# Science Granting Councils in Sub-Saharan Africa




## FINAL REPORT

Project supported by the International Development Research Centre (IDRC-CRDI)

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| AFD | French Development Agency *(Agence Française de Développement)* |
| AU | African Union |
| AUSAID | Australian Agency for International Development |
| BNRDCC | Botswana National Research, Development and Innovation Coordinating Council |
| BRICS | Brazil, Russia, India, China, South Africa |
| BRSTFA | Botswana Research, Science and Technology Funding Agency |
| COSTECH | Tanzania Commission for Science and Technology |
| CREST | Centre for Research on Evaluation, Science and Technology |
| CIDA | Canadian International Development Agency |
| CSIR | Council for Scientific and Industrial Research |
| DAAD | German Academic Exchange Service |
| Danida | Danish International Development Agency |
| DFG | German Research Foundation *(Deutsche Forschung Gemeinschaft)* |
| DFID | Department for International Development |
| DoH | Department of Health |
| DST | Department of Science and Technology |
| DSTR | Directorate of Science, Technology and Research |
| DWEA | Department of Water and Environmental Affairs |
| EU | European Union |
| FARES | Fund for the Support of Health Research (*Fonds d'Appui à la Recherche en Santé)* |
| FARP | Fund for Support to Research and Professionalisation (*Fonds d'Appui à la Recherche et à la Professionalisation*) |
| FIP | Fund for Poverty Research (*Fundo de Investigação sobre Pobreza*) |
| FIRCA | Interprofessional Fund for Agricultural Research and Council (*Fonds Interprofessional pour La Recherche et le Conseil Agricoles*) |
| FIRST | Fund to promote Scientific and Technical Research (*Fonds d'Impulsion de la Recherche, Scientifique et Technique*) |
| FNRI | National Fund for Research and Innovation (*Fonds National de la Recherche et de l'Innovatio*n) |
| FNRAA | National Fund for Agriculture and Agrifood Research (*Fonds National de Recherches Agricoles et Agro-Alimentaires*) |
| FNRST | National Fund for Scientific and Technological Research *(Fonds National de la Recherche Scientifique et Technologique)* |
| FONER | National Fund for Education and Research (*Le Fonds National pour l'Education et la Recherche)* |
| FONRID | National Fund for Research and Innovation for Development (*Le Fonds National de la Recherche et de l'Innovation pour le Développement)* |
| FRBC | Competitive Based Research Fund (*Fonds de Recherche sur Base Competitive au* |

| | |
|---|---|
| | *Cameroun*) |
| GDP | Gross Domestic Product |
| GERD | Gross Domestic Expenditure on R&D |
| GETFund | Ghana Education Trust Fund |
| GTZ | German Technical Corporation (*Deutsche Gesellschaft für Technische Zusammenarbeit*) |
| HEI | Higher Education Institutions |
| HEFC | Higher Education Funding Councils |
| IDRC | International Development Research Centre |
| IFS | International Foundation for Science |
| KENIA | Kenya National Innovation Agency |
| MCT | Ministry of Science and Technology |
| MESS | Ministry of Secondary and Higher Education |
| MEST | Ministry of Environment, Science and Technology |
| MESVTEE | Ministry of Education, Science, Vocational Training and Early Education |
| MGDs | Millennium Development Goals |
| MINEDUC | Ministry of Education |
| MINESUP | Ministry of Higher Education (*Ministère de l'Enseignement Supérieur*) |
| MINRESI | Ministry of Scientific Research and Innovation (*Ministère de la Recherche Scientifique et de l'Innovation*) |
| MoESS | Ministry of Education and Skills Development |
| MoFPED | Ministry of Finance Planning and Economic Development |
| MoHEST | Department of Science and Technology in the Ministry of Education, Science and Technology |
| MoST | Ministry of Science and Technology |
| MRC | Medical Research Council |
| NACOSTI | National Commission for Science, Technology and Innovation |
| NCRST | National Commission for Research, Science and Technology |
| NEPAD | New Partnership for Africa's Development |
| NFAST | National Fund for the Advancement of Science and Technology |
| NGO | Non-Governmental Organisation |
| NORAD | Norwegian Agency for Development Cooperation |
| NRIF | National Research and Innovation Fund |
| NRC | National Research Council |
| NSF | National Science Foundation |
| NSTC | National Science and Technology Council |
| NSTIC | National Science, Technology and Innovation Council |
| NTIA | National Technology Innovation Agency |
| NTBC | National Technology Business Centre |
| NTBF | National Technology Business Fund |
| PASE | *Programme d'Appui au Système de l'Enseignement* |
| PASRES | Strategic Support Programme for Scientific Research in Côte d'Ivoire (*Programme* |

| | |
|---|---|
| | *d'Appui Stratégique à la Recherche Scientifique*) |
| PEPFAR | President's Emergency Plan for AIDS Relief (USA) |
| PPPS | Purchasing Power Parities |
| PSI | Presidential Science Initiative |
| RCZ | Research Council of Zimbabwe |
| R&D | Research and development |
| RDCIF | Research and Development Commercialisation and Innovation Fund |
| RIEF | Rwanda Research Innovation Endowment Fund |
| SARIMA | Southern African Research and Innovation Management Association Sub-Saharan |
| SSA | Africa |
| SIDA | Swedish International Development Cooperation Agency |
| STI | Science, technology and innovation |
| STIF | Science, Technology and Innovation Fund |
| SRF | Strategic Research Fund |
| STREFund | Science and Technology Research Endowment Fund |
| TEC | Tertiary Education Council |
| TETFUND | Tertiary Education Trust Fund |
| TIA | Technology Innovation Agency |
| UNCST | Uganda National Council for Science and Technology |
| UNESCO | United Nations Educational, Scientific and Cultural Organisation |
| USAID | United States Agency for International Development |
| VSNU | Association of Netherlands Universities |
| WARIMA | West African Research and Innovation Association |
| WRC | Water Research Commission |

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# 1. EXECUTIVE SUMMARY

This report contains the findings of a study, commissioned by the IDRC in December 2012, on the strategic priorities, objectives and practices of science granting councils in seventeen countries in Sub-Saharan Africa. More specifically, the study was commissioned (1) to describe the various organisations and their institutional arrangements supporting STI in the various countries; (2) to identify and describe the recently established science granting councils in promoting STI in SSA; (3) to analyse subsequent strategies for funding of STI in countries where science granting councils do not exist; and (4) to assess the science granting councils' partnership modalities and collaboration.

The project design included an extensive literature review, a desktop study of relevant documents and statistics of the selected 17 countries, site visits to all but two countries included in the study and a consultative workshop in South Africa in November 2013. Care has been taken to verify all information gathered. The outputs of the study consist of a main report as well as 17 detailed country reports (under separate cover).

Science granting councils (and agencies with equivalent missions such as national commissions for science and technology, national sciences councils and national academies of science) are essential actors in national systems of innovation. In well-defined and clearly articulated systems of innovation they perform a number of crucial functions that contribute to the effective and efficient functioning of such systems: disbursing funds for R&D, building research capacity through appropriate scholarships and bursaries, setting and monitoring research agenda's and priorities, advising on science, technology and innovation policies, managing bilateral and multilateral S&T agreements, assessing the communication, uptake and impact of publicly funded research and many more. Such councils ideally act as fair and disinterested agents of government whilst at the same time representing the interests of the scientific community nationally as well as regionally and internationally. They are crucial "intermediaries" in the flow of international funding and technical support to R&D performing institutions in a country. We present below the main empirical findings of our study.

***Science granting councils embedded in national science systems***

Most countries in our study obtained their independence during the 1960's. But the establishment of a national Ministry of Science and Technology (or equivalent ministry) would have to wait – in most cases – for another twenty years to materialise. In fact in four countries – Namibia, Rwanda, Tanzania and Uganda – there is as yet no such dedicated Ministry. In most of these cases, the science and technology portfolio is located in a Ministry of Higher Education. One country – Cameroon – does not have a science policy document. These facts may point to a lack of commitment to prioritise science and technology matters in these countries. On the other hand, we also found evidence of a more recent commitment to prioritising science and technology as illustrated by the fact that eight countries have revised their science and technology policy documents since 2010. Thus, a first and overarching impression gained from this overview of critical dates in the development and establishment of STI policies and institutions

is that most of the countries in SSA have only in recent years given sufficient priority to science and innovation matters. But a commitment to a science policy or Ministry of Science and Technology is not sufficient if it is not accompanied by a significant investment in R&D in a country. The reality is that most governments in SSA have until now only paid lip-service to prioritising S&T and allocating sufficient funding for research. The target set for the continent, namely to spend 1% of GDP on R&D remains elusive as the latest statistics indicate that the average expenditure on R&D is in the region of 0.3 – 0.4%.

***SGC's – different historical trajectories***

A dedicated science funding council is largely a feature of the STI systems of countries in the Anglophone tradition (e.g. Kenya, South Africa, Uganda, Zambia and Zimbabwe). Francophone countries, such as Rwanda and Cameroon, do not have STI funding councils although a project to establish a National Fund for Research and Innovation is currently being discussed in Cameroon. Burkina Faso, Côte d'Ivoire and Senegal, however, do have dedicated funding agencies. In the case of Côte d'Ivoire and Senegal, funding systems promoting agricultural research have been recently established. With the notable exception of FIRST[1] in Senegal, most of the National Research Funds in the Francophone countries have been established over the last five years.

