Review of the Science and Technological (S&T) cooperation Agreement between the European Union and South Africa
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Review of the Science and Technological (S&T) cooperation Agreement between the European Union and South Africa

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<tr>
<td>AU</td>
<td>African Union</td>
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<tr>
<td>CAAST-NET S &amp; T Cooperation</td>
<td>Network for the Coordination and Advancement of Sub-Saharan Africa–EU</td>
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<td>CSIR</td>
<td>Council for Scientific and Industrial Research</td>
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<td>DST</td>
<td>Department of Science and Technology</td>
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<td>EDCTP</td>
<td>European and developing countries clinical trials partnership</td>
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<td>EU Member State</td>
<td>European Union Member State</td>
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<td>Esastap</td>
<td>European-South African science and technology advancement programme</td>
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<td>FP</td>
<td>framework programme</td>
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<td>GERD</td>
<td>gross expenditure on research and development</td>
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<td>HERD</td>
<td>higher education expenditure on research and development</td>
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<td>JSTCC</td>
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<td>NCPs</td>
<td>national contact points</td>
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<td>new partnership for Africa’s Development</td>
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<td>NRF</td>
<td>National Research Foundation</td>
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<td>Paerip</td>
<td>promoting African-European research infrastructure partnerships</td>
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<td>RTDI</td>
<td>research, technology, development, innovation</td>
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<td>R &amp; D</td>
<td>research and development</td>
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<td>SADC</td>
<td>Southern African Development Community</td>
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<td>SKA</td>
<td>Square Kilometre Array</td>
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<td>S &amp; T</td>
<td>science and technology</td>
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<td>SMEs</td>
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EXECUTIVE SUMMARY

Impressive progress has been made in cooperation in science and technology between South Africa and the European Union since the two parties entered into the agreement of 1997. Starting from a low base over the FP4–FP6 period, South African researchers have increased their involvement in FP7 to the extent that in absolute terms the country stands fifth for the level of participation by third countries. When normalised in relation to country GERD, South Africa stands first. Such a rapid increase in the level of participation demonstrates the high regard that all parties ascribe to the cooperation and signals that South African researchers are recognised as peers able meaningfully to contribute to the success of the framework programme projects.

The South Africa–European Union cooperation agreement functions alongside a host of other South Africa–European Member States bilateral agreements in science and technology. This Review looks back at the last 15 years of these various modes of cooperation to identify the major achievements, to draw conclusions on the lessons learnt and to make recommendations for improvement.

Major evolution

Crucial to the success of the cooperation has been the momentum that was created in South Africa and the European Union toward the internationalisation of science and technology policy. Europe sought to find solutions to the societal and economic challenges as reflected in the Lisbon strategy, and science and technology cooperation became a political objective in the concept of a ‘Europe of innovation and knowledge’.

South Africa, for its part, took an increasingly strategic approach to science and technology, as reflected in its 2002 R & D strategy and the Ten Year Innovation Plan of 2008.

At a policy level, the parties agree that that there is general alignment between South Africa’s innovation policy priorities and those that underlie the FPs. Individual South Africa–EU Member States bilaterals naturally reflect different priorities.

Contribution to innovation

Prior South African FP participation tended to focus on basic and applied science in the natural sciences and engineering, with FP7 seeing effort extended to the social science and humanities. Within these various fields, participation was skewed away from industry toward the public research organisations and universities because the framework programmes themselves had limited opportunity for industrial participation. Consequently, one should not expect ‘innovation’ as a direct consequence of participation in the FPs, although this should change for Horizon 2020. Nevertheless, despite the political importance attached to innovation, no clear model for EU–South Africa cooperation has yet been developed for strengthening public–private partnership in S & T and innovation. If the concept of ‘innovation’ is stretched to include novel research infrastructure and capacity, then some argue that the Square Kilometre Array (SKA) radio telescope project counts as an innovation. Another important ‘innovation experience’ in EU–South Africa S & T cooperation has been the ‘Innovation for poverty alleviation’ programme. Innovation here not only refers to ‘bringing science closer to the market’ but also to ingenious funding mechanisms and new synergies toward social innovation between DG Research and Innovation and DG Development and Cooperation —EuropeAid (DG DEVCO).
Main achievements

In our view, the main result of the agreement is the participation of South African researchers and students in the various networks and projects of the EU, and therewith the access gained to (top) institutes in particular scientific fields. Participation has led to knowledge exchange and technology transfer, mutual learning and stronger international visibility for South African researchers. In some cases, capacity in new domains has been developed. South Africa will gain prestige and value through the SKA project research infrastructure. Its universities, public research organisations, and business sector have all benefitted — the former two more than the latter, as is the case within the EU Member States themselves.

Over the period covered in the Review both world and South African scientific output have increased significantly; based on simple publication counts South Africa’s share of world science has remained steady. There has however been a marked increase in South African international co-publication. The scale of co-publication with FP partners (1.5 % of South African output) is commensurate with the level of funding (1.5 % of higher education expenditure on R & D — HERD) that has flowed toward these projects. We share the cautions of other analysts regarding causality: one cannot state that the South Africa–EU cooperation is solely responsible for the increase in co-publication. The cooperation is one among many factors contributing to an increase in output.

In 2012, South African scientists produced 8 767 articles indexed on the Science Citation Index Expanded, with 6 227 citations reported for that year. When country to country co-publications are examined, a different picture emerges, illustrated by three examples. South Africa–United States co-publication amounted to 1 679 counts with 3 674 citations; South Africa–United Kingdom 1 059 and 2 864 citations; South Africa–France 625 and 2 177 citations. The message is clear: peer recognition and co-publication march together.

Explanations for South Africa’s relative success in the FP include the observation that the country has played to its traditional strength both in terms of scientific fields (e.g. health, environment) and scientific institutions (mainly CSIR), while in general there was also a momentum for international cooperation. The Brussels office of the South African Minister-Counsellor has performed an invaluable role in supporting these developments, as has the extensive network of national contact points, and the Esastap and CAAST-Net projects. Access to closed calls was an additional factor in promoting collaboration.

The various country to country bilaterals have also had a positive contribution, especially for networking, mobility and capacity development, and as learning platforms for FP participation.
Difficulties in implementation

Among other reasons, the major difficulty experienced by South African scientists was and is in gaining access to consortia in the EU in order to be able to compete. This mainly arises from a lack of prior networks. Some of those who have gained access have mentioned the distribution of work packages within the consortia as a difficulty, feeling that they were often left with the least interesting tasks, with negotiation of the work package allocations often impossible. A long-standing issue is the bureaucratic procedure associated with the FPs. Lastly, because of the continuing dualism of South African society, uptake tends to concentrate in the research universities with the historically disadvantaged universities lagging behind.

Role and efficiency of the JSTCC

The JSTCC has served as a useful anchor for the planning, monitoring and evolution of cooperation, although effective monitoring of results has been largely absent. Policy dialogues have been fruitful despite the fact that security and commercial interests intermingled negatively in some cases, for example in energy and in ICT. Mutual learning and coordination of policies are yet to become visible, through a ‘coordinated call for proposals’. Actions towards consolidation took place on a more humble scale, such as in health and environment calls, and in food, agriculture and fisheries, and biotechnology — comprising areas in which cooperation with Africa is specifically identified, such as indigenous knowledge and agriculture and topics that are of relevance for the millenium development goals of reducing hunger and ensuring environmental sustainability — and in the 2010 Africa Call. In other areas (e.g. energy) there has been consultation on priorities and mutually beneficial cooperation, and mapping areas of excellence.

Esastap is a highly proactive network that has been successful in raising awareness about FP opportunities within the South African science community. CAAST-Net has also been useful, while Access yielded little result so far.

Regional scope of cooperation

The reported impact of cooperation on the SADC region has been relatively minor until now. (It must be noted that the impact of prior INCO-DEV and INCO-DC cooperation instruments fell outside the scope of this Review). The 2010 Africa Call and the ACP S & T programme have also been instrumental in strengthening South Africa’s key role in science cooperation of the EU with Africa as a continent.
Synergies with EU Member States bilateral agreements

Bilateral support to South Africa’s S & T is considerable in terms of funding amounts, being of the same order of magnitude as the FP7 inputs, but the outputs of bilateral cooperation with EU Member States sector partners are not easily quantifiable. These agreements have the potential to enable FP7 participation as strong bilateral links with EU Member States and are necessary to form FP7 consortia. Although the economic crisis in the euro area has reinforced national interests, efforts should be made to draw up an inventory of bilateral activities and to find areas of mutual interests for improved coordination.
CONCLUSIONS

- Both South Africa and the EU are looking back at 15 years of successful cooperation in the area of science and technology, with an impressive ascending position obtained by South Africa among third countries. Nonetheless it is difficult to ascribe major impacts to the work.

- For the EU, South Africa is an important collaborator and an interlocutor for relations with the rest of Africa; indeed it is a strategic partner.

- Regional impact has been limited in FP while the ACP S & T programme has reinforced South Africa’s leadership role on the continent. CAAST-Net has served to build the associated networks.

- South Africa’s goal of increasing access to EU research networks and facilities has been realised, resulting in knowledge exchange, technology transfer and mutual learning.

- Key to South Africa’s successes have been political commitment on both sides, the Esastap support mechanism, the proactive role of the DST’s Brussels office, and South Africa’s comparative advantage in certain scientific fields (e.g. health, environment).

- Improved synergy of the bilateral agreements between South Africa and individual EU Member States is likely to increase the return on investment in FP type activities going forward.

Recommendations

- Horizon 2020, with its strong intent to draw in the business sector, will present new challenges that must be prepared for. The promotion of public sector–private sector links to advance the commercialisation of research is a goal common to the EU Member States and South Africa. All efforts should be made to learn from good practice, especially in relation to managing the resulting intellectual property.

- The new and changing research and innovation environment dictates that support structures in Brussels should be maintained and even grown to include personnel with business sector experience. The same type of experience should be included in the network of national contact points in South Africa.

- One must naturally support all measures to simplify the EC Horizon 2020 control and accounting procedures.

- There is an urgent need (on both sides) to develop a user-friendly information system that will capture the outputs of cooperative activities in a standard form that allows for analysis and subsequent evidence-based decision-making.

- Though difficult to achieve in practice, consideration might be given to creating a forum of S & T counsellors in South Africa that could work together to ensure a harmonised approach to working with the SADC and African Union, and to find synergies to improve coordination between the EU Member States bilateral agreements with South Africa and the framework programme.

- To mitigate the harsh legacy of apartheid-driven institutional inequalities, consideration might be given to creating local ‘circles of excellence’ that will engage with partners in the EU Member States actively drawing in researchers from higher education institutions that have not yet achieved critical mass in research.
1. INTRODUCTION

The Agreement on Scientific and Technological (S & T) Cooperation between the European Community and the Republic of South Africa was entered into on 15 November 1997 with the objective to encourage and facilitate joint research in scientific areas of common interest and mutual benefit. The agreement forms part of the 20 international agreements on S & T still in force that the European Union has signed with third countries so as to strengthen the international dimension of the European Research Area. South Africa is among those countries regarded as ‘emerging economies’ (1).

The modalities of the cooperation include participation of South African scientists in the EC framework programmes (FP), and the reciprocal involvement of European researchers in South African scientific activities.

