

# **SOUTH AFRICA'S APPROACH TO FORESIGHTING: A DEVELOPING COUNTRY'S PERSPECTIVE**

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## **Abstract:**

The Department of Arts, Culture, Science and Technology (DACST) has been conducting a National Research and Technology Foresight (NRTF) project for the past two years. The aim of the NRTF is to identify emerging technologies and market opportunities that can be beneficial to South Africa in the next five years or so. The outputs of the study will be used to guide DACST and other government department in the funding of some areas of research and technology development.

In order to identify emerging technologies, four macro scenarios were developed in order to understand the environment in which South Africa might be operating in. The implications of these scenarios have been investigated for twelve sectors of the Foresight Project. A detailed approach to the foresighting process in South Africa together with some outputs of the Foresight project are presented.

## **South Africa's Foresight**

### **Background**

Shortly after the establishment of the Ministry of Arts, Culture, Science and Technology in 1994, the ministry announced it's intention to carry out a foresight exercise. The project was formally inaugurated in July 1996. In the White Paper on Science and Technology, DACST commits itself to using the results of the foresight exercise as an important input into its investments in research and development within the science budget. The foresight results will also inform the management of

the proposed innovation fund and research capacity-building programmes in the higher education sector.

## **South Africa's Approach to Foresighting**

Although foresight exercises have been conducted in various countries, the objectives, the foci and the approaches tend to vary according to circumstances. A case in point is the nature and extent of participation in the foresight process by wider communities. In Japan, for example, such processes tend to involve only science, technology and industry experts, whereas in countries like the Netherlands the broader community is usually involved.

Methodological approaches tend to differ as well. The Japanese usually focus only on conducting Delphi surveys of future technological trends, whereas the UK foresight employed various methodologies including Delphi surveys and scenario analysis. The United States concentrates instead on drafting lists of critical technologies. The foresight exercise in South Africa, though informed to some extent by approaches of other countries, had to adopt its own approach to fit the South African context. Some of the unique features of the South African Foresight are addressed below:

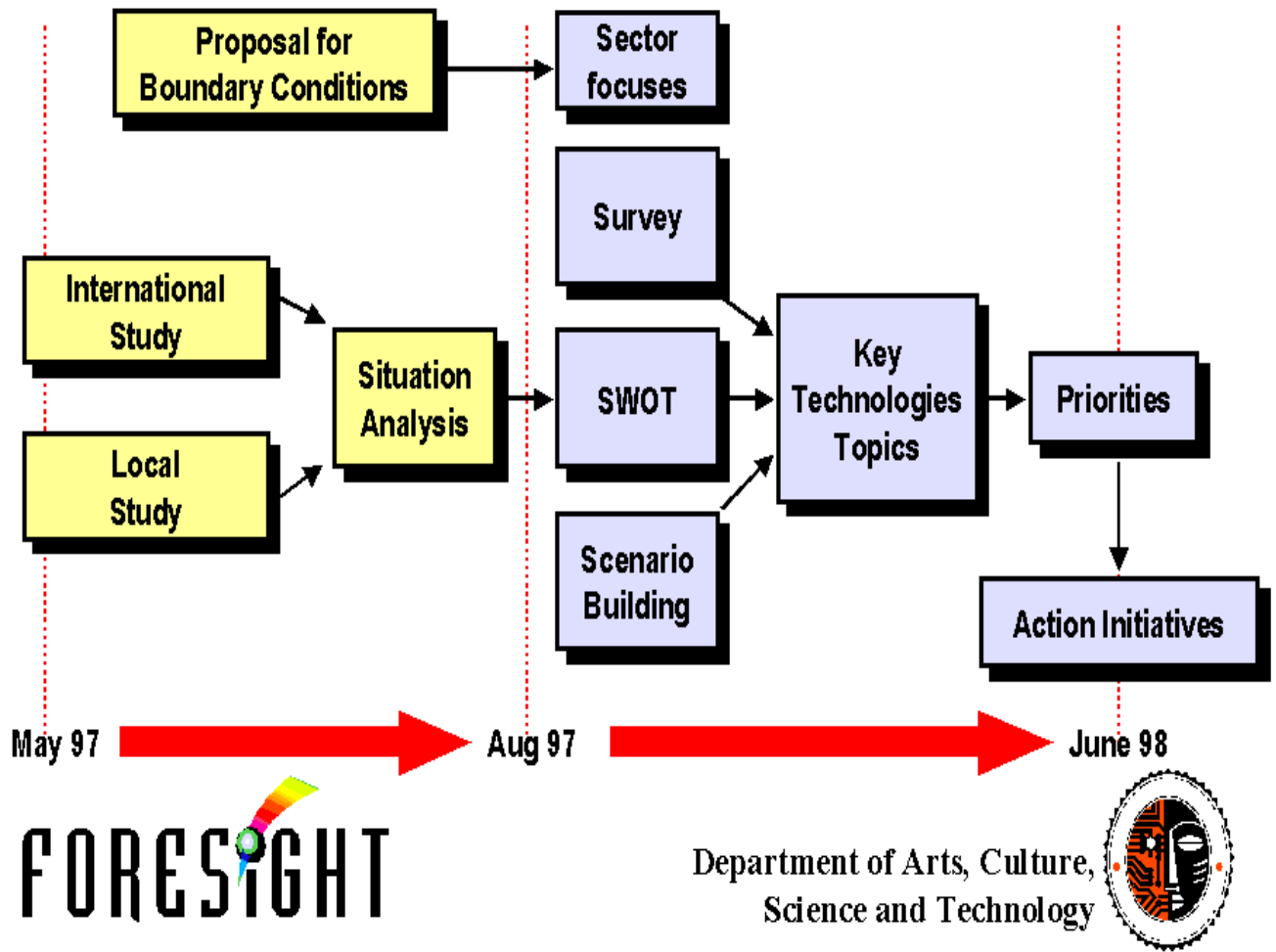
### **Consultation**

Perhaps one of the distinguishing features of South Africa's foresight is the extent of wider community involvement in the process. The foresight programme has been deliberately designed to involve stakeholders such as industry, government, labour and civil society. This inclusive participatory approach is an attempt to give ownership of the process to all sectors of our population.

### **Methodology**

The methodological approach adopted in our foresight employs a combination of techniques. These include strengths, weaknesses, opportunities and threats (SWOT) analysis, scenario analysis and survey of opinions on research and technology trends. Our methodology differs also from other countries in that, to contextualise sector work, macroscenarios for science and technology in South Africa were developed. These provided a uniform frame of reference for all sectors. The section on methodology addresses all of the techniques to be used in the South African foresight exercise in detail.

# Foresight Methodology



## Foresight sectors

The process followed to select the foresight sectors is also one of the special features of our process. A series of countrywide workshops in which participants were asked to identify future priorities for the country were conducted. The sectors that were finally selected reflect the goals of the exercise and have drivers which include social development, technological development and wealth creation.

A total of eight sector selection workshops were conducted countrywide. In total delegates from 21 academic and research institutions, 34 businesses and industries (including business and trade associations), 10 national government departments or policy NGOs, as well as many provincial government departments, and all 8 major science councils participated in this workshop process.

Furthermore meetings with a sector selection focus were held with representatives from an umbrella civic organisation, a provincial trade union confederation and a youth organisation. The outputs of these workshops were analysed and a profile of each sector was compiled using the available data. The data used included current and projected employment figures, GDP contributions, export and other significant statistics. These analyses were presented to the Foresight Advisory Board and DACST which together with the Foresight Team decided on the finalised sectors for the foresight exercise.

## **Consultation**

The initial consultation process was aimed at informing stakeholders about the project. This process was also intended to get feedback on design and methodologies for the project. Many organisations, including government departments, science councils, academic institutions, industry and civil society organisations were consulted during this process. After the sectors were selected, sector-specific consultation was also carried out by each of the sector co-ordinators. Consultation continued into the working phase of the project.

## **Identification of expertise for the foresight process**

Different methods have been applied by different countries that have embarked on similar exercises. In the United Kingdom a method known as co-nomination was used, whereas in France the exercise was primarily carried out by appointed expert panels. Co-nomination is a survey-based technique that allows the major stakeholders and the broad community to participate fully in an open exercise of identifying those individuals who are to participate in sector working groups. For the NRTF project, DACST suggested that a combination of methods be used. These were :

- co-nomination, adapted to our situation to identifying members of the sector working groups;
- direct appointment by DACST in consultation with the Advisory Board and Project Management Team.

The co-nomination objectives were to:

- identify key individuals who would serve as members of the working groups in the sectors covered in the Foresight project;
- build a database of experts who would be consulted by working groups at later stages of the project.

Four iterations of [co-nomination<sup>1</sup>](#) have so far been carried out. The response rate was above 30 % and 2 573 names have been generated so far. Most of the respondents were from higher education institutions (35,3%) and 88,2 % were males.

There were very few individuals from previously disadvantaged backgrounds and from labour organisations identified via co-nomination. To make sure that the make-up of working groups was representative, other individuals were appointed directly into these groups.