***Separation of funding for research and innovation***

An emerging trend is the separation of funding councils for Research and Innovation. This trend, which is well-established in many European countries and other modern science systems, is evident in a few countries in our study. Examples of this trend are found in South Africa (with the different mandates of the National Research Foundation and the Technology Innovation Agency); Kenya (National Research Fund and the Kenya National Innovation Agency); Botswana (with a separate National Innovation Fund); and Zimbabwe (with the Research Council of Zimbabwe and the Research and Development Commercialisation and Innovation Fund (RDCIF)). Even where funding for basic research and innovation are not separated into two different funding agencies, there is clear evidence that countries in SSA appreciate the importance of separating funding for research and innovation. So, for example, countries such as Cameroon, Senegal and Nigeria have proposed a National Research and Innovation Fund.

***Different configurations of science funding agencies***

Arguably one of the main findings of our study relates to the wide range and diversity of science funding configurations in the selected countries. Using the widely accepted principal-agent framework (cf.

[1] Although it was established as early as 1973, FIRST only began to issue annual calls for proposals in 2007. Before that, it was mainly supporting research institutions through institutional grants.

*Appendix A*), a number of issues were addressed. For instance, what is the role of a principal of a fund (where a principal refers to either a ministry or STI funding council)? Does the principal only provide technical supervision or also financial supervision? What mechanisms/structures are available to the principal to ensure that the fund is implemented according to certain guidelines, e.g. national development goals? Moreover, in the case of STI funding councils acting as agent of a ministry (principal), it could be asked to what extent they are only conduits to channel funds and how much decision-making power they really have, e.g. do they manage the funds apart from (partially or fully) administering the funds? On the basis of our study, we finally identified six typical configurations (even "models") of science granting agencies in SSA. We labelled them:

- The paradigm principal-agent model
- The sector-differentiated principal-agent model
- The multiple principal-agent model
- The embedded principal-agent model
- The sector-differentiated embedded principal agent model
- The hybrid embedded principal agent model (the embedded-case together with the green part of the multiple-principal agent model)

The differences between these models are discussed in detail in the main report. In summary, these differences can be traced to the following factors: (1) the different histories of science and colonial legacies in the countries; (2) the differential impact of sector-based funding agencies – especially in agriculture and health in some countries; but ultimately, (3) different approaches to the governance of science and innovation in the different countries.

***The functions that SGC's perform***

The study has identified 12 areas in which SGC's typically operate. The first three can be regarded as different forms of science funding support and therefore speak to the core mission of a funding agency. But functions such as the dissemination of research findings, support for scientific publishing, collecting of R&D data and statistics are new functions that were also found to be performed by many of the science granting councils in the selected countries.

1) Disbursement of research grants (various categories)
2) Disbursements of scholarships and loans (mostly Masters and doctoral students)
3) Funding support for infrastructure development
4) Valorisation of results (Dissemination and uptake of research reports and findings)
5) Supporting scientific publishing/scientific journals
6) Advocacy to the STI
7) Collect data and statistics on S&T and R&D
8) Capacity-building/training of researchers
9) Policy advice
10) Setting research agenda/research priorities
11) Management of scientific collaborations and agreements
12) Coordination of the NIS system

The wide range of functions which were identified raises huge questions about the capacity and expertise of different councils to perform all of these functions adequately. This is a matter which we address in our final recommendations.

Through the country sites visits as well as the participant presentations at the consultative workshop, the study has identified a number of areas which the SGC's themselves view as challenging and where they required support and intervention.

***Systemic challenges – challenges embedded in the respective science systems***

We have consolidated the wide range of challenges identified into six main categories.

Given the low rate of R&D investment in most countries, it is not surprising that the biggest challenge (even constraint) identified refers to inadequate and non-sustainable public funding of science. With the clear exception of South Africa, SGC's in the remainder of the countries studied all indicated that they simply do not receive sufficient public funds to disburse to the science community in their respective countries. Not surprisingly, this means that many delegates at the workshop indicated that SGC's very often have a marginal status in their countries. This, of course, is also related to the disproportionate influence of international fundings agencies who often disburse much more funds for research. Even in cases where there are established SGC's (but often only recently established), it was argued that more formal funding mechanisms need to be put in place. This, in turn was related to the lack of appropriate legislation as well as the poor implementation of science and research funding policies. Many delegates to the workshop referred to weak co-ordination within their national STI systems. This would refer to weak co-ordination between a national agency and sector agencies but also with foreign agencies. A final challenge, which is related, refers to the lack of strong partnerships between R&D performing institutions and industry.

*On reflection it is clear that none of the challenges identified by our study are by themselves new or particularly surprising. However, what was surprising is how pervasive these challenges are and how far-reaching their impact seems to be on the status, influence and functioning of the SGC's.*

***The challenge of technical support and capacity building***

Against the background of the range of systemic challenges identified, it is not surprising that a number of areas where capacity-building for the programme officers and staff of these councils should be addressed in a systematic way were suggested. The possibility of accredited training courses and workshops that could contribute to a Continuous Professional Development initiative should be investigated. Some of these areas are:

- Peer review and evaluation procedures
- Grant-making procedures
- Management of S&T international agreements
- STI policy analysis and research and innovation priority setting
- Basics of R&D management and bibliometrics

# 2. RESEARCH PROBLEM AND GOAL OBJECTIVES

CREST was commissioned by the IDRC in December 2012 to undertake a study on science granting councils in seventeen countries in Sub-Saharan Africa (SSA). The original project goal was formulated as follows:

> **To assess the strategic priorities, objectives and practices of science granting councils in Sub-Saharan Africa**

The specific objectives were described as follows:

1. To describe the various organisations and their institutional arrangements supporting STI in the various countries;
2. To identify and describe the recently established science granting councils in promoting STI in SSA;
3. To analyse subsequent strategies for funding of STI in countries where science granting councils do not exist;
4. To assess the science granting councils' partnership modalities and collaboration;
5. To highlight current trends and identify strategic pointers that are likely to influence IDRC's future programming in SSA.

# 3. PROJECT METHODOLOGY

After revision of the final commission, the following project design and methodology was adopted:

1. A **desk review** of national and institutional (science granting councils) would was conducted utilising the following sources:
    a. existing scholarly studies and other reports available at CREST;
    b. requests for additional documents through CREST's extensive networks of STI entities in SSA and;
    c. documents gathered during field visits to the science granting councils in selected countries.
2. A **series of Skype and telephone interviews** with representatives of science granting councils and other relevant STI stakeholders in the 17 designated countries.
3. A **series of field visits** to selected countries. These had the primary purpose of conducting a series of one-on-one semi-structured interviews with key role-players including key informants at institutional level.
4. **Case study analyses and reports**. The data and information gathered through steps 1 – 3 was analysed and collated to produce 17 brief case studies.

5. A **consultative workshop** was organised where delegates from all the participating countries met and discussed the preliminary findings.

CREST completed the process as outline above by the end of 2013. The consultative workshop was held on the 26th and 27th of November in Somerset-West and attended by 45 delegates. Subsequent to the workshop, we completed the individual country reports (using information included in the presentations made by delegates). In addition, as a final round of verification, the individual country reports were again sent to contact persons in the respective countries for final comments and corrections (January and February 2014). The final versions of the 17 country reports are included in die appendices.

# 4. PROJECT FINDINGS AND KEY OUTPUTS

This report constitutes the final deliverable of the study and integrates the information and lessons learnt from the process outlined above. The report is organised along the following themes:

1. Background: This section presents a general introduction to the study and its relevance and value to current debates in science and technology on the African continent.
2. STI systems in Sub-Saharan Africa: This section presents information and statistics about the national landscape and commitment to science and technology in the selected countries. In addition we map the development of the different governance arrangements (including mandates) as well as investments in R&D in the respective countries.
3. Research funding models: Utilising the most recent literature on the nature and functions of science granting councils, we developed a typology of six types of SGC-configurations in SSA. We discuss each of these types in some detail and show how these are related to very different histories of science funding on the continent (especially between the Francophone and Anglophone countries).
4. Functions of research funding agencies: Our study documents the wide range of functions performed by SGC's in SSA. We comment on the range of functions and especially the role of such councils in managing (regional) collaboration.
5. Challenges and priorities: The study has generated a rich information set on current and future challenges and priorities of SGC's in Africa. We present the results of this research in Section 5.
6. Recommendations: The report concludes with recommendations both in terms of future research and other possible follow-up research including pointers about strategic decisions for consideration by the IDRC.

## 4.1. KEY OUTPUTS

CREST produced a number of deliverables as per commission.

