

FRIDGE

Chemicals Sector Summit

Preparation:

Government support mechanisms

(Step 2)

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EXECUTIVE SUMMARY

In preparation for the Chemicals Sector Summit in 2005, evaluation of the current government support mechanisms and development of recommendations to address any gaps was commissioned by FRIDGE. This study focused on two areas of government support: financial incentives and other support mechanisms for large enterprises¹, and financial and other support mechanisms to facilitate innovation² in the sector. This document details the research findings and recommendations to improve government support mechanisms.

The **methodology** used included detailed secondary research to determine the full range of incentives and support mechanisms currently available to the chemicals sector. An innovation chain model was then developed according to agreed principles against which incentives for innovation could be compared. The incentives and support mechanisms offering was then assessed by using:

- ▶ Assessment of usage profile
- ▶ Mapping innovation incentive provision against the innovation model to determine key gaps
- ▶ Stakeholder input

Recommendations were then developed to address shortcomings in the current offering.

Key findings and recommendations on government support for the chemicals sector

Key findings were that the following gaps existed in incentive offering:

- ▶ Gaps in financial support schemes:
 - Fragmentation and gaps, with inadequate accommodation of sector-specific needs e.g. accommodating capital intensity of most chemicals companies³
 - Lack of incentives that help access market information
 - Insufficient incentives to help marketing in export markets
- ▶ Gaps in incentive administration:
 - Lack of awareness of government support and criteria for qualification for incentives are not widely known⁴
 - Application process is complicated and often cumbersome
 - Lack of transparency once application is submitted

Key recommendations to address these gaps included:

- ▶ Innovation incentives administration:
 - Streamline and coordinate incentives for the sector across the entire innovation chain
- ▶ Make existing government incentives more accessible to the chemicals sector:
 - Lobby for improvements in government incentive design and administration
 - Develop a single source of information and application resources on innovation related incentives and support programmes – include information on all programmes, links to relevant incentive entities, information on eligibility and application processes, worked examples and case studies, etc.

¹ Please note that Blueprint analysed the [support requirements of small and medium-sized enterprises](#) in the chemicals sector.

² For both large and small enterprises in the sector

³ Note: it was not possible to verify this through the incentives usage analysis due to lack of data availability.

⁴ Note: these challenges are stronger for smaller companies and new entrants.

- Provide a “one-stop-shop” service where applicants can present the project and its objectives and be connected with the appropriate incentives entity
- Enhance role of intermediaries/consultants
 - As it is estimated that over 95% of TEO’s applications are received through consultants (this is likely to be similar for other incentive applications), improving the role of these consultants could be an effective way to improve process administration and information sharing
 - Develop criteria for preferred suppliers
 - Establish a Code of Practice
- Publicise available incentives in key industry publications (e.g. Engineering News) and to industry service providers (e.g. professional service providers, CSIR, universities, etc.)
- Communicate changes to government innovation support and implications for the chemicals sector once the plans are finalised (e.g. Foundation for Technological Innovation; Small Enterprise Development Agency) Communicate role of Manufacturing Advisory Centres/replacement SEDA access points - potentially provide single point of contact that assists in determining most suitable incentives for which to apply
- Improve transparency of incentive use records and increase monitoring and evaluation of usage patterns, difficulties and areas requiring improvement

Key findings and recommendations on government support to facilitate innovation in the chemicals sector

Innovation or research and development (R&D) in the chemicals sector involves both *product innovation* and *process innovation*, and covers both *basic research* and *applied research*. Innovation is critical to industry performance and sustainable growth in the sector. However, there has been a decline in R&D in the private sector in South Africa as many corporations have disinvested in R&D whilst focusing on restructuring to face global economic challenges. Less than 1% of sales revenue in the chemicals industry is directed towards R&D, which is considerably below international standards. At the same time there has been a low level of government investment in R&D – while the [National R&D Strategy](#) has pledged a doubling of government investment in Science and Technology to raise national investment to 1% of GDP, this remains significantly lower than international benchmarks.

To encourage an increase in private sector investment in innovation, the government of South Africa provides a range of financial incentives and wider support mechanisms in the form of tax incentives for R&D activities, research grants (e.g. Innovation Fund or Support Programme for Industrial Innovation), development finance for enterprise development (e.g. Feasibility Study Scheme), and also “soft” support measures (e.g. Material and Manufacturing Support through the CSIR). The aim of this study was to assess the existing incentives and support mechanisms for innovation and determine any key gaps currently faced by stakeholders in the chemicals sector.

In order to make this assessment an innovation process chain was developed based on a review of existing national and international innovation chains as shown below.

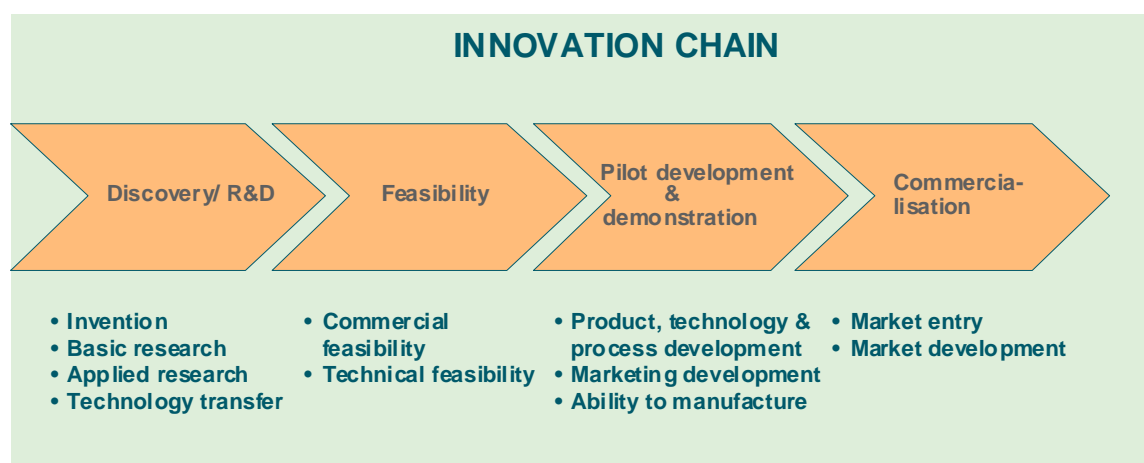


Figure I: Innovation process chain

Existing government incentives and support mechanisms for innovation were mapped against this model to identify any obvious gaps. The following **gaps in innovation support** were identified:

- ▶ Overall there is a lack of a seamless support programmes that take an innovation project from idea development through to commercialisation
 - Exceptions are programmes such as the Innovation Fund and the CSIR Material Manufacturing Support Programme
- ▶ In terms of financial assistance for innovation provided by government, the major incentives programmes (i.e. THRIP, SPII, Accelerated Depreciation Allowance) are more focused on the later stages of the innovation chain – in particular the pilot development and commercialisation stages
- ▶ Few incentives exist to support firms in enlarging levels of R&D staff

In addition, interviews with industry stakeholders were conducted, and key policy documents relating to innovation in South Africa in general and the chemicals sector in particular were also reviewed. This review highlighted the following gaps in support and improvement requirements:

- ▶ Lack of skills and scientists who can engage in R&D and innovation
- ▶ Lack of research infrastructure and funds in public research institutions
- ▶ Insufficient collaboration by public research institutions and the private sector
- ▶ Inadequate incentives and support to take innovations to pilot plant development and then to commercial scale manufacturing

The study identified the following **recommendations** to improve existing government support mechanisms for innovation:

- ▶ Innovation incentive strategy
 - Change eligibility criteria – lobby for improvements in government incentive prioritisation to make key growth areas in the chemicals sector a priority area for innovation funding (as has already been done with biotechnology), in order to increase the share of innovation incentives that are accessible to the chemicals sector
 - Additional funds
 - Lobby for additional funds to help the discovery and early feasibility testing of new concepts
 - Lobby for additional funds to help accelerate commercial ramp-up after the pilot stage development and initial market entry

- Accelerate the implementation of government-backed venture capital under the proposed Innovation Fund
 - Focus on human capital
 - Lobby for additional funds or incentive programmes that encourage employment of more research personnel (e.g. grants)
 - Resolve the current policy tension under which development strategies that aim at upskilling staff for production activities are prioritised over strategies that aim at increasing employment in research and development
- ▶ Develop Innovation Centres to foster collaboration and skills development across entire innovation chain
- ▶ Lobby for more public sector investment in infrastructure and skills development
 - Secure additional funding of specialised chemical sector (and related knowledge and know-how) university departments to carry out basic research; this can then be commercialised in partnership with the private sector once new concepts are proven

These recommendations are framed by the recognition that the limited market size in South Africa may not sustain major programmes of blue sky/basic research. However, future innovation support programmes should encourage research into new product development (rather than product modification and process improvement research only) in sub-sectors with high growth potential. New product development is particularly important to increasing beneficiation and the higher value added chemicals in sector. Ongoing support for process innovation does however remain important for the manufacture of high volume, low cost chemicals where innovation can provide sustained cost competitiveness.

In addition, a set of potential innovation indicators was recommended that track both the *innovation intensity* and *innovation direction* in the industry. This set of innovation indicators can be measured in regular “innovation audits” to assess progress in developing greater innovation capacity going forward. These indicators were grouped into *input, throughput and output measures*⁵ to review sector innovation performance and are as follows:

- ▶ Input measures could include the following:
 - R&D intensity e.g. mean of R&D expenditure/ sales in %
 - R&D personnel intensity e.g. mean of employees involved in R&D/ total employees
 - Innovation-intensity e.g. mean of innovation related expenditure/ sales in %
 - Sector involvement in R&D e.g. share of all companies that carry out R&D
- ▶ Throughput measures could include the following:
 - % change (year-on-year) in number of chemicals-related patents for which applied⁶
 - % change (year-on-year) in number of chemicals-related patents obtained
- ▶ Output indicators could include the following:
 - % of all registered companies in the chemicals sector that introduced product innovations into the market (over historical period)
 - % of all registered companies in the chemicals sector that adopted process innovation (over historical period)

However, due to the importance of the “enabling environment” in stimulating sector innovation some additional indicators of **innovation direction** should be tracked. It is important to note that the [National R&D Strategy](#) already sets out to measure on an ongoing basis a basket of indicators that tracks the development of the enabling environment for innovation and R&D. In particular, it is recommended that the following indicators of research

⁵ Source: Diez & Berger, 2003 - ibid

⁶ Please note that current patent registration systems do not track sector information. It would be valuable to include this category in future.

and technology tracked in the [National R&D Strategy](#) should be included. Please note that these could be defined to fit the chemicals sector explicitly:

- ▶ Tertiary science enrolment
 - E.g. proportion of SET tertiary students as % all tertiary students
 - E.g. proportion of chemistry tertiary students as % all tertiary students (incl. Chemistry, Chemical Technology, Chemical Engineering, etc.)
- ▶ Human capital
 - E.g. no. of SET practitioners per 10,000 of workforce
 - E.g. no. of chemistry practitioners per 10,000 of workforce
- ▶ Public R&D expenditures (GERD - BERD)
 - E.g. Public R&D expenditures as % of GDP
 - E.g. Public R&D expenditures for chemicals as % of GDP or % total public R&D expenditures

Key findings and recommendations on government support mechanisms for large enterprises

The government of South Africa provides a range of financial incentives applicable to the manufacturing sectors and support mechanisms that are applicable to the chemicals sector. For example, The Enterprise Organisation (TEO) administers amongst others the Strategic Industrial Projects programme and the Critical Infrastructure Fund. The objective of this study was to assess the current profile of usage of these incentives and support mechanisms through the assessment of government incentive entity records, and to identify an appropriate set of measures to address any gaps.

Please note that only very limited quantitative input from the government incentive entities that is required to analyse the incentive usage profile of the chemicals industry in South Africa was received by the completion of the project. All relevant government departments were repeatedly contacted.

However, based on discussions with stakeholders in the industry there appear to be the following key gaps in support and recommended improvement opportunities:

- ▶ Incentives strategy
 - Encourage development of additional start-up finance schemes as there is a potential market failure amongst private sector lenders to provide adequate funding
 - More support for accessing market information and conducting marketing activities in key export markets
 - Review level and terms and conditions of development finance and tax incentives
 - Ensure that granting criteria take into account the capital-intensive nature of the chemicals industry, and that further investment will most likely result in increased capital intensity

Many of the administration related improvements are not exclusively relevant to the chemicals sector, and might also be applicable to other sectors and overall incentive administration.

A. INTRODUCTION AND METHODOLOGY

1 Introduction to the document

As part of the FRIDGE study in preparation for the Chemicals Sector Summit, research was commissioned to consolidate information on existing incentives and support mechanisms that are applicable to the chemicals sector. The aim was to assess these incentives and support mechanisms as they relate to large enterprises and innovation in the sector⁷; and to identify any improvement opportunities and areas where additional support is needed.