Over the years both sides have acknowledged the crucial role of science and technology in economic and social development and the agreement now constitutes a supplement to the Trade, Development and Cooperation Agreement of 2004, which constitutes the legal basis for the overall relationship between South Africa and the EU. As of May 2007, the bilateral relations have further developed into a strategic partnership and an action plan for implementation.

Besides the notion of mutual benefit, the S & T cooperation agreement emphasises the principle of timely exchange of information that may affect the actions of participants in cooperation activities. It states that cooperation will take place within the framework of applicable laws and regulations, effective protection of intellectual property and equitable sharing of intellectual property rights. The agreement does not include specific provisions regarding the funding of cooperative research activities such as a common fund or a fixed budget. Each party provides budgetary support according to the availability of funds. Guidance and overview of the cooperation is provided by the Joint Science and Technology Cooperation Committee (JSTCC), comprised of officials and stakeholders from both sides.

Reflecting the South African commitment to playing a role in strengthening the EU cooperation with the rest of Africa in science and technology, the agreement explicitly takes a regional approach and aims to be of the benefit to SADC, with possible spin-off effects for the continent as a whole.

This Review is the outcome of a complex endeavour over 15 years (1997–2012), namely the delivery of a qualitative and quantitative analysis and assessment of the major evolutions of the science and technology agreement’s objectives and activities, including results and possible impacts, measured against the background of a dynamic research and innovation landscape on both sides.

The terms of reference (Annex 8.1) call for the experts to take into account the objectives and prescriptions defined in the science and technology agreement, the functioning of the JSTCC that provides guidance and overview of the scientific collaboration, the scale and scope of the cooperation activities, and their added value and links with bilateral cooperation between EU Member States and South Africa. The experts were further asked to identify problems and difficulties related to the implementation of the agreement, and to make recommendations to address these.

In the final analysis, the Review was tasked to provide an answer to the following five key questions:

1. What are the major evolutions in the bilateral cooperation over the period?
2. Are the cooperation activities producing the expected results and impacts? Are they balanced and mutually beneficial?
3. How has the role of the Joint Science and Technology Cooperation Committees (JSTC) evolved and have changes contributed to improved cooperation?
4. How useful have the relevant projects funded under the ‘international cooperation’ part of the capacities programme (BILAT, Inconet, etc.) been?
5. To what extent have the bilateral EU–South Africa cooperation activities contributed to develop coordination and synergies with bilateral cooperation of EU Member States with South Africa?

The following pages will give an overview of the methodology used, present the analysis and its main findings, outline the conclusions and offer recommendations for furthering the cooperation.

2. METHODOLOGY

A two-person expert team comprising a South African expert and a European expert was given a total of 68 working days to carry out the Review. This began with a kick-off meeting in early December 2012 at DG Research and Innovation in Brussels, followed by comprehensive desk-based research of all key documents produced in the cooperation to date.

In February 2013, the expert team conducted 6 days of field research in South Africa, during which period research institutes, the main universities, SMEs, various science councils, and the Department of Science and Technology (DST) were visited for interviews. With the assistance of the DST, a half-day stakeholder workshop in Pretoria provided additional insights into the cooperation from a South African perspective. Attendees at the workshop also included major industry R & D performers that have participated in FP projects. In March 2013, the expert team interviewed European Commission officials at various DGs in Brussels, and attended the Paerip conference. The bilateral relationship between South Africa and individual EU Member States was investigated through interviews with the National Research Foundation (NRF). Budget constraints limited interrogation of EU Member States to desk research and telephonic interviews with officials from Germany and the United Kingdom.

Qualitative and quantitative methodologies were utilised in the research. These included semi-structured interviews, the development of a logical framework to track indicators, documentation study, an examination of European Commission quantitative data, and primary financial and bibliometric analysis. All levels on which cooperation occurred — policy, agency, research and innovation institutions — were taken into account, while the nodes in the cooperation ‘network’ — the national contact points and senior scientists — were consulted. By good fortune, the expert team was able to interview former and present key senior officials both in Pretoria and Brussels that enabled it to track the evolution of the cooperation over the 15-year period.
It is widely accepted that impact assessment is an imperfect science, the more so when applied to basic research that most often only yields benefit in the long-term. The Review benefitted from previous impact assessments of FP efforts that were carried out by a range of Europe-based experts (e.g. Simmonds et al., 2010; EC 2010). As Teirlinck (2011) notes ‘In contrast with several other policy areas, assessing the socio-economic impacts of public funding for RTDI is not a common practice in Europe.’ Simmonds et al. (2010: 91) examined the impact of EU research and technology development programmes in the United Kingdom, and found ‘strong involvement by leading players in several sectors (aerospace, energy, telecommunications), while the majority of businesses from several other research-intensive sectors were typically not involved in FP6 (e.g. pharmaceuticals and biotechnology).’ Significantly, private companies make up the majority of UK FP participating organisations. In a survey of participants’ views of the most important outputs that were achieved, UK industry listed new or significantly improved tools, methods or techniques; new or significantly improved commercial products or services; new or significantly improved scientific or industrial processes; new research grants; and scientific conferences, seminars or workshops. Patent application and registration, and increased sales did not appear as priorities. Simmonds et al. (2010) also noted poor alignment between the various FP and the United Kingdom’s own interest in public sector innovation. Their overall conclusion was that ‘the study was unable to establish a line between particular framework programme instruments and the scale of their respective impacts’ (ibid: 6). Even so, the majority of industrial concerns that joined FP projects declared that this had yielded economic benefit. Impact ‘assessment’ naturally faces the problem of attribution since impact rarely manifests through a single cause. Other more ‘objective’ tools such as bibliometric analysis of scientific output also have limitations, being subject to many sources of influence, if not error. So there is on-going debate concerning the value of bibliographic citation measures when seeking to identify research excellence especially when applied to the individual scientist. Careful and independent peer review remains the benchmark for determining scientific excellence. Indeed, entry into FP consortia, with their stress on excellence and European leadership, and the award of funding to such consortia turns upon independent peer review and that with a high rejection rate. Selection for participation in the FP is a highly competitive process.

The above caveats must be borne in mind when interrogating this Review.

3. CONTEXT AND MILESTONES

3.1. Major evolutions in the bilateral cooperation, 1997-2012

The development of the agreement on S & T cooperation, in force since late 1997, coincided with the main period of South Africa’s democratic transformation when concerted efforts went toward abolishing discriminatory legislation, creating mechanisms for redress and modernisation, promoting societal well-being and increasing economic growth.

Following the 1994 elections, the new Department of Arts, Culture, Science and Technology (DACST) set out a vision for S & T through its White Paper on Science and Technology (DACST, 1996) that advocated the management of S & T through the innovation systems approach. A key objective was to harness the expertise of the legacy public research organisations (science councils, department-based research organisations and research-performing state-owned enterprises) toward the application of S & T for development. While the country has good scientists and important scientific institutions,
there are weak relations between public and private sector R & D performers. There was a need for new investment in the S & T base and the solution of inherited human capital problems.

The White Paper recommended the founding of a National Advisory Council on Innovation, allocation of competitive funding via a new Innovation Fund, a transformed National Research Foundation as grant-maker, and taking steps toward a culture of measurement and accountability. It took a strategic view of global collaborations by stressing that ‘it is the quality of our science rather than the number of international agreements we are party to’ that matters (DACST, 1996: 21). In parallel with these measures came transformation of the higher education system with the elimination of gross ethnic divisions and the designation of the technikons (polytechnics) as universities of technology.

South Africa entered into cooperation with the EU at the start of the fifth framework programme in 1998. There had by then been some 30 participations in FP4 projects (1994–98). Joint stocktaking began from 1998 with meetings at regular intervals. By then, research and development had become a political objective in Europe. This is in the Lisbon strategy of 2000 that sought to establish a ‘Europe of innovation and knowledge’ as an impetus for economic growth. The concept of the European Research Area was launched to counter-balance the fragmentation of research among and within different Member States and to soften the impact of the process of enlargement. Cooperation with South Africa, and other emerging economies was meant to generate added value and cost effectiveness in research and research capacity building.

In recent years, resources for cooperation from the EU side increased significantly. From EUR 17.5 billion for 5 years under FP6 to EUR 50.5 billion for 7 years under FP7. The approach to international cooperation under FP7 also changed significantly compared to earlier mechanisms: international S & T collaboration was now integrated throughout the FP (in particular in the thematic priorities of the cooperation programme), and both geographical and thematic targeting were enabled.

The South African research and development policy developed along similar lines with both parties finding much common grounds for collaboration, although with specific emphases according to different societal realities. The national research & development strategy of 2002 (DST, 2002), for instance, recognises the importance of openness to global opportunities but expresses concern at possible brain drain. These various understandings later saw the opening up of the Innovation Fund (now part of the Technology Innovation Agency) to include international groups (e.g. Swiss participation in the Northwestern University drug resistance project) on a self-funded basis with a focus on three areas (biotechnology, ICT and value addition), and plans for a dedicated funding mechanism for participation in FP6 from 2002 onward. South Africa’s S & T policy received additional focus in the Ten Year Innovation Plan of 2008 (DST, 2008) that is structured around five grand challenges that are a mix of platform technologies (ICT, biotechnology and nanotechnology), exploitation of southern scientific geographic advantages (skies, seas, earth, biodiversity) and social challenges (poverty).

This last aspect — the desire to make science ‘work’ in finding solutions to social challenges — forms an imperative to the bilateral relations as both parties recognise that innovation ought not refer to technological innovation only. A case in point is the revised Trade and Cooperation Development Agreement (TDCA) with South Africa that now contains science and technology as Article 83. A EUR 30 million budgetary envelope under the EU Development Cooperation Instrument (the ‘Innovation for poverty alleviation’ programme, see below) is meant to contribute to poverty alleviation and support
economic growth and employment creation. Future focus will be on the communication of results and scaling up to a regional level. On the EU side, non-technological innovation has found even stronger expression in Horizon 2020, which explicitly mentions societal challenges as its third objective, alongside support for ‘excellent science’ in Europe and ‘industrial leadership’ (2).

Another stimulus for strong bilateral relations in science and technology is South Africa’s position on the African continent. The country plays a political leadership role and now acts as a valuable interlocutor for the EU in its S & T relations with the continent. South Africa is a member of the EU–Africa expert group established to accelerate the implementation of the science, information society and space partnership of the joint Africa–EU strategy of 2007. An important focus of engagement has been the strengthening of EU contribution to Africa’s Science and Technology Consolidated Plan of Action as adopted by the African Union and NEPAD. South Africa continues to host the NEPAD S & T’s desk that is based at the CSIR, has promoted the development of innovation policy in the African Union, and actively supports flagship projects of that body, specifically the African Institute for Mathematical Sciences (AIMS); the African Laser Centre (ALC), the Southern Africa Network for Biosciences (SANBio), and the Southern Africa network of Water Centres of Excellence (SANWATCE). South Africa has also been an active member of the Bureau that is tasked with the organisation of the second EU–Africa STI Senior Officials Meeting (SOM), to take place in 2013.