(1) The main output of the study is an integrated report of the study. This report combines the overall findings and recommendations of the study according to the terms of reference of the study.
(2) In addition to the main report, we also produced 17 country reports that provide detailed information about the STI systems in each of the selected countries as well as of the history, mission and functions of science granting councils. These reports have been circulated twice to contact persons in the respective countries for verification. It is anticipated that these individual reports will be used by the respective councils as many of them have indicated that they do not have such information in-house.
(3) Delegates from all 17 countries made PowerPoint presentations at the consultative workshop in Somerset-West in November 2013. These presentations are available on the CREST website. In addition, a consolidated workshop report was produced (cf. *Appendix* B).
(4) At the request of IDRC Management, CREST also produced a concept note on a possible follow-up project. This concept note, which has been developed jointly with the NRF in South Africa, is currently under consideration.

CREST is committed to the widest possible dissemination of the results of this study. In addition to a number of scholarly articles being developed, we would strongly advise the IDRC to agree that the individual country reports be disseminated as widely as possible (on appropriate websites at CREST and the IDRC) as well as directly to the select countries. The project has already received good media coverage as representatives from SciDevNet, World University News and Research Africa were invited to attend the consultative workshop. Again, we would suggest that the final high-level findings of this study be disseminated through these and other media. For this reason CREST is also committed, with its own funds to proceed with a fifth main deliverable, viz. a Book in which the individual country reports and the integrated main report is combined.

# 5. MEETING OF PROJECT OBJECTIVES

## 5.1. BACKGROUND

The world is experiencing significant stresses as populations expand, environmental catastrophes erupt, climate change becomes less predictable and socio-economic pressures for an improved quality of life increase. Following the onset of the global financial crisis in 2008, major multilateral organisations have recognised that old certainties have been found wanting. A development dialogue in Paris in January 2009 involving the World Bank, OECD, UNESCO and other major players, accepted that the orthodoxies attached to conceptions of innovation – including the role of the state – must yield to new realities. At an OECD meeting in Addis Ababa in September 2013, there was broad consensus that the current definition of innovation is far too tied to the private sector, with innovation only being counted if it is commercialised. The meeting agreed that the definition should be broadened to include public sector and social innovation, particularly in the African context where development problems cannot be solved through commercialisation alone.

In addition, the post-World-War-II political and economic dominance of the USA, Europe and Japan is being challenged, especially through the emergence of the BRICS countries that have become much more influential within their own regions, as well as globally. While China, Russia and, to an increasing extent, India are investing in research universities, in Africa the dominant approach is still to regard the role of national universities as being to educate the next generation of state or civil service functionaries. The average R&D intensity (R&D as percentage of GDP) was 2.4% for OECD countries in 2009 and less than 1% for African countries (African Union, 2010). However, since a group of African education ministers at the UNESCO World Conference on Higher Education in 2009 called for improved financing of universities and a support fund to strengthen training and research in key areas, there has been a renewed emphasis on strengthening universities and knowledge production.

Science granting councils (and agencies with equivalent missions such as national commissions for science and technology, national sciences councils and national academies of science) are essential actors in national systems of innovation. In well-defined and clearly articulated systems of innovation they perform a number of crucial functions that contribute to the effective and efficient functioning of such systems: disbursing funds for R&D, building research capacity through appropriate scholarships and bursaries, setting and monitoring research agenda's and priorities, advising on science, technology and innovation policies, managing bilateral and multilateral S&T agreements, assessing the communication, uptake and impact of publicly funded research and many more. Such councils ideally act as fair and disinterested agents of government whilst at the same time representing the interests of the scientific community nationally as well as regionally and internationally. They are crucial "intermediaries" in the flow of international funding and technical support to R&D performing institutions in a country.

Despite the significance of these organisations, few systematic studies of science granting councils and related organisations in Africa has been done. This is in contrast with a growing body of scholarship about the nature, roles, functions and impacts of such bodies elsewhere in the world (Barrier, 2011; Braun, 1998; Geuna and Martin, 2003; Gulbrandsen, 2005; Hubert and Louvel, 2012; Jouvenet, 2011; Laudel, 2006; Lepori, van den Besselaar, Dinges et al., 2007; Theves, Lepori and Laredo, 2007; van der Meulen and Rip, 1998).

After the decline in the 1990s in support for S&T development in Africa, there is now a renewed realisation by most role-players in recognising the importance of developing STI capacity in developing countries. High profile reports outlining new visions, priorities and directions for African STI have emerged, particularly the UNESCO Higher Education, Research and Innovation: Changing Dynamics (2009) Report, NEPAD's African Innovation Outlook (2010) and the UN Rio+20 Report (2012) as well as the World Bank Africa Strategy in strengthening competitiveness and employment. These reports call for the international community's intervention to assist in promoting technology development, transfer and utilisation in Africa to enhance knowledge to support African countries to develop effective STI institutions and the concomitant capacity to become global knowledge partners. The African continent is lagging substantially behind the rest of the world with regards to STI. The UN Millennium Project Report (2009) argues that STI underpins every one of the Millennium Development Goals (MGDs) and therefore becomes a prerequisite for sustainable development.

Against this background, the IDRC decided to commission a comprehensive and in-depth investigation on the state and nature of science granting councils in 17 countries in Sub-Saharan Africa. This is a timely study as it is clear (also from this study) that science granting councils (and equivalent bodies) are at different stages of development. Some councils (for example in South Africa, Tanzania, Kenya and Zimbabwe) are well-established, whereas other (as in Namibia, Botswana and Mozambique) are in their early stages of establishment. Francophone countries (such as Burkina Faso, Senegal and Cameroon) have very different institutional arrangements where competitive funding and the associated practices are of a more recent origin and less well-established. In many of the countries included in the study, the national landscape is characterised by a multitude of funding agencies, programmes and instruments often organised around sectoral interests (Health and Agriculture).

In addition, these councils face a variety of challenges (resource-constraints, governance issues, lack of clarity on institutional differentiation, lack of co-ordination within science systems, marginalisation of influence and so on). There is little evidence of sharing of expertise and experience amongst science granting councils – often within the same country, but definitely within regions and across the continent. Against this background, it is not surprising that a clear need was expressed at a consultative workshop in November 2013 in South Africa, by delegates from all 17 countries, for more research, but especially targeted support to strengthen the science councils in their countries.

In the remainder of the report we present the main findings of the study as well as recommendations for further research and follow-up.

## 5.2. MEETING OF PROJECT OBJECTIVES

The specific objectives (and associated sections in the report) were described as follows:

TABLE 1 MEETING OF PROJECT OBJECTIVES

| Objectives | Associated sections | Rating out of 4 | Comments (explain the rating with clear examples) |
|---|---|---|---|
| **1. To describe the various organisations and their institutional arrangements supporting STI in the various countries** | Section 2 | 4 | Although not required by the commission, CREST has produced 17 detailed country reports which contain very rich descriptions of the various organisations in the selected countries. |
| **2. To identify and describe the recently established science granting councils in promoting STI in SSA** | Section 2 | 4 | Both the individual country reports as well as the integrated synthesis report contain detailed descriptions of the science granting councils in the selected countries |
| **3. To analyse subsequent strategies for funding of STI in countries where science granting councils do not exist** | Section 3 | 3 | Because all of the countries studied have some version of a science granting council, it is not possible to discuss strategies for funding where such organisations do not exist. |
| **4. To assess the science granting councils' partnership modalities and collaboration** | Section 4 | 3 | The issue of partnerships and collaboration is quite complex especially where there are evidently many regional and continent-wide collaborations. Since the latter was not included in the Brief, this issue would require further investigation. |
| **5. To highlight current trends and identify strategic pointers that are likely to influence IDRC's future programming in SSA** | Sections 5 and 6 | 4 | The final report contains detailed information about the challenges and priorities that science granting councils in SSA face and this information provides clear guidelines to the IDRC about its future work in SSA. |

## 5.3. STI SYSTEMS IN SUB-SAHARAN AFRICA

Science Granting Councils are embedded in the science and innovation systems of their respective countries. In SSA the science, technology and innovation (STI) systems vary significantly with regards to socio-political histories, geography, political and economic (in)stability, colonial legacies and most importantly (for this study), the degree of institutionalisation of research and development (R&D) (Gaillard and Waast, 1988; Mouton, 2009). The R&D function of African STI systems are primarily located in universities, science councils, public research institutes and some research NGO's (Gaillard, Hassan and Waast, 2005). There are few examples of well-established research institutes in the private sector or in industry. One of the first results of our study was to "map" key milestones in S&T governance and policy development in each of the countries included in the study.

### 5.3.1. EVOLUTION AND DEVELOPMENT OF STI SYSTEMS IN SSA

These "milestones" are presented in a comparative framework, thus allowing for a comparison between each country's S&T trajectory and those of its continental counterparts (Table 2). The "milestones" are chronologically displayed using the legend below.

| | |
|---|---|
| | Independence |
| | First S&T ministry |
| | Last change in S&T ministry |
| | First S&T policy |
| | Last revision of S&T policy |

Most countries in our study obtained their independence during the 1960's. But the establishment of a national Ministry of Science and Technology (or equivalent ministry) would have to wait – in most cases – for another twenty years to materialise. In fact in four countries – Namibia, Rwanda, Tanzania and Uganda – there is as yet no such dedicated Ministry. In most of these cases, the science and technology portfolio is located in a Ministry of Higher Education. One country – Cameroon – does not have a science policy document. These facts may point to a lack of commitment to prioritise science and technology matters in these countries. On the other hand, we also found evidence of a recent commitment to prioritising science and technology as illustrated by the fact that nine countries have revised their science and technology policy documents since 2010.