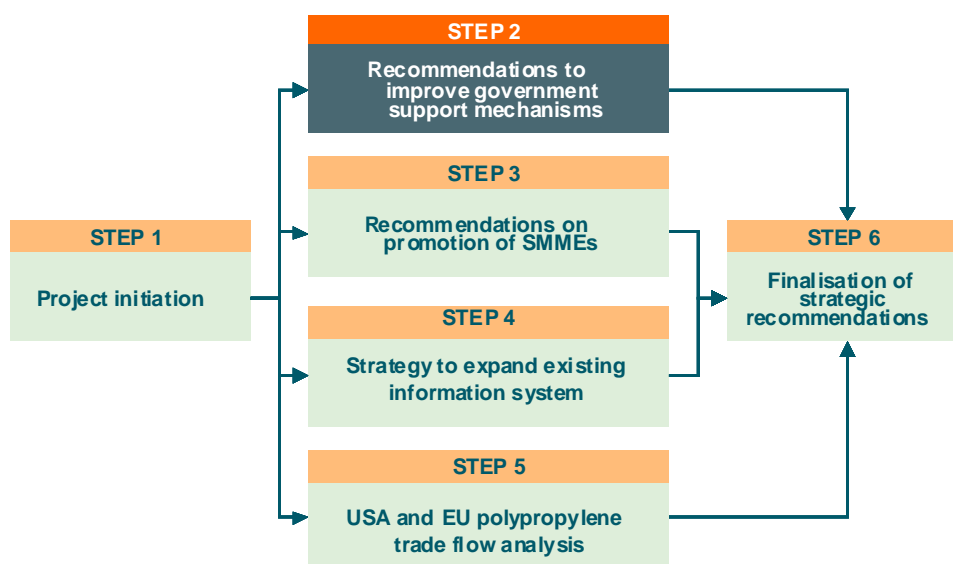


Figure 1: Overall project process context

This document details the research findings and recommendations to improve government support mechanisms. The figure above shows how this step relates to the overall project process.

⁷ For both large and small enterprises in the sector

2 Methodology

Detailed secondary research was conducted to determine the full range of incentives and support mechanisms currently available to the chemicals sector. Please see [Annexure 2](#) for a detailed overview.

An innovation model was then developed based on a review of available innovation models and adapted to reflect the needs of the chemicals sector based on agreed principles, including that the innovation model should cover the whole innovation chain from R&D through to commercialisation. Other principles set for the selection and adaptation of the model were as follows:

- ▶ Use Robert Cooper's stage gate model as the basis for the innovation chain model
 - This is a model that looks at innovation *as a process* – i.e. the process of taking an invention through to commercial introduction that typically involves the following steps:
 - Basic or applied research
 - Development
 - Commercialisation
 - Diffusion and marketing
 - This model is widely used and will have high familiarity amongst target audiences; it also provides a good schematic model and maps well on to decisions that business managers need to take – i.e. the development and commercialisation process
 - Please refer to [Annexure 3](#) for an overview of both Robert Cooper's stage gate model and other key innovation models
- ▶ Ensure that the model is “residence based” – i.e. well suited to the conditions in South Africa
- ▶ Ensure that the innovation model and innovation indicators are well aligned with innovation approaches and measures set out in the South African R&D Strategy
- ▶ Ensure that the model is also comparable to [models used by the CSIR](#)
- ▶ All innovation indicators need to be appropriate to the chemicals sector, quantifiable and clearly measurable
- ▶ Innovation indicators should, if possible, also include measures of the wider enabling environment for innovation (such as in the EU Innovation Scoreboard), and consider not only the intensity of innovation, but the direction of innovation as well
 - From a policy perspective, a more integrated view point also considers innovation as a system⁸ of interconnected organisations and institutions that influence the development, diffusion and use of innovations. Thinking about innovation from a systems approach highlights important factors that impact on how innovation actually occurs in the economy.
 - In terms of the direction of innovation, measures should be chosen that link to the core objectives set out in the sector summit (e.g. cleaner production measures, labour-intensive technology measures, etc.).

Government-supported incentive schemes were then mapped against the innovation chain developed using the above principles to determine the gaps in incentive and support provision.

Incentives usage was also investigated, however very limited quantitative input from the government incentive entities that was required to analyse the incentive usage profile of the chemicals industry in South Africa was received. All relevant government departments were repeatedly contacted. The exception was information on incentives awards for the Strategic Industrial Projects programme administered by TEO – please see further information below.

⁸ Source: Growth and Innovation Policy Team, Ministry of Economic Development, Government of New Zealand: Growth and Innovation Framework (2002)

In addition to the review of incentives usage, a number of stakeholder interviews with leading chemicals industry players was conducted to determine their assessment of the role of innovation in future sector competitiveness and sustainability as well as required government support for innovation.

A comprehensive review of published reports relevant to innovation in South Africa in general, and innovation in the chemicals sector in particular, was also conducted. Key sources consulted include:

- ▶ Sector Skills Plan⁹ (draft)
- ▶ National policy and strategy on innovation - [Advanced Manufacturing and Technology Strategy \(AMTS\)](#)
- ▶ National Skills Development Strategy 2005-2010 (final draft)
- ▶ [South Africa's National Research & Development Strategy \(2002\)](#)
- ▶ Integrated Manufacturing Strategy

Key gaps in incentive administration and offering were then identified using the input from key stakeholders and incentive gaps in the innovation chain were identified using the mapping process. Recommendations were then developed to address these gaps.

⁹ Please note that this strategy document is still in draft format and some of the issues drawn from it may therefore be subject to change during the final consultation process.

B. FINDINGS

3 Innovation model

3.1 Innovation model

Based on the principles detailed in [section 2](#) above, the following innovation model was developed that can be applied to both product and process innovation:

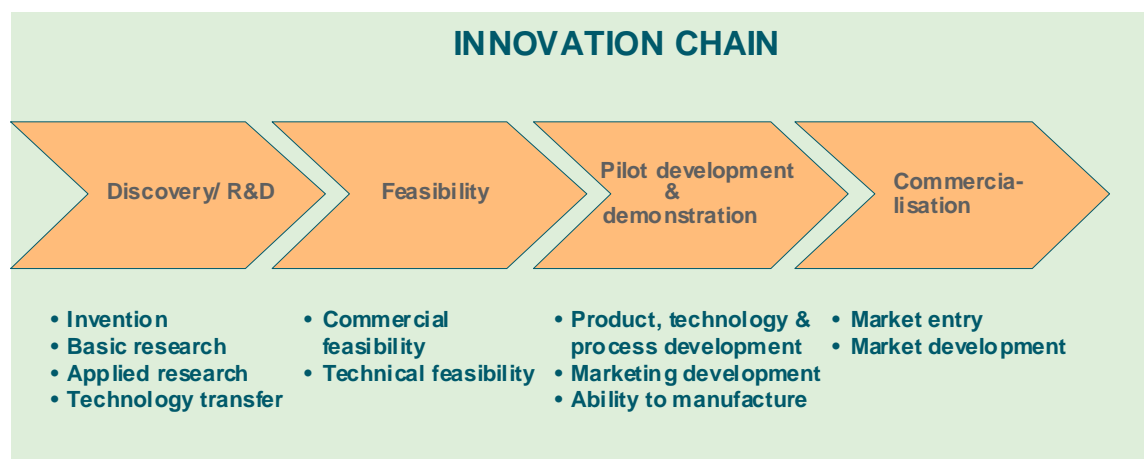


Figure 2: Innovation chain

Based on the Oslo Manual's definitions for innovation, these two different types of innovation can be defined for the chemicals industry as follows¹⁰:

- ▶ *Product innovation* is the market introduction of a product (i.e. chemical goods or service) that is new or significantly changed in terms of core characteristics, technical specifications or any other immaterial component or the intended use or ease of use. Product innovation inevitably involves changes of both processes and products. Product innovation typically dominates the innovation of non-basic chemicals. An example of product innovation could be using a new feedstock and a new process to produce a new non-basic chemical.
- ▶ *Process innovation* comprises the introduction of a new or significantly changed production process, supply method or product delivery method into the firm. The result must have a significant impact on the level of chemical production, the product quality or the production and distribution costs. Based on this definition, process innovation for production of a specific chemical product does not include end-of-pipe technologies. Process innovation typically dominates the innovation of basic chemicals. An example of process innovation could be using a new feedstock and a new process to produce the same basic chemical as before.

For illustrative purposes, an example is provided below of particular processes within product innovation that might fall within the model. Many of these processes would also relate to process innovation (with the partial exception of the market-related aspects):

¹⁰ Source: Tao Ren, An Overview of Innovation in the Chemical Industry: Process Innovation and Product Innovation (2004)

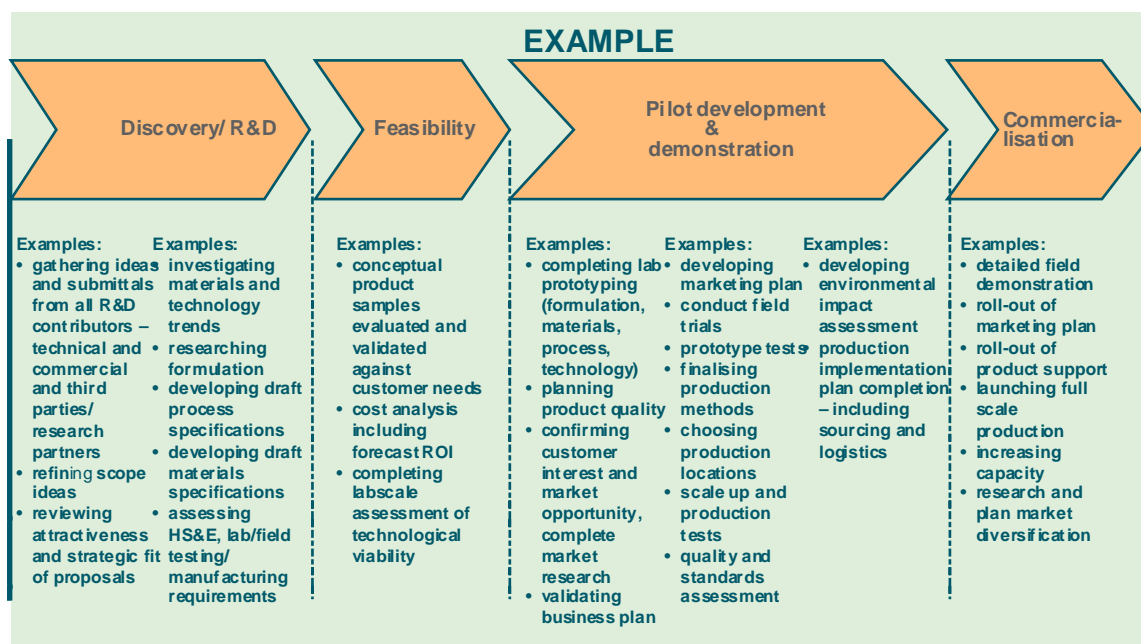


Figure 3: Examples of processes in the innovation chain

3.2 Innovation indicators

There are many standardised measures for the rate or **intensity of innovation**¹¹ that should be used to measure innovation at various stages of the innovation chain. In order to review sector innovation performance they were grouped into *input, throughput and output measures*¹²:

- ▶ Input measures could include the following:
 - R&D intensity e.g. mean of R&D expenditure/ sales in %
 - R&D personnel intensity e.g. mean of employees involved in R&D/ total employees
 - Innovation-intensity e.g. mean of innovation related expenditure/ sales in %
 - Sector involvement in R&D e.g. share of all companies that carry out R&D
- ▶ Throughput measures could include the following:
 - % change (year-on-year) in number of chemicals-related patents for which applied¹³
 - % change (year-on-year) in number of chemicals-related patents obtained
- ▶ Output indicators could include the following:
 - % of all registered companies in the chemicals sector that introduced product innovations into the market (over historical period)
 - % of all registered companies in the chemicals sector that adopted process innovation (over historical period)

However, due to the importance of the “enabling environment” in stimulating sector innovation some additional indicators of **innovation direction** should be tracked. It is important to note that the [National R&D Strategy](#) already sets out to measure on an ongoing basis a basket of indicators that tracks the development of the enabling environment for innovation and R&D (see [Annexure 1](#)). In particular, it is recommended that the following

¹¹ For example, key definitions and measures are set out in the OECD Oslo Manual (1997) and Frascati Manual (2002). These manuals have been developed by the OECD to define R&D and innovation activities for the collection of national statistics. However, the definitions are also widely used to define limits to the scope of public sector R&D and by the WTO to help define the reasonable limits of industry support programmes.

¹² Source: Diez & Berger, 2003 - ibid

¹³ Please note that current patent registration systems do not track sector information. It would be valuable to include this category in future.

indicators of research and technology tracked in the [National R&D strategy](#) should be included. Please note that these could be defined to fit the chemicals sector explicitly.