South Africa is recognised as a strategic S & T partner in the new EU strategy for international collaboration in research and innovation of September 2012. In contrast with the four BRIC countries and Mexico (members of the ‘Trillion Dollar Club’) South Africa will retain its special status and continue to receive automatic funding. The country is now one of the third country participants in FP7, with 156 signed grant agreements, and a total EU contribution of EUR 28 million. Indeed it is currently the fifth most active third country partner in FP7, directly after Russia, the United States, China and India. Although it is not one of its priority countries, South Africa is also the main partner in Africa of the Joint Research Centre, with 23 active partnerships to date. When normalised in relation to the size of its innovation system, South Africa is the largest third country participant in FP7.

The expectation is that collaborations will be further strengthened in Horizon 2020 that explicitly mentions international science collaboration with third countries as one of the key initiatives. South Africa’s commitment to S & T cooperation is evident in the upfront contribution of budget from government, significant in-kind contribution through support to the national contact points (NCPs), and through research offices at institutional level by its universities and various public research organisations.

(2) http://ec.europa.eu/research/horizon2020/index_en.cfm
3.2. Contribution to innovation

Innovation is a highly valued concept in both South Africa and the EU. FP4–FP 7 include emphasis on innovation in industry especially by seeking to draw in SMEs, and the promotion of regional clusters of innovating firms. Innovation is at the centre of the Europe 2020 strategy with the Innovation Union as its flagship and the new framework programme Horizon 2020. On its side South Africa drew up its own Ten Year Innovation Plan in 2008. For both parties, innovation mainly refers to market-oriented activities although Horizon 2020 also covers non-technological innovation, corresponding with the broad approach to innovation taken in the Innovation Union. This approach recognises the need for Europe to develop a distinct approach to innovation to be able to compete on the global scene and includes building on EU strengths in design, creativity, services and social innovation.

At the time of the S & T Agreement, FP5 (1998–2001) was seeking ‘to help EU companies meet the challenges of the 21st century and in addition, through research, to come up with answers to a wide range of issues that were important for European society, such as employment, health, environment, communications and mobility’ (EC, 2013a). The central goal of FP6 (2002–06) was to create the European Research Area, while FP7 sought to bolster European jobs and competitiveness, and to maintain its leadership in the global knowledge economy. FP7 includes the new concept of ‘European Added Value’ that is to be achieved through transnational work, including movement of researchers, and the support of national projects in frontier science. FP7 is the first such programme to be subject to ex ante impact assessment. This specifies the expected outputs in terms of scientific publications, new management tools and models, and innovation outputs—patents and new sales. FP7 demonstrates a stronger focus on socio-economic challenges and also sets out to provide researchers with international and workplace experience, with an on-going shift from curiosity-driven to mission-oriented research.

South African FP participation has tended to focus on basic and applied science in the natural sciences and engineering while FP7 saw efforts to extend this to the social science and humanities (SSH). South African SSH researchers joined eight FP7 projects, through which valuable experience was gained, in some cases as work package (WP) coordinators.

Of the 193 individual contracts that South African organisations held for FP7 work, 10 were state-owned enterprises; 21 private companies; 9 NGOs. These are all regarded as ‘private’ sector since they function in the market place. Nonetheless, it would be a stretch to claim that 40 of the 193 organisations are truly private sector. Working through the list one must exclude the NGOs and holding companies that are not research performers, in which case the number drops down to 28 or 14.5 %. Secondly, if one counts according to participation by research-performing companies rather than by contract holders, the list shortens to 22, of which roughly 7 are among the leading private sector R & D performers in the country.

FP participation is thus skewed toward the public research organisations and universities so that one should not expect ‘innovation’ to arise as a direct consequence of participation in the FPs. One may also note that the innovation surveys for 2002–04, and 2006–08 (HSRC, 2013) reveal that firms evolve through incremental and adaptive, rather than radical, innovations. Such innovations rarely make headline news.
Despite the political importance attached to innovation, no clear model for EU–South Africa cooperation for strengthening public–private partnership in S & T and innovation has been developed. As shown earlier, there is a limited participation of the South African private sector in FP6 and FP7 due to weak links, and maybe even distrust, between government and business. If the concept of ‘innovation’ is stretched to include novel research infrastructure and capacity, then some argue that the Square Kilometre Array (SKA) radio telescope project counts as an innovation. FP7 support for the development of the global SKA project and South Africa’s participation therein came through the Prepska, Paerip, and Radionet3 projects. In 2012, South Africa became the joint awardee with Australia to host the SKA. The SKA project team believes that SKA is ‘big science’ and will generate spin off applications, though its most important contribution will be new knowledge and capacity building.

Another important ‘innovation experience’ in EU–South Africa S & T cooperation has been the ‘Innovation for poverty alleviation’ programme. Innovation here not only refers to ‘bringing science closer to the market’ but also to ingenious funding mechanisms in the form of sector budget support and new synergies between DG Research and Innovation and DG DEVCO. The programme succeeded in making science ‘readable’ and ‘reachable’ for ordinary people and demonstrated ways in which it can tackle social challenges caused by poverty, e.g. providing wireless Internet access in rural schools. South Africa has demonstrated that it has the necessary conditions in place for moving a step beyond traditional development cooperation to explore new, socially innovative terrains.
4. RESULTS AND IMPACTS

4.1. Main achievements

EU S & T cooperation with South Africa is viewed as one of the most successful endeavours in its international S & T engagements with third countries. All parties attest to the cooperation as ‘a success story’ that offers important lessons for other countries seeking to work with European peers in RDT activities. South Africa has made impressive progress in participation in FP7, leading to its high ranking among third countries, being in the top five for participation and funding in absolute terms. In the FP7 cooperation thematic window ‘Food, agriculture and biotechnology’ South Africa is ranked third. In fact if FP funding is adjusted in relation to country gross expenditure on R & D (GERD) South Africa rises to first position among the third countries (see Table 1 below).

Table 1: FP funding and gross expenditure on R & D

<table>
<thead>
<tr>
<th>Country</th>
<th>USA (Euro million)</th>
<th>Russia (Euro million)</th>
<th>India (Euro million)</th>
<th>China (Euro million)</th>
<th>South Africa (Euro million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP</td>
<td>46</td>
<td>57</td>
<td>34</td>
<td>30</td>
<td>29</td>
</tr>
<tr>
<td>GERD</td>
<td>415.2</td>
<td>33.7</td>
<td>41.4</td>
<td>178.2</td>
<td>4.4</td>
</tr>
<tr>
<td>FP Funds/GERD %</td>
<td>0.01</td>
<td>0.17</td>
<td>0.08</td>
<td>0.02</td>
<td>0.67</td>
</tr>
</tbody>
</table>

Sources: OECD (2012); EC (2012).

By this measure, with a ratio of 0.67 % South Africa absorbs the highest proportion of FP7 funding.

An important policy question concerns the characteristics of participants who succeeded in joining FP consortia or made use of the bilateral channels. A detailed answer to this question was beyond the scope of the Review as this would have required extensive primary research. It was however possible to carry out a first pass quantitative analysis that is presented as Annex 8.2 below.

Analysis of the institutional participation shows the CSIR that has the largest number of FP7 projects, with 36 of all contracts. The Agriculture Research Council, Medical Research Council and Human Sciences Research Council each held 4. Among universities the order was Cape Town (19), Kwazulu-Natal (13), Witwatersrand (12), Stellenbosch (11) and Pretoria (10). Industry participation was limited.
FP7 was aimed at increasing European competitiveness through accessing global research, and addressing challenges faced by third countries that have a global character and whose investigation holds out the prospect of mutual benefit. For South Africa, a major objective of the agreement was to gain access to European research networks; there was no specific push to ensure that its top scientists would lead the drive. As shown in Annex 8.2, NRF rated scientists participate but FP7 does not appear to be a strong draw card for them. The research system is reasonably well-endowed with sources of funds and researchers can thus exercise choice as to how they will best prosper.

An important quantitative measure is scientific publication and over the period of study world output doubled while South Africa’s rose 2.5 times. Reasons for this increase include: increased openness; improved government subsidies for publications; emergence of new research areas with associated funding; the effect of ‘big science’ multinational projects; and changes in the indexing policy of the world of science. South Africa (over 2003–12): the second country co-publication counts show an increase with all EU Member States with a median of 4 times. A marked increase also applies to South Africa–USA. The increase was least with the traditional research partners, the United States, the United Kingdom and Germany. While the bibliometric evidence shows that citation counts are higher for foreign co-publications, the data does not support the claim that the FPs have been the strongest driver of the increase in co-publication, since only 228 articles declare the EC as a source of funds. The median proportion of EC funded publications for each country pair with South Africa is but 1.5 % of the total.

A qualitative measure of impact is offered by considering success stories, such as the above-mentioned Square Kilometre Array (SKA) project bid. The SKA, to be implemented during the lifetime of Horizon 2020 will give stronger international visibility and value to research infrastructure in South Africa and may act as a magnet for investments in research and innovation.

Another success story is the European and developing countries clinical trials partnership (EDCTP), which has its Africa office in Cape Town. The EDCTP was a first experience for the European Union of bringing its Member States together in the area of international clinical trials and aligning necessary policies accordingly. From a slow and complicated start in 2003, the EDCTP succeeded in harnessing expertise from 16 EU Member States to provide funding for 88 clinical trials in malaria, TB and HIV therapies across 30 countries in Sub-Saharan Africa; this despite the difficulties of overcoming different approaches and national policy structures. The Independent Evaluation of EDCTP found that ‘several promising clinical results have been presented (and that) EDCTP has been particularly successful in working with scientists and clinicians in Africa and in providing a unique platform for a genuine dialogue with African scientists’ (EC, 2009: 4).

A question that has exercised discussion is the extent to which EU scientists and technologists are aware of niche expertise in South Africa. A rare case in point is the FP7 Alfabird project that combined 24 EU Member States energy and transport PROs and firms with SASOL and four South African universities to develop aviation fuels. The project led to knowledge sharing and transfer, a link between the universities of Cape Town and Stuttgart, and strengthened the SASOL Advisory Board.
Another successful example of South–North technology transfer is FP6 BioMinE that drew on South African expertise in biological extraction of metals. Coordinated by BRGM, 40 partners including SA Mintek and De Beers, UCT and Stellenbosch University identified opportunities for applying biohydrometallurgy technology in Europe, and the viability of doing so.

From FP6 (4 participations) to FP7 (16 participations, ranking fourth in third country participation FP participation) in transport improved. The country also achieved high success rates (more than 57 %) in transport. FP7 AeroAfrica-EU was launched in 2009 and created a mapping database for FP7 opportunities. A flagship FP7 surface transport project, Stadium, studied the intelligent transport systems for public transport management for large events, e.g. the 2010 FIFA World Cup. Although uptake into FP7 cooperation in the social sciences and humanities has been limited, with only 8 out of 300 projects having South African involvement, South Africa was the initiator of the Ingineus project that addresses the evolution of global production networks into global innovation networks, and their impact on knowledge intensive activities in the EU. Local researchers also played a leading role in the Mercury project: ‘Multilateralism and the EU in the Contemporary Global Order’. The former is reported as having impacted on the EU Innovation strategy (NET4Society, 2012); at project end the latter had the distinction of a book publication.

