

## SOUTH AFRICA

### Hot STI issues

- Strengthening innovation capacity in the business and public sector to boost economic performance and address social challenges.
- Fostering collaboration between government, academia and business.
- Improving the governance of the innovation system.

**General features of the STI system:** South Africa is the continent's leading economy, with strong resource-based industries and strengths in services. Its innovation system has been shaped by infrastructure, assets and distortions inherited from the apartheid era. In 2008, BERD was 0.54% of GDP but 59% of GERD. While a large resource-based sector and the secondary economy limit the level and leverage of business R&D investments, the S&T base supports pockets of global excellence. Research and innovation rely on industry-science links (Panel 1<sup>(o)</sup>) and there is good integration in international business and academic networks. International collaboration plays a role in 46% of scientific articles and 14% of patents (1<sup>(q)(r)</sup>). South Africa's RTA in emerging technologies increased rapidly over the past decade, albeit from a low base, notably in biotechnology. RTA in environmental technologies has eroded, however. A major bottleneck for South Africa's economic and social development is the lack of a broad skills foundation. Only 4% of the adult population has tertiary level education (1<sup>(s)</sup>); 16% of workers are in S&T occupations (1<sup>(v)</sup>). The lack of design, engineering, entrepreneurial and management capacity is a major constraint. The ageing of the white male population of researchers and engineers further weakens the skills base. IT infrastructures are relatively under-developed:

fixed broadband subscribers number about 1 per 100 inhabitants (1<sup>(k)</sup>) although there is a fast-growing mobile telephony market throughout all of society. The development of network industries has been hampered by market domination by state-owned firms and restrictive legislation.

**Recent changes in STI expenditures:** Recent growth in GERD has been driven by public money, injected since 2002 as part of the National R&D Strategy. Between 2003 and 2008, business funding of R&D hardly increased while government funding doubled (Panel 2). Public funding is expected to keep increasing owing to the government's competitiveness and growth package. South Africa attracts R&D funding from abroad from multinational companies and through its active participation in global R&D initiatives (EU Framework Programmes) as well as through joint R&D programmes with multinationals.

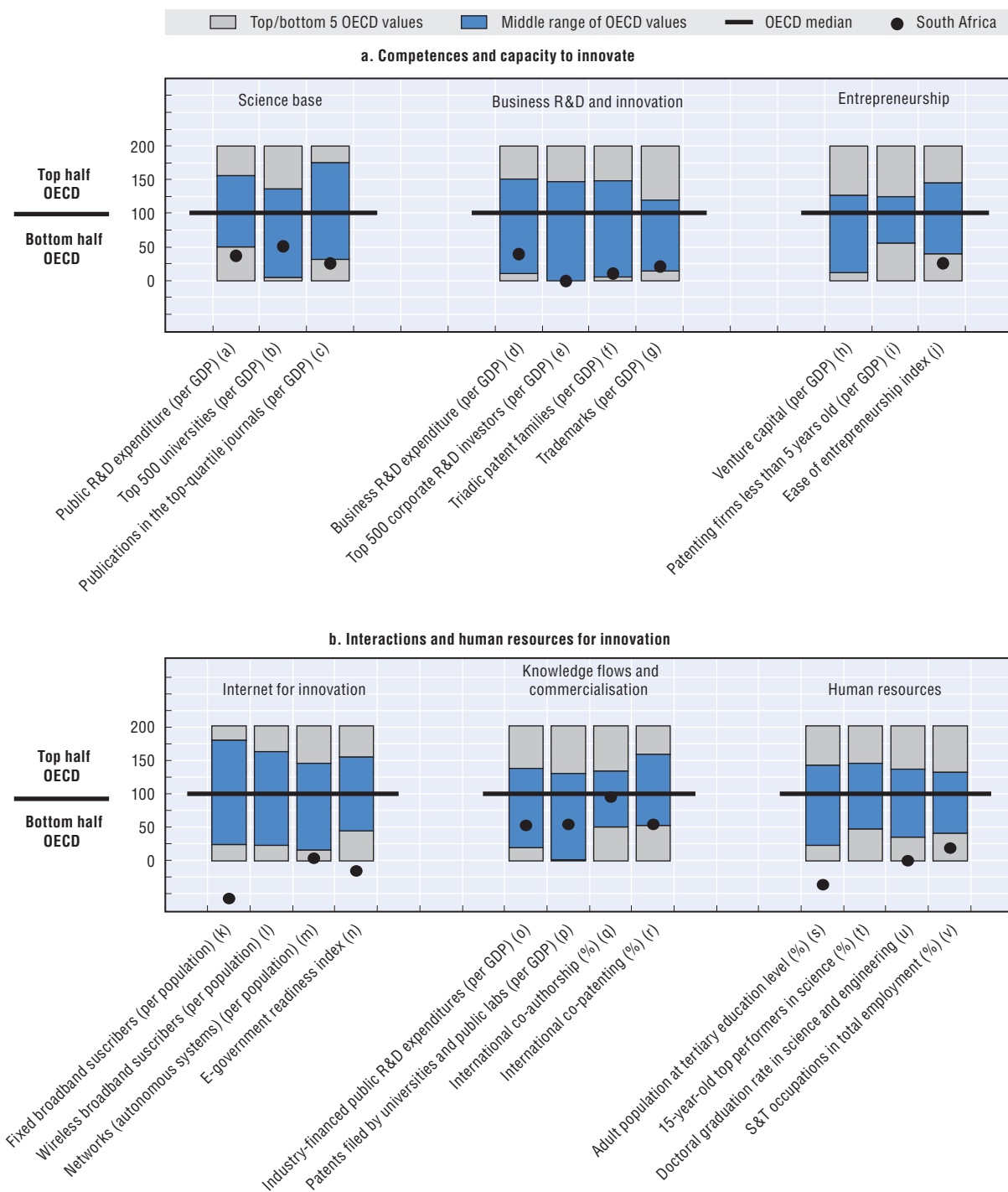
**Overall STI strategy:** The Ten-Year Innovation Plan (2008-18) identified five "grand challenges": biotechnology and pharmaceuticals, space, energy security, climate change, and understanding of social dynamics. These are in line with South Africa's technological advantages, dependency on coal and social challenges. Growing attention is given to allocation of public resources to address gaps in human capital and infrastructure in these areas.