TABLE 2 SELECTED "MILESTONES"IN S&T GOVERNANCE AND POLICY-MAKING, BY COUNTRY

| Year period | Botswana | Burkina Faso | Cameroon | Côte d'Ivoire | Ethiopia | Ghana | Kenya | Mozambique | Namibia | Nigeria | Rwanda | Senegal | South Africa | Tanzania | Uganda | Zambia | Zimbabwe |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Before 1960 | | | | | | | | | | | | | | | | | |
| 1960-1964 | | 1960 | 1960 | 1960 | | 1960 | 1963 | 1963 | | 1960 | 1960 | 1960 | | 1964 | 1962 | 1964 | |
| 1965-1969 | 1966 | | | | | | | | | | | | | | | | |
| 1970-1974 | | | | | | | | | | | | | | | | | |
| 1975-1979 | | 1978 | | | | 1979 | | | | | | | | | | | |
| 1980-1984 | | | 1984 | | | | 1982 | | | | | 1983 | | | | | 1980 |
| 1985-1988 | | | | 1986 | | | | | | 1985<br>1986 | | | | 1986 | | | |
| 1990-1994 | | | | | 1993 | | | | 1990 | | | | 1994<br>1994 | | | 1992 | |
| 1995-1999 | 1998 | 1995 | | | | | | | 1999 | | | | 1996 | 1996 | | 1996 | |
| 2000-2004 | 2002 | | 2004 | | | 2000 | | | | | | | 2002 | | | | 2002 |
| 2005-2009 | 2009 | | | 2005 | | 2009 | 2007<br>2007 | 2005<br>2005 | | | 2006 | | | | 2009 | | 2005 |
| 2010+ | 2011 | 2011<br>2012 | | 2012 | 2012<br>2012 | 2010 | 2013 | | 2013 | 2012 | | 2011<br>2013 | | | | 2011<br>2013 | 2012<br>2013 |

Summary comment: The overarching impression that one gains from this overview of critical dates in the development and establishment of STI policies and institutions is that most of the countries in SSA have only in recent years given sufficient priority to science and innovation matters. As we will see in the Section below, a commitment to a science policy or Ministry of Science and Technology is not sufficient if it is not accompanied by an investment in R&D in a country. The reality is that most governments in SSA have until now only paid lip-service to prioritising S&T and allocating sufficient funding for research.

### 5.3.2. INVESTMENT IN R&D

The New Partnership for Africa's Development (NEPAD) is the socio-economic development programme of the African Union (AU). It is a high-level platform for developing policies and setting priorities on science, technology and innovation for African Development. The STI vision of NEPAD is that of "an Africa that is well integrated into the global economy and free of poverty". The overall goals are:

- To enable Africa harness and apply science, technology and related innovations in order to eradicate poverty and achieve sustainable development; and

- To ensure that Africa contributes to the global pool of scientific knowledge and technological innovations.

In accordance with the NEPAD objectives many African governments have committed themselves to increasing their gross domestic expenditure on R&D (GERD), and to put in place the necessary policies to enact such decisions by 2015. GERD is generally regarded as a measure of how dedicated a specific country is to supporting research. But the reality is that most Sub-Saharan Africa (SSA) countries spend less than 0.5% of their Gross Domestic Product (GDP) on R&D (Table 3). Nigeria, for example, lags far behind in that only 0.20% of its GDP is assigned towards the development of R&D (African Innovation Outlook, 2010:37). Unfortunately not all SSA countries' GERD is captured in the statistics below and therefore does not present a comprehensive view of GERD in the region[2], but it can be assumed that SSA needs a timely injection of funds into STI and R&D.

TABLE 3 GROSS DOMESTIC EXPENDITURE ON R&D (GERD)

| Country | African Innovation Outlook | | | | UNESCO↑ Institute for Statistics |
|---|---|---|---|---|---|
| | Year | GERD Million PPPS | GERD per capita PPPS | GERD as % of GDP | GERD as % of GDP |
| Botswana | 2005 | n/a | n/a | 0.38 | 0.52 (2005) |
| Burkina Faso | 2009 | n/a | n/a | 0.18 | 0.20 (2009) |
| Cameroon | n/a | n/a | n/a | n/a | n/a |
| Côte d'Ivoire | n/a | n/a | n/a | n/a | n/a |
| Ethiopia | 2005 | n/a | n/a | 0.2 | 0.24 (2010) |
| Ghana | 2008 | 78.7 | 58.3 | 0.47 | 0.23 (2007) |
| Kenya | 2007 | 277.8 | 7.4 | 0.38 | 0.42 (2007) |
| Malawi | 2007 | 180.1 | 12.9 | 1.70 | n/a |
| Mozambique*‡ | 2007 | 42.9 | 2.0 | 0.25 | 0.47 (2010) |
| Namibia | 2005 | n/a | n/a | 0.3 | n/a |
| Nigeria*† | 2007 | 583.2 | 3.9 | 0.20 | 0.22 (2007) |
| Senegal | 2008 | 99.0 | 8.0 | 0.48 | 0.37 (2008) |
| South Africa[Ω] | 2010/11 | 4976.6 | 102.4 | 0.76 | 0.87 (2009/10) |
| Tanzania* | 2007 | 234.6 | 5.8 | 0.48 | n/a |
| Uganda† | 2007 | 359.8 | 11.6 | 1.10 | 0.41 (2009) |
| Zambia | 2008 | 55.3 | 4.6 | 0.37 | 0.34 (2008) |
| Zimbabwe | 2005 | n/a | n/a | 0.2 | n/a |

[2] More information and more recent statistics for GERD a % of GDP are provided in the country reports

Source[3]: African Innovation Outlook, 2010 (P.34)

* Data do not include the business enterprise sector

† Data do not include private non-profit institutions/organisations

‡ Data do not include the higher education sector

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↑ We have added an additional column to include the latest available UIS statistics on R&D investment for select countries

It is also worth noting what percentage of GERD is sourced from funds abroad. Table 4 provides the available statistics as was published in 2010. Mozambique receives almost 58% of funding available for GERD from foreign sources while Nigeria sources 99% of funding towards GERD internally. The figures suggest that sub-Saharan Africa, with the exception of Nigeria, South Africa and Ghana, is still heavily reliant on foreign funding as a source for R&D activities.

TABLE 4 DEPENDENCY ON FOREIGN FUNDING FOR R&D IN 2010 (%) (ONLY SSA)

| Country | Funds from abroad |
|---|---|
| Botswana | n/a |
| Burkina Faso | n/a |
| Cameroon | n/a |
| Côte d'Ivoire | n/a |
| Ethiopia | n/a |
| Ghana | 11.9 |
| Kenya | 17.6 |
| Malawi | 33.1 |
| Mozambique | 57.3 |
| Namibia | n/a |
| Nigeria | 1.0 |
| Senegal | 38.3 |
| South Africa | 10.7 |
| Tanzania | 38.4 |
| Uganda | 12.8 |
| Zambia | 1.7 |
| Zimbabwe | n/a |

Source: African Innovation Outlook, 2010 (P.40)

[3] Cameroon and Côte d'Ivoire were not included in the survey.

## 5.4. RESEARCH FUNDING MODELS

This section is devoted to the nature, status and functions of national research funding bodies (in cases where such an entity exists) whilst also exploring the co-ordination of funding within national science institutions in terms of its integration, coordination or fragmentation. The former will consider the legal status of national funding bodies (granting councils) either as an entity within a ministry, a semi-autonomous public institution outside the ministry or a private foundation and so forth.

The table below summarises the high-level results of our analysis of national STI funding arrangements in the 17 countries of interest. A three-level classification is used, specifying the **fund or funding programme**, whether the fund is embedded within or overseen by a **funding council** or equivalent body, and the relevant **ministry** that oversees either (or both) the funding council and fund. Where applicable, an attempt was made to also distinguish between current and proposed funding arrangements.