<b>Sectors for foresight:</b>
<p><b>Agriculture &amp; Agroprocessing</b></p> <ul style="list-style-type: none"> <li>• Food production, agroprocessing</li> <li>• Forestry and fishing</li> <li>• Food security</li> <li>• The food &amp; beverage industry</li> </ul>
<p><b>Biodiversity</b></p> <ul style="list-style-type: none"> <li>• Conservation</li> <li>• Sustainable use of biodiversity</li> </ul>
<p><b>Business and Financial Services</b></p> <ul style="list-style-type: none"> <li>• Capital flow</li> <li>• Venture capital availability</li> <li>• Applications of information and communication technologies</li> </ul>
<p><b>Energy</b></p> <ul style="list-style-type: none"> <li>• Alternative sources</li> <li>• Generation</li> <li>• Distribution</li> </ul>
<p><b>Environment</b></p> <ul style="list-style-type: none"> <li>• Pollution control and waste management</li> <li>• Natural resource management</li> </ul>
<p><b>Manufacturing &amp; Materials</b></p> <ul style="list-style-type: none"> <li>• Specific industries / sectoral perspective</li> <li>• Primary production</li> <li>• Market niches</li> </ul>

**Foresight Methodology**

Figure 1 shows a schematic representation of the foresight methodology. A brief description of the process follows:

**Vision**

The White Paper on Science and Technology envisages a future where all South Africans will enjoy an improved and sustainable quality of life; participate in a competitive economy by means of satisfying employment; and share in a democratic culture.

In order to attain this vision three goals will have to be achieved:

- the establishment of a system of technological and social innovation;
- the development of a culture which values the advancement of knowledge as an important component of national development;
- improved support for innovation which is fundamental to sustainable economic growth, employment creation, equity through redress and social development.

- Materials processing

### **Mining & Metallurgy**

- Extraction and purification technologies
- Beneficiation

### **Safety of Citizen & Society**

- Defence and security
- Refocus capacity to civil application
- Criminality (social behaviour component)

### **Tourism**

- Infrastructure
- Tourist culture and marketing

### **Youth**

- Auditing current attitudes
- Building S&T culture and capacity
- Reward system
- Entrepreneurship

### **Cross-Cutters**

- Education / HRD / skills development
- Beneficiation
- Business development

### **Foresight mission**

To promote technological innovation and deployment by identifying opportunities for economic and social development through a national research and technology foresight project.

### **Sector mission and foci**

Each sector developed its own mission and focus areas within the broader S&T environment. The aim of the mission and focus areas was to ensure unanimity of purpose of the working group and to ensure integration and linkages with other sectors.

## **Sector boundary conditions**

The boundary conditions define sector foci, which were formulated on the basis of inputs from other sector stakeholders. The sector working group have all finalised these foci.

## **International study**

A study examining current technological, market, policy and strategic trends of the sector internationally.

## **Local study**

A review of the current status of the sector in South Africa with a focus on research and technology.

## **Macroscenarios**

These were scenarios of the science and technology system in South Africa in the 20-year term. These provided a futures frame of reference for the sectors.

## **Identify SWOT and STEEP factors**

On the basis of the above information a SWOT analysis was performed. In addition major social, technological, economic, ecological and political (STEEP) factors within the sector were identified. These processes gave a picture of the current sector situation.

## **Strategic analysis and choices**

Future research and technology challenges and market opportunities over the next 10-20 years were identified and strategies developed around them.

## **Survey and workshops**

An audit of the future science and technology needs of communities were conducted via workshops and surveys. Opinions of knowledgeable people in the sector on various issues will be sought in a questionnaire-based survey. It focussed on perceptions of South Africa's status (current and future) as well as on appropriate strategies that may improve our competitiveness. Communication with sector stakeholders was maintained throughout the process.

## **Sector-specific scenarios**

As the benefits from the outputs of the NRTF project will only be realised in the long term (10-20 years) sector-specific scenarios were developed and analysed. These were informed by the macro-scenarios for South Africa's science and technology.

## **Outputs**

Whilst the Foresight reports are available at DACST, it is worth sharing several broad findings, which will be discussed below. There are several drivers that suggest there is a saturation of the agrarian and industrial economies. The next ten to twenty years will be dominated by huge growths in the information and digital economies. There are signs of the birth of bio-economy driven by developments in biotechnology and

the combination of biotechnology and information technology (Bio-informatics). This economy is expected to impact on a number of sectors such as agriculture, recombinant DNA and genetically Modified Foods), Health (transgenic foods, gene therapy, micro bio-sensors) materials (molecular mapping and atomic architecture) and others. By the year 2010, these developments will be changing the way the human race will do things. The challenge in South Africa is how the country deals with a declining industrial economy (social and economic impacts thereof, how do we prepare our skills base and human resource development for the opportunities presented by the digital and bio-economies).

The results of Foresight will be used to sharpen the choices in allocating funds from the Innovation Fund, to lay the basis if institutional capacity to conduct Foresight, in both the government and private sector, identify priorities for publicly funded research, encourage greater R&D investment in industry, improve the technology awareness and uptake in SMME's and identify skills shortages in Science and Technology (S&T) and action initiatives thereof.

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#### 1. co-nomination

*The main feature of co-nomination is that the technique relies on " snowball" sampling. Respondents are asked to nominate individuals whom they consider experts in a particular area. The nominees are further asked to nominate other experts.*

*Source : <http://www.nistep.go.jp/achiev/ftx/eng/mat077e/html/mat077je.html>*