Generally, the cooperation has contributed to the openness of the South African research and innovation system. Practically all interviewees in South Africa mentioned increased access to (top) research institutes and facilities in the EU, as by far the most important benefit of participating in the FPs. With the gaining of access, the sharing of technical know-how, mutual learning, and the alignment of research efforts through knowledge transfer and development, exchanging expertise directly (rather than learning from literature) was promoted and highly valued. South African scientific institutes also indicated that this enabled them to develop capacity in new domains. Interestingly, networking aspects of the cooperation are more highly regarded than obtaining funds for research through FP participation. South African interviewees explained that participating in the FPs gives exposure in the EU, and thereby international presence and enhanced credibility. In many cases, the ‘first prize’ was the recognition that comes with an invitation to participate in a consortium.

For the EU, the cooperation has led to an appreciation of the niche strengths in South African S & T, and through the contribution to policy learning in the interaction between ‘neutral’ science and technology and the often complex and politically charged development arena. ‘Neutrality’ is exemplified in the SKA project; complexity in GMO and HIV research.

The following success factors are identified:

Prior to the 1994 elections the South African innovation system was oriented toward self-sufficiency and import-substitution, and served minority interests. Post-1994 the challenge was re-orientation to address the societal well-being of the majority and enhance international competitiveness. The government made the strategic choice of focussing on S & T research areas that play to traditional strengths where ‘quick’ results could be achieved as is seen in FP projects on health, environment, food, agriculture (including animal science) and biotechnology; and to an extent in ICT.
The CSIR, with its research management skills and international experience, played an important role in the early phase of the cooperation, and continues to be the most prolific South African partner.

FP participation came at a time during which South Africa was re-establishing and growing international links, and had undertaken an assessment of the innovation system and its future potential through audit and foresight exercises. Its interest in the bio-economy comes from a wish for sustainable exploitation of its rich biodiversity, concerns for food security and the impact of climate change. Furthermore, the late 1990s saw a repositioning of the health sector in South Africa, whereby the health science research community addressed the infectious disease burden, especially of TB and HIV/AIDS. Funding for the SA Medical Research Council doubled and more successful medical research proposals began to appear under FP6.

Effective communication of opportunities has been promoted through the DST Brussels office and various Esastap activities. There is unanimity that the Brussels office has played a pivotal role in enhancing the South Africa–EU relationship and that South Africa demonstrates political will at all levels that is buttressed with good interpersonal relations between DG Research & Innovation and the DST at the highest level.

4.2. Difficulties in implementation

In general, from the South African perspective the lack of participation in specific projects is a case of differences in priorities, information gaps, industrial structure, a limited quantum of high-level researchers and selectivity by both sides. The most important issue that South African scientists mentioned was the difficulty of gaining access to consortia as they do not have strong networks in Europe. Also, for European scientists, there are limited incentives in inviting South African researchers to their consortia. Usually, a South African partner is only sought when certain techniques are available in South Africa and not in Europe, or when research requires South African natural or human resources as study material. For certain calls (e.g. ICT), an African partner in the consortium was mandatory and South Africa was then an obvious source of candidates because of the level of S & T, the capability of its scientific institutions, and the country’s general accessibility and solid research infrastructure compared with other African countries.

Some of the scientists that ‘got in’ complained about the distribution of work within the consortia. Consortium leaders that determine the divisions of WPs are almost always European institutions. South African researchers have tended to participate as members, with some instances of coordinating work packages, but in general there is little room for negotiation on the distribution of WPs. Consequently, South African partners sometimes feel that they are left with the least interesting intellectual work and that they are merely an ‘add on’ to consortia.

Another set of problems concerns project and financial management and reporting requirements. Generally, there is a negative perception of the bureaucratic procedures associated with the FPs, and this despite the aim of the EC to simplify procedures and administrative requirements at the beginning of each new FP. The audit procedures are specifically mentioned as being onerous. Research offices have to source top-up funds beyond what FP provides (although the DST arranges for 50% of the short-fall of manpower costs), and must also manage exchange rate fluctuations to reduce the deflation of funds.
The dualistic nature of South African society is an obstruction to even implementation across the innovation system. While the historically disadvantaged universities are growing their research capacity from a small base they are consequently not in the frontline of taking advantage of the FP. The traditionally ‘white’ universities have well-functioning research support structures with financial, project, legal and international relations staff, and sometimes a person working full-time on the FPs. The exception here is the University of the Western Cape, which has been quite successful in the FP.

Apart from these general difficulties regarding the practical application of the agreement, repeated mention is found in the JSTCC records regarding the low uptake of FP7 cooperation programmes in energy and in nanotechnology, and in the FP7 people programme (Marie Curie instruments). Regarding energy, South African state utility ESKOM dominates the national agenda of energy research and together with the science councils, in 2008/09 accounted for eight times the R & D on energy conducted in the universities, thereby setting the energy research agenda. In 2009, there was an energy research fact-finding mission to South Africa but there appears to have been no specific follow-up. Until 2011, ESKOM strongly promoted the Pebble-Bed Modular Reactor project and participated in three FP cooperations in related fields. South Africa has been a late starter in renewable energy research so there was limited but valuable uptake in FP activities as in the biofuel projects Sweetfuel and Alfabird.

Only modest investment has occurred in nanotechnology in South Africa at 1.8 % of GERD (HSRC, 2010) compared with medical sciences (14.9 %) and engineering sciences (24.4 %) so that the nanotechnology knowledge base is restricted in size, and uptake to FP7 is correspondingly limited.

The mobility instruments present other difficulties. In an effort to enhance networking, Marie Curie incoming fellowships are offered to researchers from third countries, but South Africa and other countries in the South fear brain drain, that may come with the brain circulation that is so vital to knowledge transfer. The long-term Marie Curie placements in both directions are thus few in number — outward to Europe since universities cannot spare staff to stay away for extended periods of more than a year (sabbaticals) while European scientists do not use incoming visits as a career-enhancing move. On the other hand, the IRSES short-term placements and the various South Africa–EU Member States bilaterals serve as relatively neutral channels for mobility. Somewhat perversely the euro area crisis is driving young researchers to seek job opportunities in South Africa and other emerging economies, as such jobs are now in shorter supply in Europe.

In 2004, a network of national contact points (NCPs) was implemented to support and improve South African framework programme participation. Opinions about the role and functioning of the NCPs vary somewhat. Overall, NCPs evoke ‘prestige’, even as ‘a sort of ambassadorship.’ At the very least, being a NCP gives access to networks and resources, first-hand information on future calls, and detailed knowledge of FP proposal writing obtained at workshops in Brussels. Scientists might be in touch with NCPs for technical proposal writing and for finding consortium partners in Europe.

Since NCPs are often scientists themselves, being employed by a university or research council, there is the potential for a conflict of interest, though it must be stressed that no such incidences have been reported. The trade off is that NCPs who are full-time scientists ‘know their scientific community well’ so they can be effective, although they often have little time to dedicate to their supporting role as their position is unpaid (the DST only funds expenses). For these reasons, some believe that there should be fewer NCPs (there is one for each thematic field), so that resources can be concentrated.
EC officials as well as the DST see the value of the NCPs since in the words of a DST official ‘they take priorities from the research field to the policy level,’ and ‘facilitated the creation of a local network on the FP in South Africa.’ The system of NCPs is an important asset, being the ‘institutional memory’ of the network. The DST is reviewing the NCP system with a focus on future effectiveness.
5. GOVERNANCE OF THE AGREEMENT

5.1. Role and efficiency of the JSTCC

The Joint Science and Technology Cooperation Committee (JSTCC) has met 11 times since 1998, with the last meeting in Cape Town, in November 2012, celebrating the 15th anniversary of the agreement. The Committee is made up of official representatives of each party, with the responsibility for the management of the agreement under its own rules of procedure. As part of the preparation for meetings, working groups (WGs) on thematic areas have been set up and the main conclusions for their meetings have been an input to the JSTCC meetings. There has been appropriate involvement of relevant EC services and South African ministries and agencies. During the recent meetings the highest level of political representation at the JSTCC has been through the DGs of both sides, demonstrating the growing political importance attached to the cooperation.

Generally, the minutes of the meetings and the subsequent roadmaps reflect the work done to cover the main duties of the JSTCC per Article 6 of the agreement: recent S & T policy developments both in the EU and in South Africa, a stocktaking of current main activities in the science collaboration and the strategic areas, and recommendations on new possibilities to increase the cooperation. The format of the meetings has changed in recent years: the focus is now on priority areas rather than on all activities in all sectors. This is a welcome change as a first selection of topics is made prior to the JSTCC, giving more focus and direction to the actual policy discussions. The meetings are generally perceived as a useful forum for direction setting, with preparatory work undertaken outside the meetings. Documentation shows that issues have been tracked and solved. However, there is not much evidence of the fourth task, namely ‘the review of the efficient and effective functioning of the agreement.’

5.2. Prioritisation and scale of cooperation activities

Over the 15-year period, many changes have taken place in terms of prioritisation, the scope and scale of cooperation activities decided by the JSTCC. Roadmaps became a prominent management tool for keeping track of the implementation of the agreement during FP7. Since 2008, four roadmaps have been developed as a result of the JSTCC annual meetings. The first two roadmaps have a systematised format, consisting of four sections: JSTCC agreed actions for improving FP7 cooperation; other actions for FP7 cooperation; science and technology in the South Africa–EU strategic partnership; support for regional science and technology programmes in Africa. For each field, objectives are formulated with actions to achieve these and a status overview for monitoring purposes. It is possible to track progress made with objectives and actions from year to year. Yet objectives have not been made SMART (specific, measurable, achievable, realistic, timely) so there are no effective performance indicators. The status field in the roadmap is almost always left empty.

The format of the 2011 and 2012 roadmaps is different. For each scientific field of cooperation, briefings are given on achievements, planned activities, and potential new activities. It is unclear why a narrative approach has been chosen as this does not lead to more effective progress monitoring.
Regular exchange on S & T and innovation policies and national science developments takes place through the JSTCC, and policy dialogue occurs in 20 common priority areas as part of the strategic partnership between the EU and South Africa of 2007, including trade, education, space, and ICT. Some fields of dialogue overlap with FP7 cooperation activities but are not directly linked to these except for ICT and space. In fact, research cooperation is regarded by both sides as having been more successful than the policy dialogues.

The dialogues are also subject to other imperatives — political, diplomatic, security, commercial, intellectual property rights, standards, regulatory and legal — so that it would be unrealistic to expect smooth sailing in all domains. Where the policy dialogue is focused on pragmatic needs, as for example air traffic control (EGNOS), progress has been notable; where common ground has yet to emerge, as for example the case of the Pan-African Space Agency, progress has been fitful. The EU–South Africa Space Dialogue was launched in 2008 through DG Industry and Enterprise (EC, 2013b). Thus far, there have been five policy dialogues that bring together the DST, the new South Africa National Space Agency (SANSA), the European Space Agency, and the EC. South African officials are pleased with the dialogue that informed the design of the newly formed SANSA (from a procedural point of view it can be argued that the Space Dialogue should rather resort under the TDCA — the institutional link with the S & T agreement is not direct.) On the other hand, there are differences regarding the pace with which the mooted Pan-African Space Agency is being progressed. There will always be some divergence of views where security and commercial interests prevail, a case in point is being the dialogues in the ICT sector. Roaming, broadband, research collaboration, and security are sensitive issues, as is Internet governance, with African countries, including South Africa, arguing for regulation, while the EU wants an open Internet with multi-stakeholder governance.

