antarctic region;
- Making optimal use of local expertise in developing South Africa as a "gateway" (i.e. as an economically competitive and convenient site of access) for Antarctic activities;
- Ensuring that the most is made of economic opportunities in the Antarctic region, including resource utilisation, ecotourism development and provision of logistical support;
- Preserving South Africa's influence in a strategically-important and environmentally-crucial sector of the globe, which has potential to influence economic and environmental well-being;
- Utilising the unique opportunities provided by the Southern Ocean and Antarctica for scientific endeavour in the interests of contributing to the creation of expertise and to technological advancement; included also is the opportunity to monitor the effects of global warming and associated environmental changes, particularly in the sub-Antarctic.

- Fostering national and international liaison; including diplomatic opportunities;
- Facilitating research in strategically important fields;
- Promoting educational opportunities, the national transformation agenda and capacity building; and
- Providing decision-makers with appropriate strategic and scientific advice.

5.3 Strategic assets

SANAP has substantial assets associated with its implementation and management. The DEAT and DST are currently responsible for the Programme. The DEAT is primarily responsible for logistical support, while the DST supports the management of the science.

- Capital Assets

  The major capital assets are logistic in nature and support SANAP activities. They include the three bases (SANAE IV, Marion and Gough), the supply vessel SA Agulhas, and specialised vehicles, scientific and other equipment. The replacement value of assets is approximately R1. 5 billion.

- Human Resources

  A depth of scientific, logistic and technical expertise has developed within SANAP. This expertise comprises about 200 people in a variety of government departments and institutions (including universities), which support the SANAP effort, in either a full of part-time capacity.

- Management Structure

  SANAP's management structure is linked to the deployment and utilisation of assets. The logistic component of the Programme is the responsibility of the Directorate: Antarctica and Islands of the DEAT. The research component is carried out under the auspices of the DST. The two Departments determine policy formulation and direction.

- Running Costs

  The day-to-day logistics is principally the responsibility of the Directorate: Antarctica and Islands. Annual running costs stand at approximately R65 million per annum, which includes the operation of SA Agulhas, Bases and staff salaries. The SANAP science component represents a further R14 million excluding salaries of administrative and external scientific staff.

6. THE SCOPE OF THIS INVESTIGATION

Based on the findings and recommendations of the 2007 *Review of the South African National Antarctic Programme*, the investigation should:

- Review and analyze the key issues raised in key documents related to polar research such as the SANAP review reports; due diligence report; existing legislation and

international agreements as part of the Antarctic Treaty System; the state of discussions on the declaration of Prince Edward Island as a World Heritage Site as well as those arising out of consultation with key stakeholder *inter alia:*

- Department of Science and Technology
- Department of Environment Affairs and Tourism
- Department of Foreign Affairs
- SANAP science community
- National Research Foundation
- The South African Weather Services
- The Council for Geoscience (marine geology of exclusive economic zone)
- Scientific Committee for Antarctic Research (SCAR)
- Relevant international roleplayers, such as Australian Antarctic Division, British Antarctic Survey, the National Science Foundation (NSF), the Alfred Wegener Institute for Polar and Marine Research and the Norwegian Polar Institute.
- Joint Committee on Antarctic Data Management (Taco de Bruin)

- Recommend with provisional cost(s) a model(s) for a suitable entity that would facilitate polar research. The model(s) of the entity should address the governance and organizational structure of the entity, including for example, the implications to meet the requirements of a National Facility as recommended in the *System Wide Review* of 1998

Specifically, the recommended model(s) should address the **optimal** conditions for:

- **Location (geography /governance arrangements) of the entity**
  - Relationship regarding the statutory obligations vested in SANBI and other related bodies

- **Institutional structure of the entity, and its management**
  This refers to the required institutional human resource arrangements and requirements such as:
  - Core functions, i.e. present staff possibility to be transferred, scheduling and infrastructure; transfer implications relating to conditions of services
  - Support functions like HR, finance that is provided by DEAT and implications for other bodies to which the facility/entity would be transferred
  - Out sourced functions if any and so on

- **Logistics and infrastructure management**
  With specific reference to an assessment of:
  - the existing infrastructure; and additional infrastructure that will be required to support the science e.g. data management infrastructure; connectivity etc
  - an optimal system for the management and maintenance of infrastructure and logistics in the new model?
  - cost of the infrastructure and logistics in the proposed model both short term, that is, directly related to the transfer, and long term, with respect to conversion into a “national facility”

- **Science**

Investigate and recommend areas of science that would constitute an appropriate research framework for the proposed model. This investigation should take cognizance of the recommendation contained in the 2007 review of the SANAP

programme with respect to the ARESSA; as well as the key strategic directions contained in the DST 10 year Innovation Plan, SCAR and others. The investigation should also consider the expectations of the Research Community in terms of research support, international collaboration/agreements, ship time , IT connectivity and specific field linkage with areas such as: Geosciences, including marine geology; Oceanography; Space Physics (SHARE and SuperDARN); Biodiversity; Climate change; those linked to other themes of the DST sponsored research programmes etc

7. DELIVERABLES

- An interim draft report should be presented to key stakeholders - DST, DEAT, NRF and polar science community - (March 2009).