- ▶ Tertiary science enrolment
 - E.g. proportion of SET tertiary students as % all tertiary students
 - E.g. proportion of chemistry tertiary students as % all tertiary students (incl. Chemistry, Chemical Technology, Chemical Engineering, etc.)
- ▶ Human capital
 - E.g. no. of SET practitioners per 10,000 of workforce
 - E.g. no. of chemistry practitioners per 10,000 of workforce
- ▶ Public R&D expenditures (GERD - BERD)
 - E.g. public R&D expenditures as % of GDP
 - E.g. public R&D expenditures for chemicals as % of GDP or % total public R&D expenditures

Further, there is the potential to link innovation to wider development goals for the sector that are agreed upon by sector constituencies. These development goals can be included by looking at some measures of *innovation direction*. Please note, however, that unlike for the rate of innovation there are no standard indicators for the direction of innovation, and there may be difficulties in gathering accurate data. Potential measures to consider are as follows¹⁴:

- ▶ Energy efficiency and cleaner production methods, such as:
 - % of chemical companies who consider reducing environmental damage as an important objective of innovation
 - % of chemical companies who consider material consumption as an important objective of innovation
 - % of chemical companies who consider energy consumption as an important objective of innovation
 - % companies that had implemented processes that qualify in terms of agreed cleaner production principles
 - % companies that had consciously adopted a labour-intensive technology
- ▶ OHS&E
 - E.g. share of chemical companies who consider improving OHS&E as an important objective of innovation
 - % improvement in occupational health and safety compliance

The nature of these factors might require a survey-driven approach, although there might be potential to integrate directional criteria into gathering of official statistics in some cases.

The following figure shows how these two types of innovation measures – i.e. measures of innovation intensity and measures of innovation environment and direction – map onto the innovation model:

¹⁴ Source: EU Community Innovation Survey II

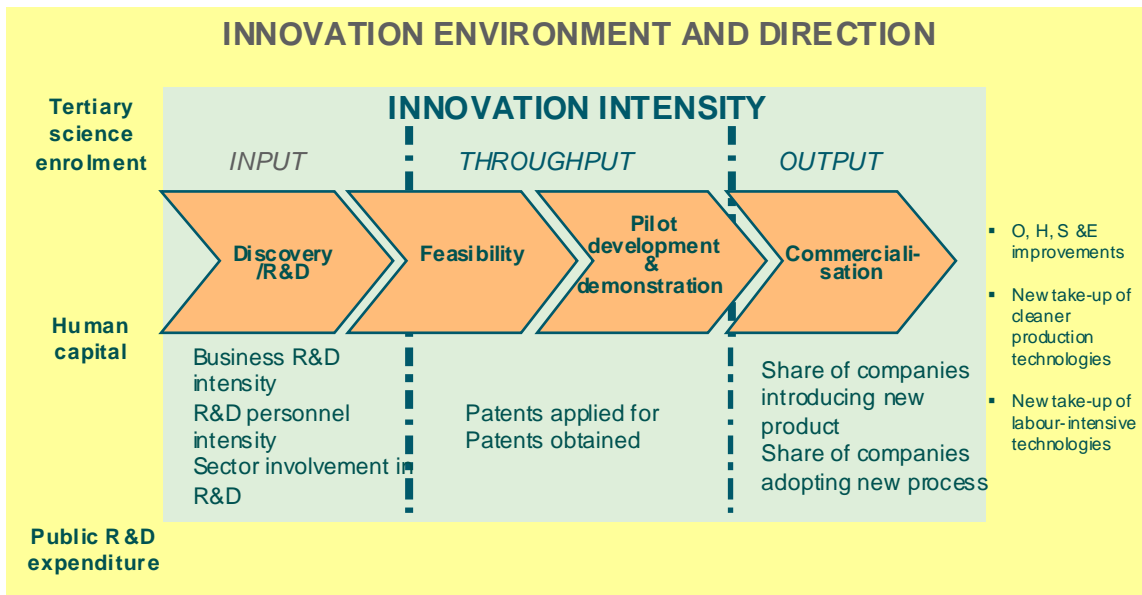


Figure 4: Innovation environment and direction context of the innovation chain

4 Assessment of government support mechanisms for innovation

4.1 Gap analysis of incentives for innovation

There is a wide range of support measures that broadly fall into the following categories¹⁵:

- ▶ Research grants: e.g. Innovation Fund; Technology and Human Resources for Industry Programme (THRIP); Support Programme for Industrial Innovation (SPII)
- ▶ Development finance especially for enterprise development: Development Finance; Seed Capital; Risk Capital; Feasibility Study Scheme
- ▶ Tax incentives for R&D
- ▶ “Soft” support measures: e.g. Material and Manufacturing Support through the CSIR

The following potential gaps in incentives provision for government-supported incentive schemes relevant to innovation were revealed when these were mapped against the innovation chain:

- ▶ With the possible exceptions of the Innovation Fund and the CSIR Material and Manufacturing support programme, no single support scheme covers the entire innovation chain.
- ▶ In terms of government financial assistance for innovation the major incentives programmes (i.e. THRIP, SPII, Accelerated Depreciation Allowance) are more focused on the later stages innovation chain – in particular the pilot development and commercialisation stages.
- ▶ Few incentives exist to support firms in enlarging levels of R&D staff.

The following table provides an indication of how key government-funded incentives and support programmes relate to the key innovation chain stages of discovery / R&D, feasibility, pilot development and demonstration, and commercialisation. Where programmes do not provide incentives but rather commercial support for entities, they are indicated by grey shading.

Entities	Programmes	Stage of innovation chain			
		Discovery / R&D	Feasibility	Pilot Development & Demonstration	Commercialisation
National Treasury	Tax concessions	✓ Tax concessions on R&D expenditure			✓ Tax concessions for capital expenditure on manufacturing equipment (in conjunction with the SIP)
Dept Science & Technology (with the dti)	Innovation Fund	✓ Available to a broad range of entities for funding research and feasibility	✓	✓	Commercialisation Office provides support for patenting and commercialisation costs

¹⁵ Partially based on analysis by Sunil Mani; United Nations University/Institute for New Technologies – “Government, Innovation and Technology Policy: An Analysis of the South African Experience since 1994” (2001)

Entities	Programmes	Stage of innovation chain			
		Discovery / R&D	Feasibility	Pilot Development & Demonstration	Commercialisation
Khula	Technology Transfer Guarantee Fund			✓ Encourages purchase of technology for manufacturing	✓
The Enterprise Organisation	Accelerated depreciation allowance				✓ Encourages purchase of manufacturing equipment
	Foreign Investment Grant				✓/✗ Encourages import of manufacturing equipment
	Small and Medium Enterprise Development Programme				✓ Encourages new investment in plant and equipment
	Skills Support Programme	✓/✗ Encourages training and training infrastructure development, and therefore available skills			✓/✗ Encourages training and training infrastructure development, and therefore available skills
IDC	Support Programme for Industrial Innovation (SPII)	✓/✗ Partnership scheme	✓/✗ Feasibility scheme	✓ Matching	
	Risk Capital facility			✓/✗	✓/✗
TISA	Support for international registration of patents, trademarks and quality marks				✓/✗ Support for commercialisation activities
CIPRO	Domestic registration of patents and trademarks		✓ Patent registration will increase feasibility of project		
SABS	Product test subsidy for SMMEs			✓/✗ Encourages testing of new products	
	Product certification (Mark scheme) and Capability Assessments			✓/✗ Product certification services	