Mutual learning and coordination of policies are yet to become visible, through a ‘Coordinated Call for Proposals.’ Such deepening of cooperation was considered under FP7 Health but this did not materialise because it was not financially feasible for South Africa. For reasons of budget, a joint EU–South Africa call similar to the EU–India’s (in the water and bio-resources) has also not taken place as yet. There has been a dedicated topic in FP7 ‘Future Internet research experimentation with South African funding of the South African partners’.

Actions towards consolidation took place on a more humble scale, such as in health and environment calls, in food, agriculture and fisheries, and in biotechnology — comprising areas in which cooperation with Africa is specifically identified, such as indigenous knowledge and agriculture and topics that are of relevance for the millennium development goals (MDGs) of reducing hunger and ensuring environmental sustainability. In other areas (energy) there has been consultation on priorities and mutually beneficial cooperation, and mapping areas of excellence.

Despite the smaller impetus, these initiatives were a direct result of policy dialogues at the highest levels and contributed to enhanced South African participation in FP7. The common viewpoint within the EC is that South Africa has a strategic approach to the engagement beyond mere access to funds, and it is able to formulate what it seeks to achieve. South Africa has a critical mass of institutional capacity in a limited number of areas, but insufficient human capital to be a stronger partner.
5.3. Regional scope of the cooperation

The agreement explicitly states that science cooperation between the EU and South Africa ‘should also be to the benefit of the Southern African Development Community where possible and justified,’ and thereby further builds upon the INCO projects financed under FP5 and FP6. There is indeed evidence of effort to draw in the SADC region through the exchange of information on possible common themes and institutional mechanisms for cooperation and awareness raising but the impact has been limited until now.

The agreement does not mention potential benefits of the cooperation for Africa as a whole. The FP activity focusing on the wider level is the Africa Call of 2010. Another S & T cooperation programme with Africa is run by DG DEVCO, the ‘ACP science and technology’ (ACP S & T) programme, which is aimed at building and strengthening the capacities of ACP countries in formulating and implementing S & T policies. Both programmes have been instrumental for advancing South Africa’s role in both the FPs and the African Union (AU) science community. The DST is both funder and role player in the ACP S & T programme, contributing EUR 5 million. The DST also supports the hosting of the Southern African Biosciences Network of the NEPAD African Biosciences Initiative at the CSIR. SANBio has so far brought one natural-based pharmaceutical product to clinical trial stage, trained 34 postgraduate students, supported bioinformatics in Mauritius, and mushroom cultivation in Namibia. Finland has been a major donor to the SANBio network and its associated Biofisa project.

The Africa Call formed part of a package of measures to advance science cooperation between the EU and Africa. As demonstrated by the EU–Africa partnership on science, information society and space, which was adopted in Lisbon in December 2007, cooperation between the two continents has become more important in recent years, as one of the eight partnerships in the joint Africa–EU strategy. A major achievement has been the alignment between EDF-funded S & T programmes and the FP7. For instance, the African Research Grants are supported through the 10th EDF, and the Africa Call project on water management and food security (the Africa Call) is supported through the FP.

Although South Africa has undoubtedly played an important stimulus role in ERAfrica and is a key participant in CAAST-NET, which seeks to advance future research cooperation between the EU and Africa through the strengthening of the S & T policy dialogue, it is difficult to attribute exact outcomes or impact to this involvement. The ability to operate on a pan-African level clearly depends on the willingness and efficiency of the African Union Member States. South Africa has to play a subtle role being conscious of the fact that it should not be too pushy in relation to the rest of Africa. In all scientific areas, there is a delicate balancing act to play between wanting to ‘take this forward’ and ‘being careful not to be seen as “Big Brother”’. A South African official expressed this as ‘leading from behind’. EC officials also seem to have picked up a general sensitivity about South Africa’s role in Africa. Despite its key position in Africa, South Africa is regarded by several EC officials interviewed as a ‘very composed country’ and even ‘overactive’, being capable of utilising ‘different, and even contrasting discourses in different settings’, which complicates dialogues and partnerships. Yet these dynamics also provide an area of mutual learning. One EC official explained that ‘while trying to understand how to deal with Africa and South Africa, we learnt that there was a need to combine strong bilateral relations in transport with progressive empowerment of the African Union in doing business regionally.’ In essence, South Africa is viewed as an equal partner and a necessary interlocutor to have on board, always able ‘to get the right people at the table.’
5.4. Usefulness of ‘international cooperation’ in capacities programme

The BILAT instrument to support the bilateral coordination of S & T policies between South African and the European Union — the European-South African science and technology advancement programme (Esastap) — has been key to South Africa’s success in the FPs. There have been three Esastap projects: Esastap (2005–07, funded under FP6, EUR 340 000 EU funds with co-investment of EUR 410 000 by DST, which also managed the programme), Esastap 2 (2008–11, funded under FP7, EUR 500 000 EU funds and EUR 800 000 contributed by the DST) and the recently launched Esastap Plus (2013–15, funded under FP7, EUR 1.5 million EU funds, and EUR 300 000 funded by the DST). The Esastap projects were conceived with the objectives to improve and increase South Africa’s participation in the FP, to develop networks and partnerships between South African and EU researchers and institutions, and to better identify mutual interest in enhanced S & T cooperation. Esastap Plus now includes a consortium of EU Member States (Greece, Germany, France, Italy) and Switzerland to improve the coordination of EU Member States research policies and programmes vis-à-vis South Africa.

Esastap is a highly proactive network that has been successful in raising awareness within the South African science community about FP opportunities. Under Esastap 2, over a hundred events and activities were organised in South Africa and in Europe to identify opportunities and to facilitate partner matching. Decisive here has been South Africa’s decision to retain a Science Counsellor in Brussels as the DST’s representative to the EC. Also helpful, although with less obvious direct impact, was the ‘Cooperation in scientific and technical research’ programme (COST) — a ‘reciprocal arrangement’ between the European cooperation and the DST — that provided funding through Esastap for short-term scientific missions by South African and EU researchers from 2010 onwards.

CAAST-Net (Network for the coordination and advancement of Sub-Saharan Africa–EU S & T cooperation) an INCO programme, ran over 2007 to 2012 and linked 7 EU Member States and 2 ERA members with 12 African countries — Botswana, Cameroon, Cape Verde, Egypt, Ghana, Kenya, Madagascar, Nigeria, Rwanda, Senegal, South Africa, and Uganda. South Africa plays a strongly supportive role in CAAST Net, that complements Esastap and showcases research opportunities, especially the 2010 Africa Call. It is a ‘policy support project’ that does not readily lend itself to impact analysis, and it has been difficult to structure CAAST-Net to combine policy dialogue and information sharing, a shortcoming that CAAST-Net Plus will address.

Another INCO project is SAccess that has worked hard to communicate research opportunities in South Africa to parties in Europe, but without much evidence of success. The evaluators found that South Africa’s funding instruments were focused toward domestic needs and had not paid much attention to creating a global information presence. It is doubtful whether a similar EU project could achieve a very different outcome to that of SAccess. A fourth INCO BILAT project, ERAfrica set out to create a European Research Area Network for Africa bringing nine EU Member States together with South Africa, Kenya, Egypt. Its first concrete action was the joint call for research proposals of January 2013, meaning that its activities fall outside the scope of this Review.
6. THE AGREEMENT AND EU MEMBER STATES BILATERALS WITH SOUTH AFRICA

6.1. Synergies with bilateral agreements of EU Member States

Bilateral activities constitute a strong basis for, and continuity of European presence in the science field in South Africa. The DST coordinates the political/diplomatic aspects of international bilateral relations, while the NRF is responsible for the operational aspects, with the S & T Agreements Committee (STAC) providing the guidelines for cooperation. Most agreements date back to South Africa's transition to democracy and were established to assist the country in overcoming apartheid era isolation. There are 12 country level S & T agreements with EU Member States, and many inter-agency agreements across the EU and ERA, including with Russia, Switzerland, Norway, and Israel. Cooperation with the United Kingdom, Germany, France and the Netherlands are among the most important, but Hungary, Sweden, Finland and Russia also make large financial contributions.

Over 2008–12, NRF recorded in the order of R 194 million expenditure through the EU Member States and ERA bilaterals. To this may be added R 50 million under the South Africa–Norway collaboration, R 24 million from Finland (BioFISA, Cofisa), and in-kind support from France and Germany to R 5 million, a combined amount of similar magnitude (± EUR 40 million) as the flow from the EU in support of South Africa’s FP7 projects.

The ‘outputs’ of this wide range of activity are not readily quantifiable. Noteworthy however is the South Africa–Germany Year of Science, signaling a ramp-up of German S & T bilateral cooperation. Germany is a major trading partner with South Africa, and its companies maintain local R & D laboratories. This industrial linkage may become increasingly important as Horizon 2020 begins to roll out. German support for technical and vocational education and training, and technology incubation is highly appreciated, has been institutionalised in centres of competence and absorption of the GTZ-funded Tshumisamo project into the Technology Innovation Agency.

Over the years NRF has commissioned evaluations of a number of bilateral agreements (Norway, France, Germany, Belgium (Flanders) that provide some indication of achievement and fitness of purpose. However a systematic process of evaluation conducted according to a standard template does not seem to be in place, so that summary data on bilateral outcomes are unavailable. Quite naturally the problem of attribution of outputs also applies.

Generally speaking, bilateral agreements that specify the partners and their responsibilities are believed to have been the most successful. It is clear that bilaterals require considerable input from both sides and that this hidden activity, necessitated by inevitable system mismatches, can be considerable.

Bilateral agreement activities also wax and wane over time according to shifting practical and political goals. For some years the United Kingdom–South Africa bilateral was not employed as a major channel for cooperation, with institutions being left to make their own links. The fact is that the United Kingdom was and is the major EU Member States S & T collaborator. There now seems to be movement to change this and energise the bilateral agreement with resources, the more so given UK’s commitment to space science, the SKA and other projects including the Bloodhound supersonic vehicle. Unless a bilateral programme is adequately funded, little will be achieved.
Among the main benefits of the bilaterals have been the growth of institutional linkages, especially for historically disadvantaged universities that are growing their research capacity, staff training, networking and study visits, and to a variable extent, research collaboration and knowledge sharing though ‘while it is easy to obtain mobility grants through the bilaterals; the problem comes after that when project funding is needed.’ It should be noted that health, and agricultural research were not included as a focus of the bilateral agreements under NRF management. Some have also pointed to the value of the bilateral agreement system as enabling FP participation but no concrete evidence supports this assertion. At a late stage the implementation of the assessment site visits to EU Member States were replaced with telephonic interviews so that it proved difficult to locate the most appropriate officials that could express views on the direct impact of the bilaterals.

6.2. Towards improved coordination

Over the years, attempts have been made to find common ground and synergies between the FP and the various bilateral agreements involving South Africa and EU Member States, but this has not been easy due to strong national interests, historical and political linkages and national pride on the European side. The European policy environment has become ever more complex due to the euro crisis with Member States pursuing national rather than European interests. A case in point is Germany (see above).