TABLE 5 FUNDING BODIES IN THE 17 SELECTED COUNTRIES

| | Ministries / departments | Funding councils / intermediaries | Funds / funding instruments |
|---|---|---|---|
| **BOTSWANA** ***(Current)*** | Department of Research, Science and Technology in the Ministry of Infrastructure, Science and Technology directly funds R&D | | |
| | Ministry of Education and Skills Development (MoESS) | Tertiary Education Council (TEC) | Sectoral Research Funds (competitive) under the TEC Funding Model for Botswana |
| | National Commission for Science and Technology (NCST) | | |
| | | | Training of Scientists and Technologists Fund |
| **BOTSWANA** ***(Supposed to be operational by now but evidence is lacking)*** | Department of Research, Science and Technology in the Ministry of Infrastructure, Science and Technology | Botswana Research, Science and Technology Funding Agency (BRSTFA) | |
| | | Botswana Innovation Hub | Innovation Fund |
| **BOTSWANA** ***(Proposed)*** | Department of Research, Science and Technology, to become a Directorate in the Botswana National Research, Development and Innovation Coordinating Council (BNRDCC) | | National Research Fund |
| **BURKINA FASO** | Ministry of Scientific Research and Innovation | National Fund for Research and Innovation for Development (*Le Fonds National de la Recherche et de l'Innovation pour le Développement* – FONRID) | |

| | Ministries / departments | Funding councils / intermediaries | Funds / funding instruments |
|---|---|---|---|
| | Ministry of Secondary and Higher Education (MESS) | National Fund for Education and Research (*Le Fonds National pour l'Education et la Recherche* – FONER) | |
| | Research Health Directorate of the Ministry of Health | | Fund for the Support of Health Research (*Fonds d'Appui à la Recherche en Santé* – FARES) |
| **CAMEROON *(Current)*** | Ministry of Scientific Research and Innovation (MINRESI) | | Competitive Research Fund (*Fonds de Recherche sur Base Competitive au Cameroun* – FRBC) (for agricultural research) |
| | Ministry of Higher Education, Support (MINESUP) to Education System Programme (*Programme d'Appui au Système de l'Enseignement* – PASE) | | Fund for Support to Research and Professionalisation (*Fonds d'Appui à la Recherche et à la Professionalisation* – FARP) |
| | | | Fund for the Development of Cocoa and Coffee Sectors (FODECC) (Fonds de Développement des filières Cacao et Café) |
| | | | Competitive fund to reward researchers, including for Scientific Research and Innovation Excellence Week (JERSIC) (Journées de l'Excellence de la Recherche Scientifique et de l'Innovation au Cameroun) |
| | | | Fund to Support Research, the University Fund for Dissemination of Scientific and Technical Information (FUDIST) |
| **CAMEROON *(Proposed)*** | Ministry of Scientific Research and Innovation (MINRESI) | | National Fund for Research and Innovation (*Fonds National de la Recherche et de l'Innovatio*n – FNRI) |
| **CÔTE D'IVOIRE** | Ministry of Higher Education and Scientific Research | Strategic Support for Scientific Research Programme in Côte d'Ivoire (*Programme d'Appui Stratégique à la Recherche Scientifique* – PASRES) | |
| | Ministry of Agriculture | Interprofessional Fund for Agricultural Research and Council *(Fonds Interprofessional pour La Recherche et le Conseil Agricoles* – FIRCA) | |
| **CÔTE D'IVOIRE (Proposed)** | Ministry of Higher Education and Scientific Research | National Fund for Scientific and Technological Research *(Fonds National de la* | |

| | Ministries / departments | Funding councils / intermediaries | Funds / funding instruments |
|---|---|---|---|
| | | *Recherche Scientifique et Technologique - FNRST)* | |
| **ETHIOPIA *(Current)*** | Ministry of Science and Technology (MoST) | | Local Research and Development Grant |
| **ETHIOPIA *(Proposed)*** | Ministry of Science, Technology and Innovation | National Science, Technology and Innovation Council (NSTIC) | |
| **GHANA** (Current) | Ministry of Environment, Science and Technology (MEST) | Council for Scientific and Industrial Research (CSIR) | Science and Technology Research Endowment Fund (STREFund) |
| | Ministry of Education | | Ghana Education Trust Fund (GETFund) |
| **GHANA *(Proposed)*** | | National Research Funding Council (apex body) | |
| **KENYA *(Current)*** | Department of Science and Technology in the Ministry of Education, Science and Technology (MoHEST) | National Council for Science and Technology | Science, Technology and Innovation (STI) Fund |
| **KENYA *(Proposed)*** | Department of Science and Technology in the Ministry of Education, Science and Technology (MoHEST) | National Commission for Science, Technology and Innovation (NACOSTI) | National Research Fund (NRF) |
| | | | Kenya National Innovation Agency (KENIA) |
| **MOZAMBIQUE *(Current)*** | Ministry of Science and Technology (MCT) | | Fund for Poverty Research (*Fundo de Investigação sobre Pobreza* – FIP) |
| **MOZAMBIQUE *(Proposed)*** | Ministry of Science and Technology (MCT) | | National Research Fund (NRF) |
| **NAMIBIA *(Current)*** | Line ministries fund research, researchers and research institutes operating with the ministries | | |
| **NAMIBIA *(Proposed)*** | Ministry of Higher Education | National Commission for Research, Science and Technology (NCRST) | National Research Fund (NRF) |
| | | Council for Research and Innovation (CRI) | |
| **NIGERIA *(Current)*** | Research funding by the various ministries i.e. Federal Ministries of Health, Agriculture, and Environment | | |
| | | | Tertiary Education Trust Fund (TETFUND) |
| **NIGERIA *(Proposed)*** | Ministry of Science and Technology | | National Research and Innovation Fund (NRIF) |

| | Ministries / departments | Funding councils / intermediaries | Funds / funding instruments |
|---|---|---|---|
| | | National Research and Innovation Council (NRIC) | |
| | | State Science, Technology and Innovation Council (SSTIC) | |
| | | National Council on Science, Technology and Innovation (NCSTI) | |
| | | | Education Trust Fund Research Fund (ETF) |
| **RWANDA** ***(Current)*** | Directorate of Science, Technology and Research (DSTR) in the Ministry of Education (MINEDUC) directly funds research in the country | | |
| | Ministry of Education (MINEDUC) | | Rwanda Research Innovation Endowment Fund (RIEF) |
| **RWANDA** ***(Proposed)*** | Directorate of Science, Technology and Research (DSTR) in the Ministry of Education (MINEDUC) directly funds research in the country | National Commission for Science, Technology and Innovation | National Research Fund |
| **SENEGAL** ***(Current)*** | Ministry of Higher Education and Research | Fund to promote Scientific and Technical Research (*Fonds d'Impulsion de la Recherche Scientifique et Technique* – FIRST) | |
| | Ministry in charge of Agriculture | National Fund for Agriculture and Agrifood Research (*Fonds National de Recherches Agricoles et Agro-Alimentaires* – FNRAA) | |
| **SENEGAL** ***(Proposed)*** | Ministry of Higher Education and Research | National Fund for Research and Innovation (FNRI) | |
| **SOUTH AFRICA** | Department of Science and Technology (DST) | National Research Foundation (NRF) | Various funding instruments |
| | | Technology Innovation Agency (TIA) | Four funding instruments |
| | Department of Health (DoH) | Medical Research Council (MRC) | Various funding instruments |
| | Department of Water and Environmental Affairs (DWEA) | Water Research Commission (WRC) | Two funding instruments |
| **TANZANIA** ***(Current)*** | Ministry of Communication, Science and Technology | Tanzania Commission for Science and Technology | National Fund for the Advancement of Science and |

| | Ministries / departments | Funding councils / intermediaries | Funds / funding instruments |
|---|---|---|---|
| | | (COSTECH) | Technology (NFAST) |
| **TANZANIA** ***(Proposed)*** | | Tanzania Commission for Science and Technology (COSTECH) | National Research Fund (to replace NFAST) |
| **UGANDA** | Treasury | | Presidential Science Initiative (PSI) |
| | Ministry of Finance Planning and Economic Development (MoFPED) | Uganda National Council for Science and Technology (UNCST) | Science, Technology and Innovation Fund (STIF) |
| | | | National Innovation Fund (NIF) |
| **ZAMBIA** ***(Current)*** | Department of Science and Technology in the Ministry of Education, Science, Vocational Training and Early Education (MESVTEE) | National Science and Technology Council (NSTC) | Two funding instruments (Strategic Research Fund and Science and Technology Innovation Youth Fund) |
| | | National Technology Business Centre (NTBC) | National Technology Business Fund (NTBF) |
| **ZAMBIA** ***(Proposed)*** | Department of Science and Technology in the Ministry of Education, Science, Vocational Training and Early Education (MESVTEE) | National Research Council (NRC) | None, as it will not be a funding agency |
| | | | National Research and Innovation Fund (NRIF) |
| | | National Technology Innovation Agency (NTIA) | Unknown |
| **ZIMBABWE** | Ministry of Higher & Tertiary Education, Science & Technology Development | Research Council of Zimbabwe (RCZ) | Two funding instruments (Small research grants for M&D students and large research grants open to all) |
| | | | Research and Development Commercialisation and Innovation Fund (RDCIF) |

Salient points

***(1) Differences between Anglophone and Francophone countries***

As can be seen, a dedicated science funding council is largely a feature of the STI systems of countries in the Anglophone tradition (e.g. Kenya, South Africa, Uganda, Zambia and Zimbabwe). In the Francophone countries, such as Rwanda and Cameroon, there are no STI funding councils (although a project to establish a National Fund for Research and Innovation is currently being discussed in Cameroon). Burkina Faso, Côte d'Ivoire and Senegal, however, do have dedicated funding agencies. In the case of

Côte d'Ivoire and Senegal, funding systems promoting agricultural research have been recently established.