- A final report to the Assignment Principal (Mid May 2009). The report should include:
    - an executive summary;
    - overview of the investigation;
    - key findings;
    - recommendations, and
    - appendices containing, e.g. terms of reference, persons interviewed.

8. TIME FRAME

The review, including the submission of the report will take place from 2 Februrary 2009 to 15 May 2009.

9. BUDGET

9.1. The Service Provider will submit a budget for the review to the Assignment Principal for approval.

9.2. The costs incurred for the review will be covered by the South African National Antarctic Programme.

The terms of reference may be amended should the need arise.

APPENDIX IV: PERSONS CONSULTED

Dr I Ansorge, Oceanography	University of Cape Town
Dr J Augustyn, Chief Director: Research	MCM, DEAT
Prof M Bester, Zoology	University of Pretoria
T Bossinger, Professional Officer: KFD and SANAP	National Research Foundation
Dr P Cillier, Research Scientist	Hermanus Magnetic Observatory
Dr A Collier, Reserach Scientist	Hermanus Magnetic Observatory
Prof J Cooper, Zoology	University of Cape Town
Prof S Chown, Director: CIB	University of Stellenbosch
Prof J Compton, Marine Geology	University of Cape Town
Prof D Cowan, Microbiology	University of the Western Cape
B Damonse, Executive Director	SAASTA
Prof M de Wit, Director: AEON	University of Cape Town
Dr J Diener, Geology	University of Cape Town
Dr M Doucouré, COO: AEON	University of Cape Town
Prof J Field, Director: Ma-Re	University of Cape Town
Prof W Froneman, Zoology and Entomology	Rhodes University
Dr O Gon, Research Scientist	SAIAB
Dr G Grantham,	Council for Geoscience
Prof C Harris, Geology	University of Cape Town
Dr J Hermes, Manager: Egagasini Node	SAEON
Dr B Janse van Vuuren, Molecular Genetics	University of Stellenbosch
Dr A Kaniki, Executive Director, KFD	National research Foundation
R Kriger, Executive Director: Int. Science Liaison	National Research Foundation
Dr L Magnus, Research Scientist	Hermanus Magnetic Observatory
Dr L Makuleni, Chief Executive Officer	South African Weather Services
Dr S Malinga, Managing Director	Hermanus Magnetic Observatory
Dr J Marot, Manager: Frontier Geology	Petroleum Agency of South Africa
Dr P Matutu, General Manager	DST
Dr K Maze, Chief Director: Biodiversity Planning	SA National Biodiversity Institute
Dr G Mazithulela, Vice-President, Nat. facilities	National Research Foundation
Prof S McCourt, Geology	University of Kwazulu-Natal
Prof C McQuaid, Zoology and Entomology	Rhodes University
Prof I Meiklejohn, Geography	University of Pretoria
Dr P Monteiro, Head, Ocean Systems and Climate	CSIR, Stellenbosch
Prof H Moraal, Physics	North-West University
A-M Niewhoudt, Group Accountant	national research Foundation
J Pauw, Managing Director	SAEON
Dr B Oppermann, Research Scientist	Hermanus Magnetic Observatory
M Pienaar-Marais, Manager: Corp. Governance	National Research Foundation
Prof. J Rash, Physics	University of Kwazulu-Natal
Prof P Ryan, Zoology	University of Cape Town

G Schulze, General Manager, Executive Projects	South African Weather Services
Prof. Y Seleti, Acting Deputy Director General	DST
Dr G Siko, Manager	DST
B Singh, Executive Director Finance	National Research Foundation
Dr K Sink, Manager: Marine programmes	SA National Biodiversity Institute
Prof. P Skelton, Executive Director	SAIAB
Dr G Smit, Chief Director, Biosystems	SA National Biodiversity Institute
K Smith, Manager: Marine Geoscience	Council for Geoscience
Prof. V Smith, Zoology	University of Stellenbosch
C Steele, Manager, KFD and SANAP	National Research Foundation
Dr G Susino, OSL dating	University of the Witwatersrand
Dr P Sutcliffe, Research Scientist	Hermanus Magnetic Observatory
M Thaoge-Lefyeti	DST
P Thompson, Executive Director, HR	National Research Foundation
Dr R Uken, Marine Geology	University of Kwazulu-Natal
H Valentine, Director	Antarctica and Islands, MCM
R van Deventer, Architect	Spaceworx
Dr A Van Jaarsveld, Acting President	National Research Foundation
Prof D Walker, Physics	University of Kwazulu-Natal
Prof M Watkeys, Geology	University of Kwazulu-Natal
Dr P Zawada, Executive Manager	Council for Geoscience