On the South African side, better coordination and more synergy would be welcome. Policy officials have said that a more integrated approach is needed to S & T relations with Europe. They understand that strong bilateral links with EU Member States are needed to form FP consortia to compete for EC funds. It is thus clear that better coordination would have a positive impact on the efficiency of all cooperation activities between South Africa and Europe, including those with EU Member States.

Even though no specific activities have been developed to date, there is obviously a huge potential for mutual reinforcement. Through FP, return on investment in bilateral cooperation may be increased. Scientists that have networked through a bilateral agreement might continue their collaboration in a FP project. In this way, the EU Member States–South Africa bilaterals could serve as an enabling mechanism to engage with FP, as networks are established through them. Furthermore, FP represents an opportunity for large-scale cooperation, which would not be possible through a bilateral arrangement with individual EU Member States. Efforts to find synergies and mutual grounds should take place in Europe rather than in South Africa since policies and flows of funding originate from there. A useful starting point could be to draw up an inventory of bilateral activities of EU Member States with South Africa in the science and technology field, in addition to regular discussions on the issue of coordination within Easastap Plus. At the moment, there is no evidence of attempts to find synergies.
7. CONCLUSIONS AND RECOMMENDATIONS

7.1. Conclusions

The most obvious conclusion to be drawn regarding the S & T cooperation agreement is that both principals see it as a resounding success. We share this viewpoint, even though as explained in the text, it is difficult to ascribe specific impacts to the agreement. There have certainly been numerous outputs, but their translation into outcomes and impacts takes time and is difficult to track.

From the European Union side, South Africa is viewed as a sound and competent partner, ‘able to get the right people on board,’ willing to work hard to give substance to the agreement both from its own national perspective, and indeed as an important interlocutor and strategic partner for the EU with SADC and Africa. South Africa has managed its dominant role in Africa with care, by ‘leading from behind.’ South Africa will continue to receive automatic funding.

There has been valuable policy dialogue between the parties, with evidence of South–North learning and technology transfer based on South African niche expertise and certain geographic advantages.

From the South African side the goal of gaining and increasing access to European research networks has been realised, this despite the natural mismatches between research cultures and regulatory practices. There has been considerable learning, inward technology transfer, capacity development and a general strengthening of links. Intellectual property disputes have not manifested themselves.

A broad mix of senior and younger scientists have participated in all aspects of the cooperation and bilateral agreement mobility opportunities.

South Africa is satisfied with the alignment between the EU and South African and innovation agendas, and especially pleased with the support offered to the SKA project, the fight to alleviate the burden of infectious disease, and the transfer of specific ICTs to assist in monitoring and control of the environment and air space.

The numerous South Africa–EU Member States bilaterals have delivered to their various mandates to varying degrees. These bilaterals by virtue of smaller funding quanta and simpler procedures complement the larger and more cumbersome FP projects, and have enabled considerable mobility for South African scientists. Synergies between the two have yet to be found and are important as this would enhance the return on investment considerably. Yet political will might not come easily as national economic interests currently dominate the international cooperation agenda of many Member States in their quest of finding solutions to the euro crisis they are facing.

The Joint Science and Technology Cooperation Committee (JSTCC) has functioned well, and its recent adoption of a more focused approach makes for enhanced monitoring and decision-making, even though the narrative style could incur some loss of objectivity.

As noted by many interviewees, a key element in South Africa’s large share of FP projects is attributable to the commitment of the DST, the early and ongoing role of the CSIR, the network of NCPs, and most importantly the consistent work of the DST Brussels office and the various officials responsible for Esastap over its three phases.
It is obvious that the framework programmes place Europe first, so that scientists outside the ERA are likely to find some difficulty in slotting into consortia at bid stage. It is also obvious that the ‘invisible college of science’ is now more open than ever thanks to the Internet, broadband, search engines and social media dedicated to networking researchers.

Links between the individual South Africa–EU Member States bilaterals and FP participation are rather tenuous; there is also no evidence to support the claim that FP participation is the strongest driver accounting for the increase in South African publication outputs results.

DG DEVCO has used the fact of South Africa’s excellent record of cooperation in S & T to fund the Innovation for the poverty alleviation project, a ‘first’ for DG DEVCO in the area of technological innovation. A verdict of qualified success for this project adds to the overall sense of achievement.

The above speak to the gains of the cooperation, but there are naturally some shortcomings too. One such shortcoming is common to both sides, namely the lack of systematic capture of project outputs. While the EC has an exemplary system of recording project proposals, awards, and financial transactions, it does not routinely capture information on project outputs, and this despite numerous recommendations of its own evaluators that this is needed. There is a similar gap on the South African side. Without a proper record of outputs, even were these to be limited to scientific publications, the evaluator is hard-pressed to arrive at firm conclusions regarding project attainment.

A second and obvious matter for improvement is EC procurement and reporting requirements. These have been the subject of much comment over the years, with undertakings to simplify, but the recipient community appears to remain unconvinced.

The third is a matter obvious to both sides: South Africa has done well in relation to its size, but must grow its skilled resource base and reduce inequalities among its institutions. This will take time and careful use of all instruments, especially mobility grants.

### 7.2. Recommendations

South Africa has done well in grappling with the complexities of accessing the FPs and in managing the multiplicity of country to country bilateral agreements. In our view future South Africa–EU collaboration may be strengthened and deepened by addressing the following issues.

- **Horizon 2020** with its strong intent to draw in the business sector will present new challenges that must be prepared for, perhaps through the Eureka network. Promoting public sector–private sector links in order to advance commercialisation of research is a goal common to both sides and South Africa should make all efforts to learn from EU good practice, especially in relation to managing the resultant intellectual property.

- The new and changing research and innovation environment suggests that the DST support structures in Brussels should be maintained and even grown to include personnel with business sector experience. The same type of experience should be included in the NCP network at home.

- Other third countries might wish to study and emulate Esastap to grow their access to Horizon 2020 going forward.
• One must naturally support measures to simplify the Horizon 2020 control and accounting procedures.

• There is an urgent need to develop a user-friendly information system (on both sides) that will capture the outputs of the cooperative activities in a standard form that allows for analysis and thus supports evidence-based decision-making.

• Though difficult to achieve in practice, consideration might be given to creating a forum of EU Member States S & T counsellors in South Africa who could work together to ensure a harmonised approach to working with the SADC and AU, and find synergies to improve coordination between the EU Member States bilateral agreements with South Africa, and future framework programmes.

• To mitigate the harsh legacy of apartheid-driven institutional inequalities, consideration might be given to creating local ‘circles of excellence’ that will engage with partners in the EU Member States whilst drawing in researchers from higher education institutions that have not yet achieved critical mass in research.
8. ANNEXES

8.1. TERMS OF REFERENCE (version 5.9.2012)

**Expert’s tasks and planning**

TERMS OF REFERENCE
‘Review of the S & T Cooperation Agreement between the European Union and South Africa’

**A. INTRODUCTION AND OVERALL OBJECTIVE**

These are the terms of reference for an expert group set up by DG Research & Innovation of the European Commission to conduct a review of EU–South Africa cooperation in the field of research, assessing in particular the implementation and impact of the S & T cooperation agreement concluded between the European Community and South Africa (EU–South Africa S & T agreement).

Through a combination of collective and individual work punctuated by several meetings and one mission of the experts to South Africa, the expert group should analyse and assess qualitatively and quantitatively the evolution of EU–South Africa science, technology and innovation cooperation objectives and activities prioritised by the Joint Committee over the period 1997–2012, and as far as possible, their results and impacts. It will take into account the objectives and prescriptions defined in the S & T agreement, the functioning of the Joint S & T Steering Committee, the evolution of the S & T policies on both sides, the potential of cooperation for both sides, the scale and scope of the cooperation activities, their added value and links with bilateral cooperation between EU Member States and South Africa. It will also identify problems and difficulties related to the implementation of the agreement which may limit its impact, and, where appropriate, make recommendations to address them. It will address in particular the questions set out in section 2.2, using indicators where appropriate.

The group will prepare a final report in which it will present analysis, main findings, conclusions and recommendations.

**B. MANDATE, DELIVERABLES AND TIMETABLE**

**Context and rationale**

Several S & T cooperation agreements are in force between the European Union and third countries. They offer a political, legal and administrative framework for coordinating and facilitating S & T cooperation between European legal entities and international partners, thereby strengthening the international dimension of the European Research Area.
These S & T cooperation agreements do not include specific provisions regarding the funding of cooperative research activities (funding remains subject to the respective applicable laws/regulations, policies and programmes of the two parties to the agreement). They do, however, set the principles regarding partnership for balanced mutual benefits as well as the management and sharing of the intellectual property created or used in the context of cooperative research activities.

The EU–South Africa S & T agreement was signed on 5.12.96 and entered into force on 11.11.97. Article 11(b) of the agreement provides that it is ‘renewable by common agreement between the Parties (tacit renewal) for the specific programmes implementing subsequent framework programmes of the Community’.

**Questions to be addressed**

The approach should take into account changes in the research and innovation landscapes and the evolution of S & T policies of the EU and South Africa including their international dimension, as well as the role of research and innovation in the broader political and economic context and relation between the EU and South Africa. On the EU side, the international aspects of the Innovation Union and the development of a more strategic approach of the Commission to international cooperation will also be taken into account.

The expert group will address the following questions.

**What are the major evolutions in the bilateral cooperation over the period?**

The report should address in particular the following aspects:

- objectives and priorities of the cooperation: S & T areas, societal challenges, human resources, infrastructures, SMEs, clusters, etc.;
- the extent to which cooperation addresses innovation issues (beyond research);
- the nature, scale and scope of activities: policy exchange, mutual learning and coordination; support to research cooperation, including budget and funding instruments used; activities to support dissemination and exploitation of results; activities to promote awareness and networking between organisations on both sides;
- the quantitative and qualitative participation of entities from South Africa in the framework programme: repartition between different themes and areas, types of research and innovation organisations involved (universities, industry, including SMEs, research centres, intermediaries, funding agencies, research and innovation policymakers, etc.);
- the extent to which programmes in South Africa are open to promote collaborative activities with organisations in Europe.
Are the cooperation activities producing the expected results and impacts?
Are they balanced and mutually beneficial?

In particular:

- the main achievements, including concrete examples of successful activities (success stories), identifying factors of success;
- difficulties/problems in the implementation of the cooperation activities including how they have been addressed or why they could not be addressed (e.g. research and innovation capacity, information and awareness actions, role and training of contact points in South Africa, partnering with European organisations, FP7 rules; alignment of funding mechanisms, etc.).

How has the role of the Joint S & T Cooperation Committees evolved and have changes contributed to improve cooperation?

In particular with respect to:

- the prioritisation, scope, and scale of cooperation activities decided by the Joint Steering Committee;
- the appropriate involvement of the relevant Commission services and South African ministries and agencies
- the monitoring of the implementation of the cooperation activities and the dissemination of the results;
- the extent to which the bilateral cooperation benefited from and contributed to regional level cooperation in the Sub-Saharan Africa on themes of common interest; needs and opportunities for regional level cooperation.

How useful have the relevant projects funded under the ‘international cooperation’ part of the capacities programme (BILAT, Inconet, etc.) been?