As Table 6 shows, the creation of Science Granting Councils and Competitive Research Funds is of a rather recent origin in SSA. Over the past decade, however, we have seen an increase in either the establishment of dedicated science granting councils or agencies or promulgation of policies which stipulate that such agencies must be established in the foreseeable future. All of this point to a general and emerging consensus as to the necessity of having such councils as part of the national science system.

TABLE 6 THE RISE OF SCIENCE GRANTING COUNCILS AND COMPETITIVE RESEARCH FUNDS IN SSA

| Countries | Research Councils/Foundations | Year of creation |
|---|---|---|
| BOTSWANA | NRF | *To be established* |
| | NCST | 2002 |
| | Innovation Fund | *To be established* |
| | **BRSTFA** | *To be established* |
| | **TEC** | 1999 |
| | **BIH** | 2013 |
| | **BNRDCC** | *To be established* |
| BURKINA FASO | **FONRID** | 2011 |
| | **FONER** | 1994 |
| | FARES | 2008 |
| CAMEROON | FRBC | 2009 |
| | FARP | 2009 |
| | FNRI | *To be established* |
| CÔTE D'IVOIRE | **PASRES** | 2007 |
| | **FIRCA** | 2002 |
| | **FNRST** | *To be established* |
| ETHIOPIA | **NSTIC** | *To be established* |
| GHANA | **CSIR** | 1969 |
| | STREFUND | 2008 |
| | GETFUND | 2000 |
| | NRFC | *To be established* |
| KENYA | NRF | 2013 |
| | KENIA | 2013 |
| | **NCST** | 1977 (replaced with NACOSTI) |
| | **NACOSTI** | 2013 |
| MOZAMBIQUE | NRF | 2009 |

| | | |
|---|---|---|
| NAMIBIA | NRF | *To be established* |
| | **NCRST** | 2013 |
| | **CRI** | *To be established* |
| NIGERIA | TETFUND | 2011 |
| | NRIF | *To be established* |
| | NRIC | *To be established* |
| | SSTIC | *To be established* |
| | NCSTI | *To be established* |
| | ETF | *2009* |
| RWANDA | NRF | *To be established* |
| | RIEF | 2012 |
| | **NCSTI** | 2013 |
| SENEGAL | **FIRST** | 1973 or 2007 (see footnote 4) |
| | **FNRAA** | 2008 |
| | **FNRI** | *To be established* |
| SOUTH AFRICA | **NRF** | 1918 (RESEARCH GRANTS BOARD) |
| | **MRC** | 1969 |
| | **WRC** | 1971 |
| | **TIA** | 2008 |
| TANZANIA | **COSTECH** | 1988 |
| | NFAST | 1995 |
| | NRF | *To be established* |
| UGANDA | NIF | 2002 |
| | STIF | 2009 |
| | **UNCST** | 2009 |
| ZAMBIA | **NRC** | *To be established* |
| | **NTBC** | 2001 |
| | **NSTC** | 1999 |
| | SRF | 2007 |
| | NTBF | 2011 |
| | **NTIA** | *To be established* |
| | NRIF | *To be established* |
| | STIYF | 2007 |
| ZIMBABWE | **RCZ** | 1986 |
| | RDCIF | 2004/2005 |

*Note: Cameroon has no National Competitive Research Fund; FONER - despite its name - can hardly be considered as a Competitive Research Fund.*

*Acronyms indicated in Bold can be described as funding councils/intermediaries*

### *(2) Separation of funding for research and innovation*

A second emerging trend is the separation of funding councils for Research and Innovation. This trend, which is well-established in many European countries and other modern science systems, is evident in a few countries in our study. Examples of this trend are found in South Africa (with the different mandates of the National Research Foundation and the Technology Innovation Agency); Kenya (National Research Fund and the Kenya National Innovation Agency); Botswana (with a separate National Innovation Fund); and Zimbabwe (with the Research Council of Zimbabwe and the Research and Development Commercialisation and Innovation Fund (RDCIF)).

Even where funding for basic research and innovation are not separated into two different funding agencies, there is clear evidence that countries in SSA appreciate the importance of separating funding for research and innovation. So, for example, countries such as Cameroon and Nigeria have proposed a National Research and Innovation Fund.

### *(3) Different configurations of science funding agencies*

Arguably one of the main findings of our study relates to the wide range and diversity of science funding configurations in the selected countries. Using the widely accepted principal-agent framework (cf. *Appendix A*), a number of questions presented themselves. For instance, what is the role of a principal of a fund (where a principal refers to either a ministry or STI funding council)? Does the principal only provide technical supervision or also financial supervision? What mechanisms/structures are available to the principal to ensure that the fund is implemented according to certain guidelines, e.g. national development goals? Moreover, in the case of STI funding councils acting as agent of a ministry (principal), it could be asked to what extent they are only conduits to channel funds and how much decision-making power they really have, e.g. do they manage the funds apart from (partially or fully) administering the funds?

The following serve as examples of how these questions are addressed quite differently in different countries:

- In **Ghana** the Council for Scientific and Industrial Research (CSIR) coordinates and administers the operations of the Science and Technology Research Endowment Fund (STREFund). The STREFund is an independent funding mechanism. One mechanism by which the Ministry of Environment, Science and Technology (principal) ensures that the CSIR (agent) is serving the interest of Government in its administration of the fund is through co-representation. The STREFund governed by a board of trustees of nine persons, representing the CSIR, the Association of Ghana Industries, the Ministry of Finance and Economic Planning, universities, the National Council of Tertiary Education, the Ghana Academy of Arts and Sciences, and the Ghana Atomic Energy Commission. At the same time it could be argued that the representative board is

also a mechanism by which the fund itself (as a second layer of agent) satisfies the interest of the CSIR as its immediate principal.

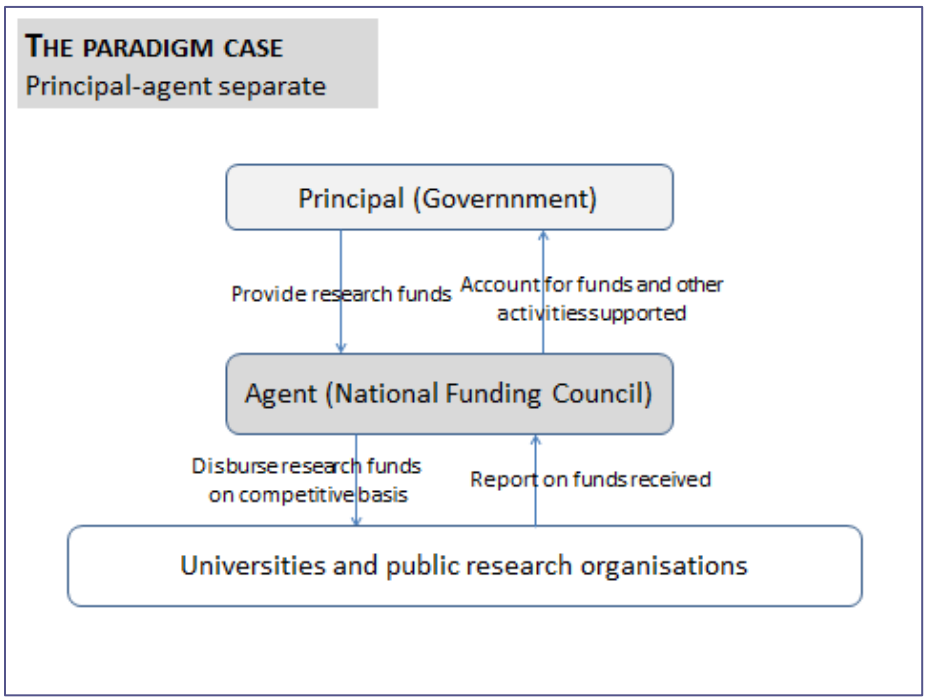
- A similar scenario could be observed in the case of **Tanzania**. The Tanzania Commission for Science and Technology (COSTECH) (the agent) is a government institution under the Ministry of Communication, Science and Technology (the principal). The National Fund for the Advancement of Science and Technology (NFAST) is located within the structure of COSTECH. The fund is an inter-ministerial fund channelled by treasury through the Ministry of Communication, Science and Technology. The fund is administered by an inter-ministerial and multi-sectoral committee. The committee is comprised of representatives of the relevant ministries (President's office, Treasury, Planning commission, Communication, Science), the Bank of Tanzania, the National University, the Chamber of Commerce, Agriculture and Industry, and the Director General of COSTECH. Thus, through representation on the committee, Government, as principal, can ensure that COSTECH, as primary agent, is executing the fund in a manner that meets the national interest.
- In the case of **Zambia**, the National Science and Technology Council (NSTC) (agent) administers the Strategic Research Fund (SRF) on behalf of the Department of Science and Technology in the Ministry of Education, Science, Vocational Training and Early Education (MESVTEE) (the principal). The mechanism by which MESVTEE ensures that the NSTC serves the national interest in the administration of the fund is through dual fund management. The SRF is managed by two committees: the Technical Committee of the NSTC and the Fund Management Committee of the MESVTEE.

On the basis of our study and the literature study (cf. *Appendix A*), we subsequently identified a number of science/research funding configurations or models. These "models" capture the most commonly found organisational arrangements for public research funding in the 17 countries investigated.