Entities	Programmes	Stage of innovation chain			
		Discovery / R&D	Feasibility	Pilot Development & Demonstration	Commercialisation
SABS	System Certification (ISO 9000, 14000, OHSAS 18000, HACCP)			✓/✗ System certification services	✓/✗
Technology for Women in Business	Technology access	✓ Support for women in gaining access to technology			
	Science, technology, engineering and entrepreneurship career guidance for young women	✓/✗ Gives guidance and encouragement for women should they want to enter the chemicals industry			
CSIR	Material and manufacturing support	✓ Support services	✓	✓	
	Technology for Development Programme	✓ Aids in technology transfer		✓ Aids in technology transfer	
	Technology and Human Resources for Industry Programme (THRIP)	✓/✗ Contributes to research projects that develop human resources		✓ Contributes to research projects that develop human resources	
Business Partners	Innovation Investment Product			✓/✗ Provides financing options	✓/✗ Provides financing options
Chemin	Technology Incubator			✓ Provides laboratory infrastructure support and administrative support	✓ Provides business, marketing, and limited financial support

Potential changes in innovation support

- ▶ The [National R&D Strategy](#) sets out proposals for the development of the 'Foundation for Technological Innovation' (FTI) that will sit within the Department of Science and Technology. The aim of this function will be to act as a knowledge-based financing agency concentrating on innovation within each of the technology missions. It will fund innovation across the public and private sectors, and across the value chain from concept to market – though, with a key focus on high-cost development and market acceptance stages through commercialisation, incubation and diffusion. The FTI will potentially provide a single point of strategic direction for the above financing instruments (e.g. SPII) and technology diffusion and transfer programmes (e.g. GODISA)
- ▶ There may also be changes to the nature of innovation support relating to small businesses as the Small Enterprise Development Agency takes over the role of Khula, Ntsika and the Manufacturing Advisory Centres, including the administration of the Technology Transfer Guarantee scheme.

4.2 Overview of incentive usage profile

All of the following incentives applied by the Tshumisano Trust are for technology transfer in the chemicals sector:

Tshumisano		2000/2001*	2001/2002	2002/2003	2003/2004
Number of Successful Applications		5	13	22 11 (Female)	34 (Total) 15 (Female)
Spend per Period		R 200 000	R 360 000	R 659 000	R 715 000
Provincial Breakdown of Successful applicants	North West	75%	45%	45%	41%
	Gauteng	25%	32%	32%	32%
	Mpumalanga	0%	9%	9%	26%
	Limpopo	0%	14%	14%	0%
% BEE Ownership of all successful applications		100%	100%	100%	100%
Statistics for unsuccessful applications		Info not Available	Info not Available	4	6
BEE Profile		Black Female Black Male	Black Female Black Male	Black Female Black Male Indian	Black Female Black Male
Reason for unsuccessful		Service not offered by TSC Businesses referred to financiers	Service not offered by TSC Businesses referred to financiers	Business constraint is not technology transfer	Business not stable Business constraint is not technology transfer

*Note: Figures for 2000 are based on estimates.

In addition, the **Innovation Fund** has funded 2 companies involved in chemicals; one which is wholly involved in the chemicals sector and one which is involved 20 to 30%. These are both based in the Gauteng region. In terms of BEE profile, one is considered to be 60% BEE while BEE is planned for the other.

Chemin chemical incubator has been allocated funding of R3 m per year until 2006/7. They have established 7 SMEs, creating 21 direct jobs and 200 indirect jobs.

From this limited information it can be seen that Tshumisano is supporting an increasing number of SMMEs with technology transfer, although the financial amount of this support is limited. Additional support for innovation through the Innovation Fund and Chemin is limited.

4.3 Wider issues relating to incentives for innovation

The following chart maps out some of the key gaps in innovation support based on stakeholder input. In particular it highlights some of the challenges faced in the industry in progressing from one stage to the next in the innovation chain.

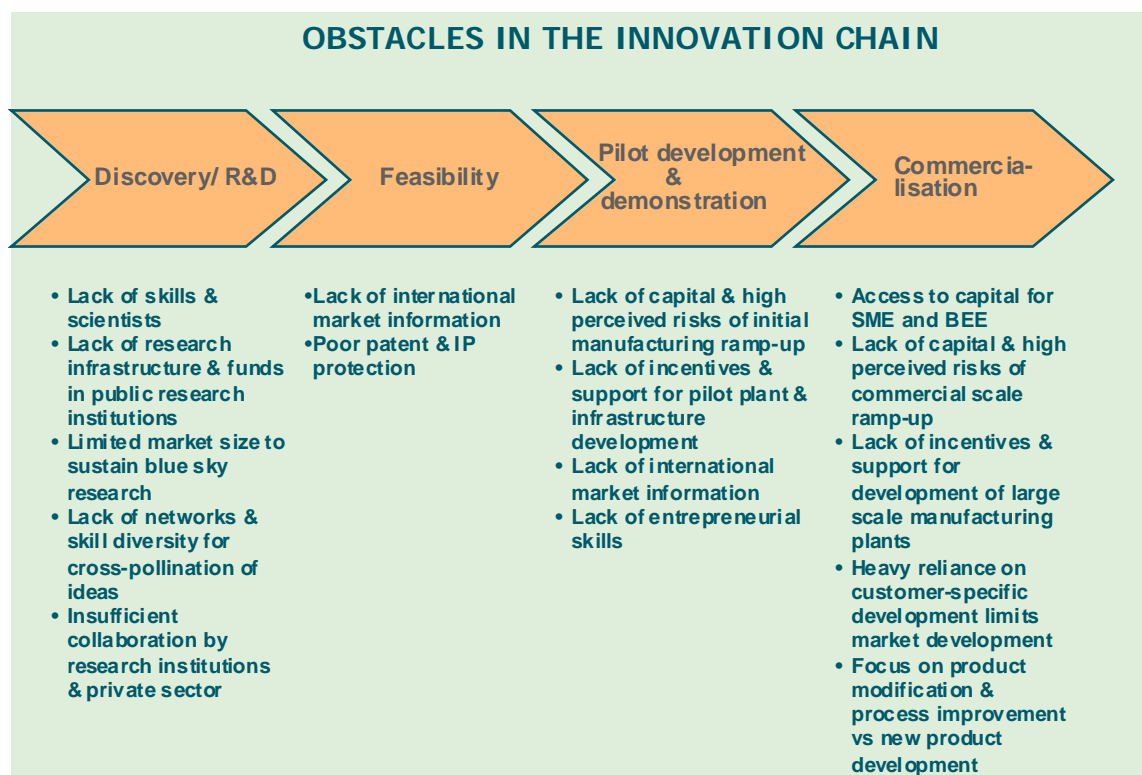


Figure 5: Obstacles at each stage in the value chain

Further detail on these issues includes:

- ▶ Lack of awareness as to what stage of the innovation chain it is appropriate to apply for support - and what support to apply for at that stage
 - Few stakeholders appeared to have applied for incentives specifically for the purpose of innovation
 - Poor alignment between different innovation support programmes means that each has different criteria and a different application process – potential applicants need to invest significant effort just to understand the different programmes
- ▶ Prioritisation for available funding is not well suited to the chemicals sector
 - While there are sufficient funds available overall, these are not accessible for much of the chemicals sector due to a focus on biotechnology as a priority area for innovation funding
- ▶ Incentives potentially have a role to play across the entire innovation chain in trying to accelerate the innovation process
 - Currently the pace of research and innovation is too slow and market opportunities may be missed if good ideas are not commercialised in a competitive timeframe
 - Overall, there is seen to be a lack in incentive provision after the discovery/R&D stage for issues such as developing the ability to manufacture in the development and demonstration phase (e.g. to optimise processes and to scale-up production). There is also a lack of incentive support to take a new product to large scale production and the associated capital-intensive development of new plants and infrastructure.

- Unlike in the biotech sector where Biotech Regional Innovation Centres (BRICS) are stimulating growth, collaboration and skills development through the early and late stage of development, there is no such comprehensive support spanning the entire innovation chain available in the chemicals sector. Current chemical incubators do not cover the whole innovation chain.
- ▶ Additional help to accelerate commercial ramp-up after the pilot development and then the market entry stage of commercialisation are incomplete
 - In particular, smaller companies risk losing a lot of money if the initial commercialisation cannot be speeded up
- ▶ Infrastructure for developing and implementing technology has not been developed in the chemicals sector (as underscored by very low R&D expenditures in the sector)¹⁶
 - Less than 1% of the sales revenue in the industry is directed towards R&D, which is considerably below international standards
- ▶ Imbalance between product application and research oriented towards process development¹⁷
 - In particular, more research into new product development should be encouraged through incentives as currently the focus is mainly on adapting existing products and their manufacturing processes
- ▶ Incentives to encourage research and innovation in beneficiation and higher value added chemicals
- ▶ Given the importance of human capital in innovation, support to encourage employment of more research personnel could also be useful e.g. grants

Other constraints identified include:

- ▶ Inadequate appropriate skills are a key obstacle to innovation
 - Continued government support in HR development is seen by the industry as equally important as financial incentives for private sector innovation:
 - Government support for universities and technikons so that more research can be carried out there and commercialised in partnership with the private sector once concept is proven
 - In some cases, competing nations have higher government funding for research institutes who can 'sell' new product concepts and technologies to businesses at reasonable rates for commercialisation
 - Overall, further investment in specialised university departments is critical. These will require leading edge research infrastructure to be successful.
- ▶ The South African market is not large enough to sustain large investments in blue sky research
- ▶ The lack of market size and lack of capital to produce a new product also leads to heavy reliance on customer-specific innovation and manufacturing which, in turn, further limits the market for a product

The relative lack of innovation and R&D activity has been recognised outside the chemicals sector as a national issue. **General problems in South Africa with regards to innovation** include the following:

- ▶ Lack of networks that encourage cross-pollination of ideas
 - Also, secrecy and lack of information on who is working on what¹⁸
- ▶ Access to capital – particularly for black investors looking to commercialise a new idea
 - Finance houses have limited interest in start-ups
 - This is now partly addressed by the Innovation Fund

¹⁶ Source: Sector Skills Plan

¹⁷ Source: Sector Skills Plan

¹⁸ Source: T. Gqubule; Business Day – “SA must create a culture of innovation” (December 2003)

- Own contributions are set too high therefore further limiting access to venture capital
- ▶ Lack of venture capital stimulation and fiscal incentives to encourage private sector participation in innovation and R&D¹⁹
- ▶ Low level of government investment in R&D
 - This is partly due to termination of key government-funded technology missions in early 1990s
 - However, current national investment of 0.7% of GDP remains significantly less than international benchmarks (e.g. OECD average across public and private sectors is 2.15% of GDP); [National R&D Strategy](#) pledges doubling of government investment in S&T 2002-2005 to raise national investment to 1% of GDP²⁰
- ▶ Declining research and development in the private sector
 - Many corporations in South Africa have disinvested in R&D while focusing on restructuring to face global economic changes
 - Industrial R&D for foreign-owned businesses is typically carried out abroad
- ▶ Low levels of patenting and intellectual property protection
 - At present South Africa lacks a formal policy for intellectual property protection of publicly financed research leading to uncertainty amongst individuals and institutions over intellectual property rights and their management
- ▶ Difficulties sustaining long-term innovation programmes despite increase in R&D expenditure and making innovation a corporate value²¹
 - This is due to a lack of diversity in skills base and time needed to achieve culture changes
- ▶ National infrastructure not large enough to support purchasing of new technology, research or compounds²²
- ▶ Severe shortage of scientists and engineers who can engage in innovation and R&D
 - Lack of capacity for local innovation and high dependency on imported know-how in many areas where South Africa is currently competitive
 - This is partly due to low enrolment in science and engineering subjects in higher education, and also possibly migration abroad of technically skilled personnel leading to a “brain drain”
 - There are also low levels of participation amongst women and people from previously disadvantaged communities
- ▶ Policy tension with regards to innovation and human resource development²³
 - Prioritisation of strategies aimed at upskilling staff for production activities rather than for research
- ▶ Government S&T system and governance not fully aligned to effectively support the National Innovation System²⁴

The **expected benefits of increased innovation** include the following:

- ▶ New entrants into the industry and increased entrepreneurship
- ▶ Increased sustainability
 - E.g. reviewing resource and energy use
 - E.g. utilisation of waste stockpiles to reduce impact on the environment
 - Improving the sustainability index for South Africa in international markets can provide competitive advantage over non-compliant supplier countries
- ▶ Increased competitiveness