In particular with respect to:

- the relevance of the project activities and participants and the project results which contribute to facilitate and enhance the cooperation;
- options for improvement of these projects.

To what extent have the bilateral EU–South Africa cooperation activities contributed to develop coordination and synergies with bilateral cooperation of EU Members States with South Africa?

In particular with respect to:

- types of activities which have contributed to increase coordination and synergies;
- options to further increase coordination and synergies.
Deliverables and timetable

The expert group is requested to address to the Commission a report, of maximum 15 pages plus annexes, which includes the main elements of the analysis, the findings and a set of conclusions and recommendations for improving the cooperation. The main section of the report should be prefaced by a summary, not exceeding two pages. The final report will be in a publishable form and will include an overview presentation for briefing/presentation purposes. The report will be made publicly available on the Europa website.

The expert group will start its work mid-November 2012 and its final report should be addressed to the Commission mid-May 2013.

The kick-off, progress and final meetings will normally be held in Brussels. Contact will be maintained with the Commission nominated policy officer throughout the work of the expert group, through progress coordination meetings and regular telephone/e-mail contacts as appropriate.

To perform the tasks, a maximum of 34 working days are considered necessary for each of the two experts, comprising:

- the work at the experts’ normal location;
- up to a maximum of four meeting days in Brussels;
- one trip (maximum 6 days) for meetings with relevant organisations in South Africa (public authorities and stakeholders); and
- maximum two trips (1 day each) for meetings in EU Member States’ on their S & T bilateral agreements with South Africa;
- Trips to South Africa and the Member States are subject to prior written approval of the responsible officer.

The following steps and deliverables will define the implementation of the expert group’s work:

- Kick-off meeting (between 15 November 2012 and 15 December 2012) to establish and finalise the work plan, methodology, time-schedule and partition of workload between the two experts
- Planning of information acquisition to set out the requirements, sources and access for the information needed to identify and establish contact with organisations/people in the EU and South Africa (policymakers and stakeholders), to define an appropriate method for assessing the EU–South Africa cooperation
- Analysis of EU–South Africa cooperation activities in S & T to conduct a quantitative and qualitative analysis of cooperation activities on the basis of FP7 statistics; the EU–South Africa S & T cooperation agenda and other available information
- Collection and analysis of the views of a representative panel of research and innovation organisations
- Mission to undertake face-to-face interviews in South Africa with public officials and representative stakeholders; to report and present main findings and conclusions
- Progress coordination meeting with Commission staff responsible for the expert group and presentation of interim report (Mid-February 2013)
- Missions in EU Member States with the most active S & T bilateral agreements with South Africa to undertake face-to-face interviews with policymakers and representative stakeholders; to report and present main findings and conclusions
- Qualitative and quantitative analysis and assessment of scope, scale, results and impacts of cooperation activities undertaken under the EU–South Africa S & T agreement; in particular to identify the limitations and constraints which constitute obstacles and limit progress in successfully implementing EU–South Africa S & T cooperative activities; assess the coordination and synergies between EU and Member States
- Additional progress coordination meeting(s) with Commission staff responsible for the expert group by common agreement
- Drafting of final report (Mid-April 2013) providing a comprehensive review of the development of the EU–South Africa cooperation and last meeting in Brussels to discuss it
- Final Report (20 May 2013)

List of tasks: see as detailed above.

List of deliverables: draft final report (15.4.2013); Final report (20.5.2013)
C. OPERATION OF THE EXPERT GROUP

Number, identification and selection of experts

The expert group will consist of two members who are selected on the basis of the following criteria:

- experience in the design and implementation of research and innovation policies and programmes, including the international dimension;
- good knowledge of EU research and innovation policies and programmes;
- the appropriate language skills;
- a regular rotation of experts.

Experts are identified from a list, continually updated by an open-ended call for applications (OJ C 305 of 14.12.2006), for the constitution of expert groups assisting the Commission’s services for tasks in connection with the Seventh RTD framework programme (https://ec.europa.eu/research/participants/portal/page/experts).

Working method

The partition of the work between the experts will be agreed between the experts and the Commission services, ensuring optimal use of their expertise. The experts will produce an integrated report.

The Commission staff responsible for the expert group will be in regular contact with the group to ensure the smooth running of the review, and will provide relevant available information and orientations when necessary. The Commission staff will inform and seek input where necessary from other relevant Commission services concerned.

In order to speed up and increase overall efficiency, experts will have to make use of e-mails, telephone, faxes at no extra cost to the Commission; they will have to download information and/or documents from the Commission’s websites where the relevant documents are stored.

Circumstances in which a conflict of interest may exist

(For details see the terms of Annex I to the Appointment letter)

A disqualifying conflict of interest exists in the following cases:

- An expert must declare any vested interests in relation to the questions upon which he/she is asked to give advice. In particular, he/she will not be allowed to participate in the group if he or she or his or her organisation could stand to benefit, or be disadvantaged, as a direct result of the advice given.
- An expert must declare if he/she is in any other situation that compromises his or her ability to carry out his or her task impartially.
- A potential conflict of interest may exist if an expert is in any other situation that could cast doubt on his or her ability to give an advice impartially, or that could reasonably appear to do so in the eyes of an external third party.
- An expert must declare any vested interests in relation to the questions upon which he/she is asked to give advice.
Credits

The physical and intellectual products generated by the expert’s assignment will remain the property of the Commission. The published report prepared will acknowledge the authorship and other contributions of the members of the expert group.

8.2. QUANTITATIVE ANALYSIS

DG Research and Innovation provided high-level quantitative data on South Africa participation in FP projects. This comprehensive data speaks to the volume of participation by funds allocated, fields, projects and participating institutions. It mainly comprises input data (financials and institutions) rather than outputs. In fact the lack of output data on both sides of the cooperation presents a serious gap. This gap has been remarked on in various studies on the FPs (Simmonds et al., 2010; EREC, Delanghe and Muldur, 2007). CORDIS, whilst valuable at the same macro-level does not provide evidence of outputs. Instead one would be forced to correspond directly with the projects to determine the extent of actual codifiable outputs.

Institutions

As is the case in Europe, it is a South African PRO, the CSIR, that is involved in the largest number of FP7 projects, namely 36 (19 %) of all contracts signed. The CSIR is by far the largest science council and has quite deliberately set out to benefit from the type of networking and learning that the FPs offer. By design the CSIR has long engaged with the private sector and international community both before and since the onset of the new political dispensation. It is adept at contract, financial, project and IP management, and is thus well-positioned to engage with the modalities of FP participation. The organisation has transitioned from a previous strong focus on defence research into a multi-disciplinary state laboratory that plays its role of technology acquisition, development and transfer. Many of the national contact points are located in the CSIR, or were previously employed in the organisation. The CSIR shifted its reporting line to the DST in 2004, and unsurprisingly its research priorities are well-aligned with those of the department. The next largest PRO, the Agriculture Research Council held four contracts, as did the Medical Research Council and Human Sciences Research Council. It is significant to note that the DST is signatory to 17 contracts, the National Research Foundation to five.

The next most prolific organisation, with 19 (10 %) contracts is the University of Cape Town, the leading research university that is currently ranked in position 113 on the Times Higher Education Supplement listings, and is followed by the University of Kwazulu-Natal (13), Witwatersrand (12), Stellenbosch (11) and Pretoria (10).

Financials

The quantum of funds involved for FP7 is EUR 27 million from the EC side with an upfront contribution of EUR 15 million from the South African side. This converts to roughly ZAR 450 million over the period 2007–13. This quantum may be placed in context by estimating higher education expenditure on R & D (HERD) over the same period to be in the order of ZAR 35 billion.
Scientists

FP7 has the overarching goal of promoting world-class state-of-the-art research. This naturally implies the participation of top researchers in its activities. In the case of the United Kingdom such participation of its leading scientists was a specific government objective. In the United Kingdom, research excellence was until recently mainly determined at the level of research group through the Research Assessment Exercise, not at individual level. Simmonds et al. (2010), in their assessment of UK FP7 achievement thus based one aspect of their analysis on the 2008 Research Assessment Exercise, and concluded that the leading UK research groups were strongly represented in all thematic areas of FP6. They used a survey method to identify the UK leading scientists through which they confirmed that this group were strongly represented in FP activities so that the government objective was attained.

For South Africa, on the other hand, the first goal was to gain access to the framework programmes and thereby to build knowledge, networks and capacities. There was no drive to focusing on encouraging ‘the best’, that in any case receive excellent support through the South Africa Research Chairs Initiative and the Centres of Excellence programme. As it happens, South African has a mechanism to identify ‘the best’, namely the National Research Foundation Rating System that has been in operation since the mid 1980s. This individual rating system uses peer review and academic outputs to rank researchers in six main categories: Leading international researcher; Internationally acclaimed researcher; Established researcher; Prestigious awardee; Young researcher; Late entrant. Rating is voluntary so that of the roughly 17 000 researchers in its universities, by 2013 some 2 637 were rated with 117 being Leading international, 570 Internationally acclaimed, and 1 553 Established. The majority of rated scientists are in the natural sciences and engineering and are university-based.

Resource constraints did not permit this Assessment to inquire into the rating of each principal investigator among the SA FP7 projects and thereby determine whether in fact there was a strong showing of leading researchers. We did however collect data for four of the five research universities that found 23 rated researchers across the 52 projects. Of these five leading international researchers: eight internationally acclaimed researchers; seven established researchers; three young researchers. In other words around 40 percent of projects had a prominent researcher as their principal investigator. Significantly all five leading international researchers were at a single university, suggesting a relatively low uptake into FP of this category. Nonetheless one cannot draw firm conclusions from this small sample — rated scientists do participate in FP7, but FP7 does not appear to be a strong draw card for them. This viewpoint is confirmed through the interviews with university research managers who point to the FP as but one among many sources of funds so that researchers can exercise choice as to where they will best prosper in terms of access to funds or networks.

Bibliometric analysis

As noted earlier, the paucity of output information pushes the use of bibliometric indicators as almost the sole source of quantitative information, a source that is strongly time-dependent since scientific publications will in general take several years of gestation before appearance. A four-year project may see no publications before the third year, with a steady rise after project completion for maybe two or three years thereafter followed by a natural decline unless the publication enters the ranks of the highly cited. It is also important to acknowledge the limits of bibliometrics: ‘It is essential to contextualise research activity of any kind because research cultures vary, as do the
availability of resources and the size and structure of communities. For publication and citation data this is particularly important. Citation rates and typical citation counts vary significantly from one field to another and cannot be directly compared’ (Thomson Reuters, 2010: 8). Even so, the technique remains much the only show in town.

What then is the overall performance of South African authors across the study period, and what can be learnt from the co-publication data? Over the period of study, world scientific output has doubled, with strong gains from the Asia-Pacific region, and South Africa’s output has also risen strongly (Figure 1).

Figure 1: South African authored article count, 1991–2011

Source: Author extract from Web of Science; Science Citation Index-Expanded, Social Science Citation Index, Arts & Humanities Citation Index. Data: Appendix 8.5.1.