### Key figures

<b>Labour productivity, GDP per hour worked in USD, 2010</b> (annual growth rate, 2005-10 )	n.a.	<b>GERD, as % of GDP, 2008</b> (annual growth rate, 2005-08)	<b>0.93</b> (+5.9)
<b>Environmental productivity, GDP per unit of CO<sub>2</sub> emitted in USD, 2009</b> (annual growth rate, 2005-09)	<b>1.37</b> (+0.4)	<b>GERD publicly financed, as % of GDP, 2008</b> (annual growth rate, 2005-08)	<b>0.42</b> (+9.3)

Figure 10.37. Science and innovation in South Africa

Panel 1. Comparative performance of national science and innovation systems, 2011



Note: Normalised index of performance relative to the median values in the OECD area (Index median = 100).

**STI policy governance:** The *OECD Reviews of Innovation Policy: South Africa* pointed to scope for improvement, including in horizontal and vertical policy co-ordination. The Ministry of Science and Technology (DST) has tasked a committee to evaluate the functioning of the national system of innovation.

**Business R&D and innovation:** South Africa intends to add capacity for developing advanced manufacturing technologies and new R&D-led industries in order to transform the industrial base, enhance local appropriation, benefit from natural resource endowments and increase competitiveness. The Framework for South Africa's Response to the International Economic Crisis (2009) reiterated a growing need for scientific and technological input to address national challenges in areas such as energy security, food security and industrial development. Subsequently, increased financial support to industry was announced to drive the National Industrial Policy Framework (NIPF), which had been adopted before 2008. Links to STI policies are to be strengthened with the creation of the Technology Innovation Agency (TIA) (2010).

**ICT and scientific infrastructures:** South Africa has made structural investments in large-scale facilities. Based on its ICT Strategy, infrastructure projects have been rolled out, *e.g.* the Centre for High Performance Computing and the South African National Research Network (SANReN), a high-speed network that connects the South African research community to global research networks. Significant investments in scientific equipment include the Centre for High Resolution Electron Microscopy (CHRTEM) and the world-class Karoo Array Telescope (MeerKAT). The National Roadmap on Research Infrastructure is currently being developed.

**Knowledge flows and commercialisation:** Adoption of IP policies for publicly funded R&D, the creation of the National Intellectual Property Management Office and development of infrastructures for open innovation, *e.g.* technology transfer offices at PRIs, aim to improve technology transfer and commercialisation of research. The National

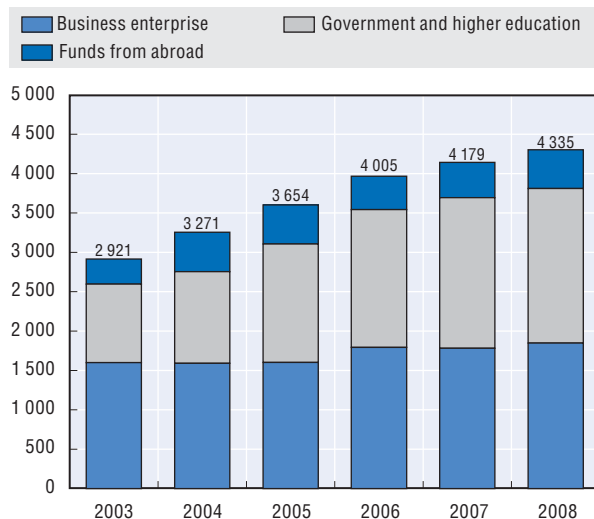
Technology Transfer Centre provides grants for technology transfer to the secondary economy. The Technology Localisation Programme provides non-financial assistance to local manufacturers to help them qualify for public procurement programmes, while technology stations provide innovation management and support for technical development to inventors, entrepreneurs and SMEs.