¹⁹ Source: South Africa's National Research & Development Strategy (2002)

²⁰ Source: South Africa's National Research & Development Strategy (2002)

²¹ Source: T. Gqubule – *ibid*

²² Source: T. Gqubule – *ibid*

²³ Source: Sunil Mani; United Nations University/Institute for New Technologies – “Government, Innovation and Technology Policy: An Analysis of the South African Experience since 1994” (2001)

²⁴ Source: South Africa's National Research & Development Strategy (2002)

- Through better responsiveness to key global drivers of change affecting the increasingly mature global chemicals industry. The Sector Skills Plan identifies these as follows:
 - New external technologies such as the Internet
 - Increased value of intellectual property, branding and know-how
 - Development of knowledge networks to effectively utilise employees' knowledge
 - The impact of the "triple bottom line" on companies' strategies (a framework for measuring and reporting corporate performance in terms of economic, social and environmental parameters)
- Through more efficient processes and introducing lean production technology
 - E.g. new technology allowing greater extraction and separation leading to better recoveries
- Through optimising capacity to market demands
 - E.g. the development of small-scale plants at a significant capacity reduction compared with world-scale plants. Recent successes include the reduction of alcohol plant (oxo-alcohol, methanol and distillation) and vessel reactors down to 1/6th of original design
- Through identifying import replacement opportunities
- Through reducing time to market
- ▶ Increased beneficiation of domestic primary materials
 - E.g. potential beneficiation of exports

4.4 International comparisons of innovation support

Incentives offered internationally to encourage innovation were investigated to gauge the relative success of South African incentive policy to that of other developing countries. Innovation policies across 5 countries researched by Sunil Mani (2004) are set out in the table below²⁵. Please note that this analysis covered a wide range of sectors, including the chemicals sector.

Country	Tax Incentives for R&D	Research Grants	Government-backed Venture Capital	Non-Fiscal Instruments
Singapore	Double deduction on R&D expenses for both manufacturing and services	Research incentive schemes for companies Innovation development scheme Funds for industrial clusters Promising local enterprises scheme	Techno-entrepreneurship fund: the government launched a US\$ 1 billion investment fund to attract more venture capital activities to Singapore	Strengthening tertiary education in S&T fields at the university and polytechnic levels Engineering positive spillovers to local small and medium enterprises from FDI Strengthening the technological infrastructure by setting up 13 government research institutes (GRIs) in areas of high technology

²⁵ Mani, S, Government, innovation and technology policy: an international comparative analysis, International Journal of Technology and Globalisation, Vol 1, No. 1, 2004

Country	Tax Incentives for R&D	Research Grants	Government-backed Venture Capital	Non-Fiscal Instruments
Malaysia	Nine different types of tax incentives for R&D	Industry R&D grant scheme Technology acquisition fund Intensification of research in priority areas Commercialisation of R&D fund Multimedia grant scheme Demonstrator applications grant scheme	No specific policy on venture capital industry	Not clearly articulated
South Africa	Poorly defined tax incentive scheme	Innovation fund Technology and Human Resources for Industry Programme (THRIP) Support Programme for Industrial Innovation (SPII) Partnership in Industrial Innovation	No specific policy on venture capital industry	Strengthening the technological infrastructure: some reforms of GRIs
India	A variety of direct and indirect tax incentives for R&D, but poorly administered	Program aimed at technological self-reliance Fund for technology development and application Home grown technology program Technology projects on mission mode	Government backed venture capital funds Reasonably well articulated public policies for the development of venture capital	Strengthening the technological infrastructure by reforming the GRIs
Brazil	Five different types of tax incentives for R&D	Three different types of research grants and loans administered by two different agencies of the government	The INOVAR project – in its initial stages	Strengthening the technological infrastructure by reforming the GRIs

Mani finds that only Singapore has an effective innovation policy due to its emphasis on human resource development and its emphasis on raising research consciousness of small and medium size firms, especially at a local level. This was achieved by first developing a “critical mass” of trained personnel, followed by fiscal incentives to encourage R&D. This effective policy was evidenced by increasing research intensity, number of patents, and a relatively high high-tech export intensity.

Mani's research finds that while the South African and Malaysian governments have both implemented research grants, and while South Africa's system of innovation compares favourably to other countries, these countries lag behind in innovation due to a shortage of skilled human resources. In the case of Malaysia, innovation is hampered by low enrolment ratios in S&T subjects.

These findings therefore emphasise the importance of developing skilled human resources in South Africa as critical to the stimulation of innovation, as detailed above.

5 Assessment of government support mechanisms for large enterprises

5.1 Overview of existing incentives available to large enterprises in the chemicals sector

The key incentives and support mechanisms for large enterprises (in addition to those available for innovation) are as follows:

- ▶ TEO
 - Critical Infrastructure Fund
 - Accelerated Depreciation Scheme
 - Industrial Development Zone
 - Foreign Investment Grant
 - Strategic Industrial Projects
 - Sectoral Partnership Fund
 - Export Marketing and Investment Assistance (EMIA) suite of incentives (formerly administered by TISA) – although oriented towards small business, these incentives can also be accessed to some degree by larger enterprises
- ▶ IDC
 - Finance for the expansion of the manufacturing sector
 - Risk Capital Facility
- ▶ National Treasury
 - Tax concessions
- ▶ SALMAR
 - Assists in the establishment of consumer or industrial chemical companies or plants. They focus on the complete greenfield startup of businesses operating in the chemical industries.

However, please note the following anticipated changes affecting some of the above list of government incentives and support entities:

- ▶ According to the 23 February 2005 Budget speech, “the special tax allowances for strategic industrial projects will lapse in July 2005”, on the basis that “a more favourable depreciation regime for manufacturing assets has been introduced and a more direct programme of government investment in critical infrastructure is under way”. Given that the SIP incentive is one of the most used incentives by large corporates in the chemicals sector, this may create a gap in government support.
- ▶ Within the Customised Sector Programmes that are being developed by the dti (which are due for completion in September 2005), sector-specific incentives may be developed. While no incentives relevant to the chemicals sector are being developed during the current financial year, there may be scope for customised government support in the medium to long term.

5.2 Overview of incentives usage profile

Stakeholder interviews suggested that the Strategic Industrial Projects (SIP) programme is the incentive most widely applied by large corporates in the chemicals industry and with highest awareness amongst stakeholders. This incentive is typically applied to assist expansion and the development on new plants. Also, the chemicals industry is also making good use of the National Industrial Participation (civil industrial offset) projects. These projects bring investments, exports, skills and technology transfers and jobs into the South African economy through the offset obligations of international defence contractors.