### 5.4.1. THE PARADIGM PRINCIPAL-AGENT MODEL

The "**paradigm**" or **"model"** case of science funding models is represented below. In this model – which is the simplest manifestation of the principal-agent principle at work, government delegates its responsibility as far as science or research funding is concerned, to a (relatively) autonomous body – usually referred to as a National Research/Science Foundation or Council. Although such a Foundation or Council receives its funds directly from government and has to account for it on a regular basis (usually annually), it derives its autonomy through a statutory act of establishment and the appointment of a separate Board or Council. This Council then establishes the required structures, policies and procedures to ensure fair, transparent and efficient disbursement of funds to public universities and research organisations. Foundations would typically establish different "funding instruments" (scholarships, bursaries, travel grants, grants for emerging and established scholars, capacity-building grants and so on) to give effect to their mission.

FIGURE 1 THE PARADIGM CASE



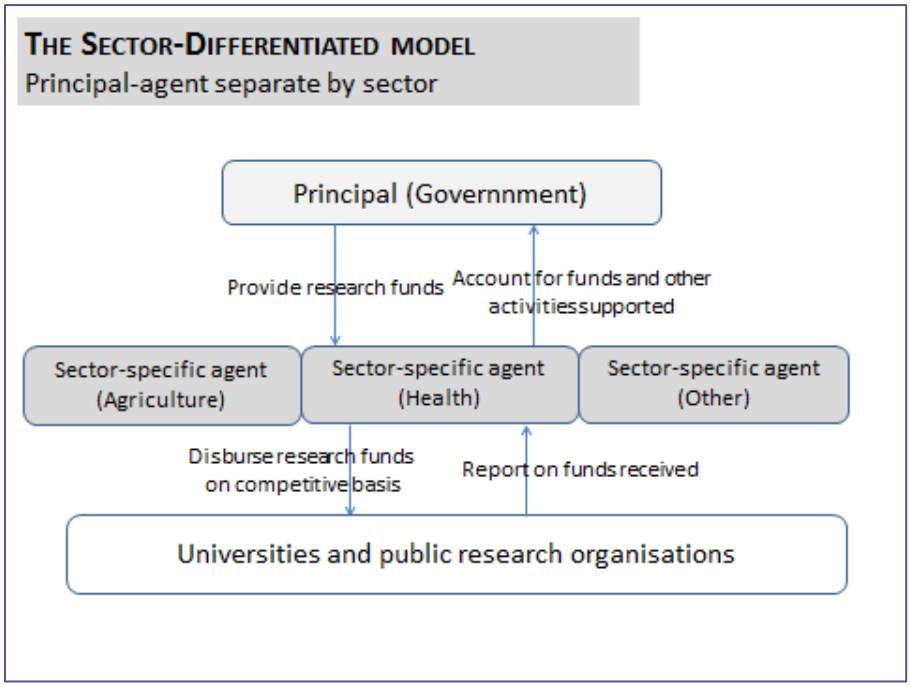

The best example of the paradigm case is the ***South African National Research Foundation***. It was established in 1998 as a statutory body with its own council. It receives its funding from Treasury via the Department of Science and Technology and disburses this money through a wide range of funding instruments to South African universities on a competitive basis. Mozambique also has a similar configuration in that the NRF is directly responsible to the Ministry of Science and Technology. Other countries with similar arrangements are Senegal, Côte d'Ivoire and Namibia where a science granting council under this model should be established in the very near future.

### 5.4.2. THE SECTOR-DIFFERENTIATED MODEL

In many countries we found sector-specific funding agencies. In most cases funding agencies for agriculture and health (the two most common domains) have developed over time usually reflecting the priority afforded to supporting research in these two areas in most African countries. In addition, sector-specific agencies have their roots in inter-departmental rivalries and vested interests which led governments to establish different research funding councils or foundations for different sectors in the science system. We refer to this as the **sector-differentiated model**. There are some examples of this in Africa. A good example is the South African case where there are three bodies that have a statutory responsibility for research funding: the National Research Foundation (which reports to the Department of Science and Technology), the Medical Research Council (which reports to the Department of Health) and the Water Research Commission (which reports to the Department of Water Affairs and Forestry). With this configuration, it is not surprising to find that the funding agencies report to the different "principals" within Government. This fact, in itself, often causes challenges around co-ordination in science funding in the science system.

This model is also applicable to the case of ***Burkina Faso***. In Burkina Faso there are three funding agencies which report directly to their respective ministries: FONRID reports to the Ministry of Scientific Research and Innovation; FONER is responsible to the Ministry of Secondary and Higher Education; while FARES reports to the Ministry of Health.

FIGURE 2 THE SECTOR DIFFERENTIATED MODEL



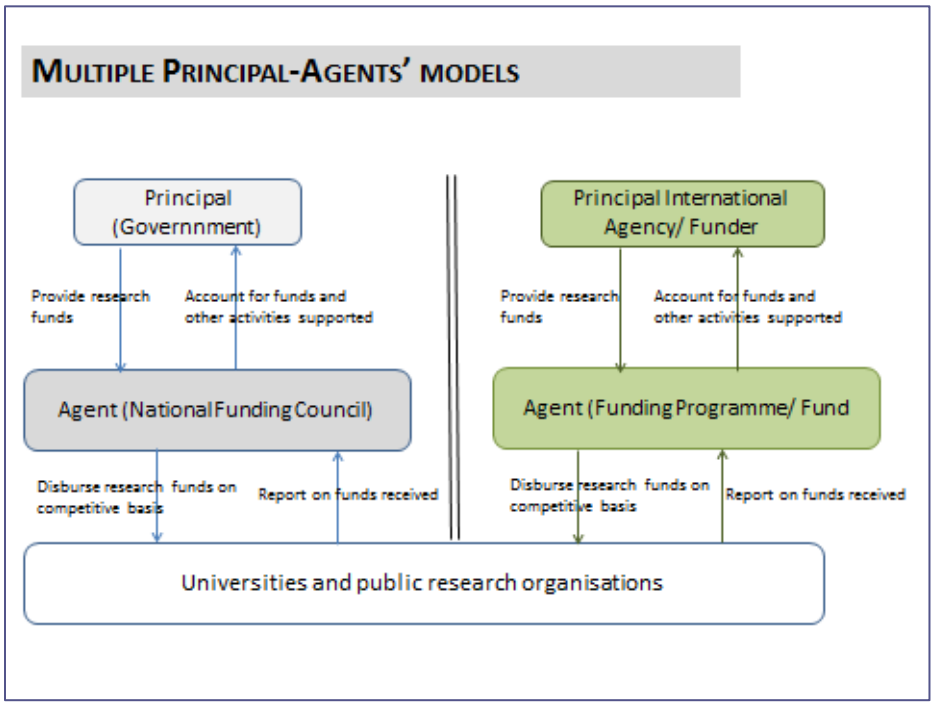

### 5.4.3. MULTIPLE PRINCIPAL-AGENTS MODEL

A "popular" configuration of the paradigm case found in our study can be labelled the "multiple principal-agents" model. In addition to the funding that is channelled from government (via some council or fund) to the universities, there are also various other "principals" at work in the national science system. These are typically international funders, foundations and development agencies (AFD, EU, SIDA, CIDA, Wellcome Trust, GTZ, Danida, NORAD, DFID, AUSAID, USAID, DAAD, Carnegie Corporation of New York, Ford Foundation, Rockefeller Foundation, Gates, PEPFAR, World Bank, and many others) who all channel funds predominantly to universities and research institutes but also to NGOs in African countries.[4] In the representation below we emphasise that these two configurations are often found to co-exist (like "parallel universes") in the same system. We will henceforth refer to these

[4] In a study carried out at the beginning of last decade, not less than 300 sources of foreign funding supporting research activities in SSA were identified. The four main funding sources by far measured in number of project occurrences were USAID, the European Union, the French Cooperation and WHO followed by IDRC, FAO, AUPELF/UREF, IAEA, the World Bank and UNESCO (Gaillard and Furo Tullberg, 2001).

parallel systems as the government and non-government science funding channels. We found that there is often very little or no co-ordination or interaction between these two funding channels. Such a situation obviously raises many questions: about priority setting, parallel lines of reporting and accounting, duplication, and so on.

FIGURE 3 MULTIPLE PRINCIPAL-AGENTS' MODELS




Our study has shown that there are a number of variations on the multiple principal-agents model. We distinguish two such variations. These variations predominantly arise because of the differences in the "strength" of government funding in relationship to non-government science funding in a country. In the case where government spends relatively significant amounts of money on research (at least 0.5% GERD/GDP), the government science funding channel is strong and hold its own vis-à-vis the non-government funding channel. However, it is common knowledge that many African governments do not spend more than 0.2 or 0.3% of GDP on R&D. This often translates into a situation where government funding is weak and, therefore, has to rely heavily on foreign funding for research in the country.