**Human resources:** To nurture a new generation of researchers and to address skills shortages, a series of initiatives aim to encourage participation in STEM studies (*e.g.* Youth into Science Strategy), in doctoral and postdoctoral studies (National Research Foundation Fellowships) and in research careers, including for women and the black community (*e.g.* Thuthuka Programme). Financial support to researchers has helped to mitigate brain drain. The new National Human Resources Development Strategy (2010-20) anticipates future national human resources requirements. Increased policy attention has been paid to lifelong learning and better articulation between workplace learning and higher education.

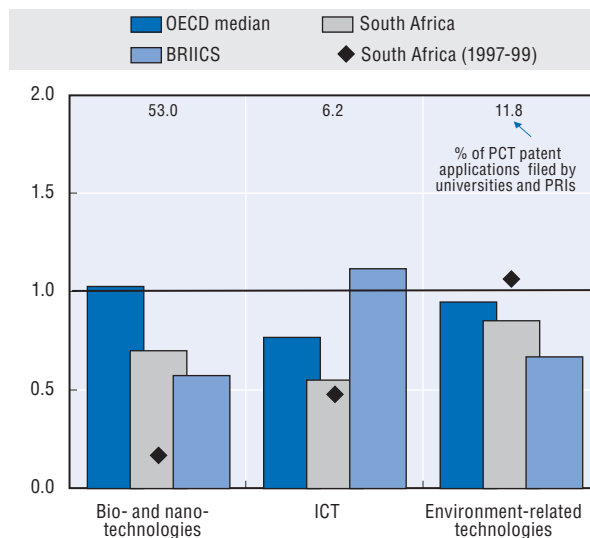
**Emerging technologies:** The Biosciences Park is being developed to assist biotechnology start-up firms to incubate marketable products. An Astronomy Desk has been established at the DST and the South African National Space Agency has been established.

**Green innovation:** Development of the renewables market is seen as key to energy sufficiency and the transition to a green economy. The South African Renewables Initiative (SARi) foresees an ambitious 25% reduction in CO<sub>2</sub> emissions. The Renewable Energy Finance and Subsidy Office (REFSO) was set up to manage renewable energy subsidies and offers advice to developers. The Green Efficiency Fund, which is administered by the Industrial Development Corporation (IDC), assists South African companies to invest in energy efficiency and renewable energy projects. The DST is currently developing a Waste Innovation Plan, in order to address the increasing waste problem in South Africa, and a ten-year roadmap for innovative technologies to improve water security.

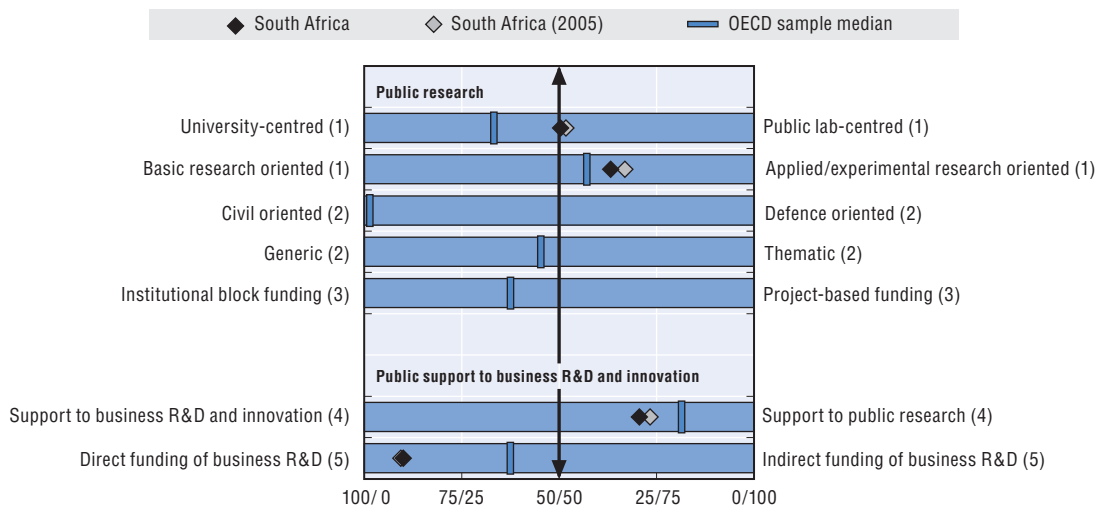
**Panel 2. GERD by source of funding, 2003-08**  
As a % of total GERD



**Panel 3. Revealed technology advantage in selected fields, 2007-09**  
Index based on PCT patent applications



**Panel 4. Overview of national innovation policy mix, 2010**



1. Balance as a percentage of the sum of HERD and GOVERD.
2. Balance as a percentage of total GBAORD.
3. Balance as a percentage of total funding to national performers.
4. Balance as a percentage of the sum of HERD and GOVERD funded by government and higher education and components of (5).
5. Balance as a percentage of the sum of indirect funding of business R&D and innovation through R&D tax incentives and direct funding of BERD through grants, contracts and loans.

Source: OECD, Research and Development Statistics (RDS) Database, June 2012; see reader's guide and methodological annex.

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