Output shows a strong increase from around 2003, despite the fact that the full-time equivalent number of researchers in higher education (the overwhelming source of South Africa’s publications) has remained fairly constant. There are many reasons for the increase in the count: increased openness; improved government support for publication; the emergence of new research areas with associated funding; the effect of ‘big science’ multinational projects; and changes in the indexing policy of the world of science. World output doubled, but South Africa’s increased almost 2.5 times.

This Assessment is concerned with cooperation in S & T and it is thus instructive to investigate the pattern revealed in the co-publication data (Figure 2). A straightforward picture is obtained by examining South Africa — second country counts.
Figure 2 shows the South Africa and second country co-publication count over 2003–12, revealing that the count with all EU countries has increased over the period with a median increase of 4 times. A marked increase also applies to South Africa–USA. It is interesting to note that the increase was least with its traditional research partners, the United States of America, the United Kingdom and Germany, and strongest with the smaller EU research performers, Sweden, Spain, Poland and Italy.

What of the claim that the FPs have been the strongest driver of the increase in this co-publication? One way to examine this is by querying the Web of Science database for the acknowledgement of the EC as a source of funds for articles with South African authors. This query identifies 228 articles among the 55,394 published over the period 2008–12. Table 2 displays the basic data. The median value for the proportion of EC funded publications is 1.5% for each country pair with South Africa. By coincidence this is in the same order of magnitude as the ratio of FP7 funding inputs to the cumulative value of HERD over the same period. Essentially the FP7 funding whilst important is but a modest component of HERD, so that the resulting outputs must necessarily also be modest in number. This is not to suggest that there is a fixed ratio linking financial inputs and publication outputs; there is a relationship but it is imprecise.
Table 2: South Africa - second country co-publication count, 2008–12

<table>
<thead>
<tr>
<th>Country</th>
<th>Count</th>
<th>EC funded</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>8 705</td>
<td>120</td>
<td>1.24</td>
</tr>
<tr>
<td>Germany</td>
<td>4 435</td>
<td>56</td>
<td>1.26</td>
</tr>
<tr>
<td>France</td>
<td>3 435</td>
<td>51</td>
<td>1.48</td>
</tr>
<tr>
<td>Italy</td>
<td>1 740</td>
<td>39</td>
<td>2.24</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2 762</td>
<td>51</td>
<td>1.85</td>
</tr>
<tr>
<td>Sweden</td>
<td>1 680</td>
<td>23</td>
<td>1.36</td>
</tr>
<tr>
<td>Spain</td>
<td>1 642</td>
<td>40</td>
<td>2.43</td>
</tr>
<tr>
<td>Belgium</td>
<td>1 640</td>
<td>27</td>
<td>1.60</td>
</tr>
<tr>
<td>Poland</td>
<td>1 007</td>
<td>9</td>
<td>0.89</td>
</tr>
<tr>
<td>USA</td>
<td>12 700</td>
<td>67</td>
<td>0.53</td>
</tr>
</tbody>
</table>

Source: Author extract from Web of Science, Science Citation Index-Expanded, Social Science, Citation Index, Arts & Humanities Citation Index.

In a study for the interim evaluation of FP7, Thomson Reuters (2010) seek to quantify country to country collaboration by specifying that country Y collaborates with country Z in a specific research area if at least 7.5% of country Y publications in a given research area involve country Z. The criterion is applied relative to each country output in a given research area. Applying this criterion to the South African research areas with the highest overall publication counts and the five main co-publishing countries yields the data in Table 3.

Using the 7.5% criterion of Thomson Reuters, one finds unidirectional collaboration between South Africa and the five countries in physics and astronomy and astrophysics, and except for the Netherlands, also in environmental science and ecology. Collaboration in other research areas is more country-specific. In no case is the collaboration bidirectional according to the 7.5% criterion. There is no field where the European partner collaboration intensity reaches the 7.5% level toward South Africa. This bias goes some way toward explaining why there is limited uptake of the Marie Curie Outgoing Fellowships. In general, and in no way derogating from its areas of niche expertise, the research environment in South Africa is not intensive enough to act as a drawcard.
Table 3: South African collaboration with its main co-publication partners, 2012

<table>
<thead>
<tr>
<th>ZA top Research area</th>
<th>ZA/UK</th>
<th>ZA/DE</th>
<th>ZA/FR</th>
<th>ZA/NL</th>
<th>ZA/US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environment and ecology</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>S &amp; T (other)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Mathematics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Infectious diseases</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Plant science</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Astronomy and astrophysics</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Public and environmental health</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Source: Author extract from Web of Science, Science Citation Index-Expanded, Social Science Citation Index, Arts & Humanities Citation Index.

The strong collaboration in physics and astronomy & astrophysics in part derives from the strongly international nature of the large projects in these fields — ATLAS and HESS being but two examples in the respective fields. The strong showing of infectious diseases and public & environmental health reflects the specific health problems of HIV/AIDS and tuberculosis that the South Africa is grappling with. TB is the largest single cause of mortality (StatsSA, 2013).

This brings one to the final topic of bibliometric interest, namely citation counts. The total citation count of the 8 779 articles with a South African address for 2012 indexed to the Science Citation Index-Expanded was 6 227, yielding an average of 0.7 citations per article.

Average country to country co-publication was: SA–US 2.2; SA–UK 2.7; SA–DE 4.0; SA–FR 3.5; SA–NL 3.8; SA–IT 4.7; SA–ES 4.8. In all cases the average for co-publication is much higher than the total SA higher count. International co-publication clearly leads to greater exposure in the literature.
8.3. BIBLIOGRAPHY


Teirlinck, P. (2011), ‘The improvement of ex post impact assessment as a tool for policymaking in the field of RTDI.

8.4. PERSONS CONSULTED

SOUTH AFRICA

- Richard Lynch, Institute of Mine Seismology
- Robert Kotzé, Postgraduate and International Office, Stellenbosch University
- Lizél Kleingbiel, Research proposal developer, Stellenbosch University
- Dr Bongani Ndimba, NCP-Food, Agriculture, Fisheries and Biotechnology, University of the Western Cape
- Thomas auf der Heyde, former DG at DST (April 2008 to April 2012)
- Dr Renfrew Christie, Dean of Research, University of the Western Cape
- Cindy Desa, PR and Strategies, Council for Geoscience
- Luc Chevallier, Manager Western and Northern Cape and Marines, Council of Geoscience
- Renée le Roux, Research Grant Manager, University of Cape Town
- Dr Michael Makanga, Head of Africa Office, EDCTP
- Dr Phil Mjwara, DG at DST
- Dr Mohammed Jeena, Agricultural Research Council (ARC)
- Dr Laurence Baloyi, Head of Department of Research and Innovation Support, University of Pretoria
- Professor Connie Medlen, Research Consultant, University of Pretoria
- Dr Rob Adam, former DG at DST
- Ms. Bérénice Lue Marais, Group Manager Contract Research and Development, CSIR Strategic Alliances
- Cristina Pinto, Wits Commercial Enterprise, NCP-Legal and Financial
- Dr Beverly Damonse, Group Executive Science Advancement, NRF
- Dr Robert Kriger, Director Special Projects, NRF
- Dr Chris Scheffer, former Chief Director, DST
- Anita Loots, SKA South Africa
- Professor Don Cowan, University of Pretoria
- Dr Rita Raseleka, Manager of Research, Tswana University of Technology
- Dr Mandla Innocent Msibi, Director Research and Innovation, Tswana University of Technology
- Dr J. Meyer, Nuclear Energy Cooperation
- Dr J. Van Zyl de Villiers, Group Executive, Nuclear Energy Cooperation
- Mamohloding Tlhagale, DST Deputy-Director
- Maja Clausen, Science and Technology Programme Officer, German Embassy
- Tim Moody, Second Secretary, UK High Commission
PARTICIPANTS IN DST WORKSHOP, PRETORIA

- Francois Prinsloo, CSIR National Laser Centre
- Natalya Dolya, EEAS-PRETORIA
- Corline Kriel, SARIMA
- Karin, Dyason, SARIMA
- Thembakazi, Mali, SANEDI
- Kenny, Kistan, CSIR
- Dr Christa van Zyl, HSRC
- Dorothy Mutheu Ngila, ASSAf
- Dr Takalani Rambau, ASSAf
- Tumisang Sebitloane, DST
- Jeanette Morwane, DST
- Beeuwen Gerryts, DST
- Peacemaker Dlamini, DST
- Lisa Du Toit, DST
- Ntombi Mchuba, DST
- Tugela Matubatuba, DST
- Mamohloding Tlhagale, DST
- Mabatho Ndwandwa, DST
- Khanyisa Matiwane, DST
- Kentse Letlhoo, DST
- Kogilam Iyer, DST
- Dr Anwar Vahed, CSIR
- Dr Carl Viljoen SASOL
- Dr Ereck Chakauya, CSIR
- Dr Mariekie Gericke, Mintek
BRUSSELS

- Marnix Surgeon, RTD.C1 — International Cooperation Strategy
- Dr Gerasimos Apostolatos, RTD.C3 - Project officer SA and Africa projects
- Ioannis Loizidis, RTD.C4 — Statistics
- Dietlind Jering, RTD.E1 — Project Officer Biotechnologies, Agriculture and Food
- Daniel Spoiala, DG INFSO— South Africa Desk Officer
- Oluf Nielsen, DG INFOSO — Project Officer
- Alvis Ancans, DG INFOSO — Programme Officer EU policies
- Philippe Froissard, RTD.B3 — Deputy Head of Unit, Infrastructure B3
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- Panagiotis Balabanis, RTD.12 — Deputy Head of Unit
- Gianpietro van de Goor, RTP.F3 — Project Officer EDCTP
- Bodo Richter, EAC-C3, Deputy Head of Unit
- Mario Roccaro, EAC-C3, Policy Officer
- Francesco Affinito, DG-Devco — Policy Officer, Research for Development
- Monika Nauduziate, JRC — International Relations Officer
- Augustin Bondo Tshiani, DG Devco — South Africa Desk Officer
- Marco Morettini, EEAS — South Africa Desk Officer
- Alessandro Damiani, Transport H1 — former Head of Unit in charge of Policy Dialogue with Third Countries
- Ad van Ommen, DG RTD — Policy Officer Horizontal Aspects
- Dr Heiko Prange-Gstoehl, RTD B5 — Research Programme Officer
- Ugo Celestino, DG ENTR — South Africa Policy Officer
- Daan du Toit, Minister Counsellor (Science and Technology): South African Mission to the European Union
- Nienke Buisman, DG RTD — Policy Officer Sub-Saharan Africa

LONDON

- Dr Andy Cherry, Senior Programme Officer for S & T, Association of Commonwealth Universities
### 8.5. DATA TABLES

#### 8.5.1. South African authored article count, 1991–2011 (SCI-E; SSCI; A&HCI)

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Progress has been made in cooperation in science and technology between South Africa and the European Union since the two parties entered into the agreement of 1997.

Starting from a low base over the FP4–FP6 period, South African researchers have increased their involvement in FP7 to the extent that in absolute terms the country stands fifth for the level of participation by third countries.

The South Africa–European Union cooperation agreement functions alongside a host of other South Africa–European Member States bilateral agreements in science and technology.

This Review looks back at the last 15 years of these various modes of cooperation to identify the major achievements, to draw conclusions on the lessons learnt and to make recommendations for improvement.

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