This leads to two versions of the multiple principal-agent model - the equivalent and non-equivalent model. The most common model found in our study is the non-equivalent model where there is relatively weak government and strong non-government funding. Within the equivalent model, there is greater equivalence or parity between the government and non-government funding models. In fact, in some cases governments (such as Côte d'Ivoire) actively collaborate with other governments (Switzerland) to manage the parallel fund. We see this configuration with the FIRCA in ***Côte d'Ivoire***. This agency is positioned between the government and professional agricultural institutions. FIRCA was an initiative both by the Côte d'Ivoirian government and the World Bank. FIRCA therefore reports to the Ministry of Agriculture, but also to representatives of the agricultural production sectors funding its activities in Côte d'Ivoire. FIRCA acts as a service provider to the agricultural professionals by funding

basic and applied research, disseminating of results, encouraging technology transfer as well as supporting the institutions' structures for which these professionals contribute financially to the FIRCA. Our study suggests that ***Zimbabwe*** is also an example of the first (non-equivalent) variation, but in the absence of R&D statistics no strong claim can be made.

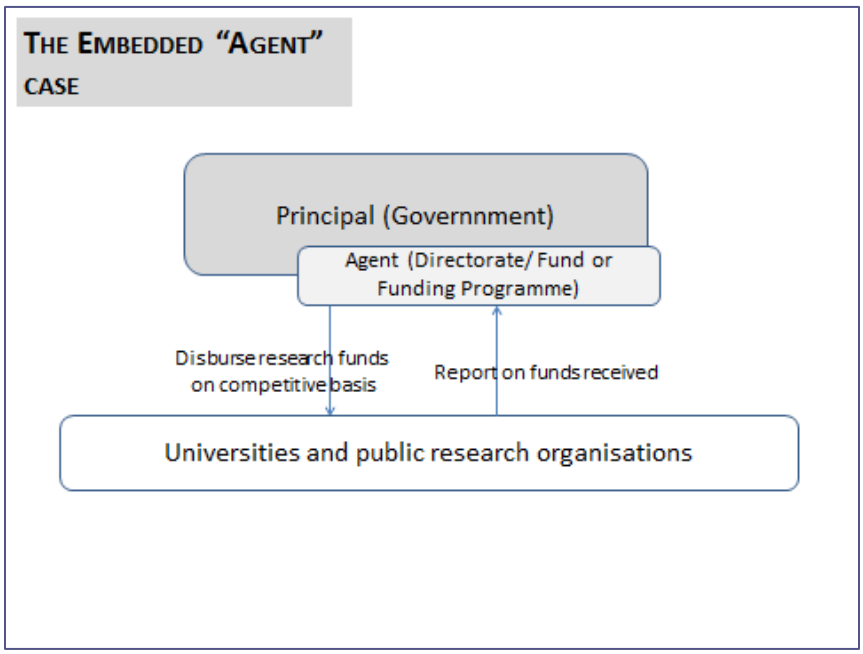
We would also argue that where foreign funding for scientific research is significantly bigger than government investment in R&D (the non-equivalent model) two different variations may be possible: either the paradigm case with foreign funding being channelled parallel to it, somewhat independently and targeting researchers at grassroots level, or an embedded case with foreign funding being channelled parallel to it. ***Mozambique*** seems to be an example of the latter. Mozambique does not have a national funding council but only a fund associated with a ministry. Yet, in terms of GERD by source of funding, 57% of funds are from abroad compared to only 28% from government. Thus, this is a non-equivalent model but without a national funding council.

And finally, the "green" section in the "multiple principal agents' model", can also be included in the embedded principal agent model to form a variant of the latter. This means that there is not only one, but two, additional variants of the "embedded principal-agents' model": the one described above as well as a "sector differentiated embedded agent model". This variant would refer to more than one ministry with an embedded research fund in each.

### 5.4.4. THE EMBEDDED PRINCIPAL-AGENT MODEL

A different configuration of the Paradigm Case is evident in the figure below. Here the "agent" is not institutionally separate from the government (Ministry or Department of Science and Technology/ Higher Education). We labelled this the "embedded agent" case as the "agent" is organisationally part and parcel of a government department. In cases such as these, it is typical that the "agent" is (1) either a sub-department or directorate within a Ministry or Department of S&T; or (2) a Fund/ Funding Programme that is administered by a department. It is evident that here the agent is simply an extension of government with no obvious autonomy or independence from the department in which it is located. One could argue that the agent, under this model, is not a proper "agent" (as suggested by the principal-agent framework) as it acts more as a commissioning agency than a disbursing agency. In fact, one of the best examples of the "embedded-agent" model is that of COSTECH in Tanzania – the Commission for Science and Technology. In two other countries (Namibia and Rwanda) these funding agencies are also referred to as "commissions". The distinction between research "foundations", "councils" and "commissions" is important and clearly requires further investigation.

FIGURE 4 THE EMBEDDED "PRINCIPAL-AGENT" MODEL




The "embedded principal-agent" model is also found in the case of ***Senegal***, with FIRST. The Fund to promote Scientific and Technical Research is situated within the Ministry of Higher Education and Research. Other examples are FONRID in ***Burkina Faso***, the Local Research and Development Grant in ***Ethiopia*** and the Fund for Poverty Research in ***Mozambique***.

In the final analysis, our study suggests the existence of at least six research funding models (or "configurations") in the countries reviewed:

- Paradigm principal-agent model
- Sector-differentiated principal-agent model
- Multiple principal-agent model
- Embedded principal-agent model
- Sector-differentiated embedded principal agent model
- Hybrid embedded principal agent model (the embedded-case together with the green part of the multiple-principal agent model)

Concluding comments:

The differentiated landscape of research funding models found in this study is not only the result of different histories in science policy development and different trajectories in the institutionalisation of a science ministry in the respective countries, but it also reflects different science governance models. As we have seen these governance models are related to the historical roots of these systems in the British and French models of science management. But we have also seen that more recent trends which included the notion of "national systems of innovation" are reflected in the separation of funding (basic) research and innovation.

The relatively poor investment in R&D in many SSA countries, which have a direct impact of the science funding models, point to different "inscriptions" of science in different countries and different values afforded to science. On the one hand some governments clearly recognise the value and importance of science and hence invest in science funding and also the establishment of a national funding agency. On the other hand, many governments have not – at least until very recently – judged science to be of sufficient value and importance to invest in the establishment of a relatively autonomous agency to disburse state funds for research and development. Having said this, the fact that there has been a surge of interest in the recent past in reformulating existing science policies as well as the establishment of a separate Ministry of Science, may be indicative of a change even amongst the latter categories of countries.

## 5.5. FUNCTIONS OF RESEARCH FUNDING AGENCIES

Studies about the functions of science funding agencies typically identify three areas: selection, policy and control. We elaborate on each before discussing the empirical findings of our study.

### SELECTION

In the selection arena, funding projects are selected by either anonymous scientific referees, mail review or by scientific peer review groups. Administrators are considered as brokers within these review groups. For refereeing, criteria are supplied by the funding agency, and there is some selection of the 'right' referees by staff of the agency. After refereeing, the proposals, review reports and other documents are put together and ranked, and authoritative decisions eventually lead to allocation of funds. To put it briefly: "the business of a funding agency is: proposals in, money out" (Rip, 2000:469). It is important to discuss the peer review process as it is vital to our understanding of the decisions and processes in the selection arena.

The majority of projects selected by initial peer review are typically transferred to more encompassing scientific boards which check for compliance with the general mission of the funding agency. While initial peer review groups do control for scientific quality and, if need be, for pick-a-back criteria, scientific boards are taking account of the relevance of research projects, either for the scientific community or for external communities. Even during the check there can be no doubt that scientific quality remains the main criterion for the selection of projects: only rarely will one find projects which have been funded because they fulfil the programmatic criterion while the scientific quality was not certified (Braun, 814).

There are two dominant procedures which have been chosen as peer review procedures in funding agencies with somewhat different implications for the selection process: (i) the anonymous mail review by individual referees (for example, by the DFG in Germany and the NSF in the USA); (ii) and the peer review group, which is the predominant form found in funding agencies. Some granting councils are using simultaneously both procedures particularly useful in case of disagreement within the peer review group (for example the International Foundation for Science). As has already been pointed out, the legitimate norms of distributing funding resources are at this stage clearly inspired by the promotion of

scientific quality. There are no differences in this respect between funding agencies. This means that funding administrators do not interfere in order to claim the application of relevance norms at this stage. Thus, only the specific interests and positions of scientific referees matter with regard to the outcome of the distribution game. Criteria used in the reviews are, for example, the quality of the research design and the theories chosen, the consideration of former research, the originality of the research, its significance for the advancement of knowledge and the qualification the applicant (Braun, 1998: 815).

Evaluation is also used to decide funding, following performance assessments of researchers, projects, programmes, departments, and institutions. The assumption is that funds that are allocated after performance is evaluated, will yield greater returns (Geuna & Martin, 2003:278). In the UK, this is the responsibility of the Higher Education Funding Councils (HEFCs), while in The Netherlands, evaluations are carried out by the Association of Netherlands Universities (VSNU). The HEFCs use evaluation as a method of allocating funds, while VSNU uses evaluation as a management tool. Different agencies also employ different criteria. They tend to focus on four typical output measures: volume, quality, impact, and utility. Peer review and bibliometric measures are their main methods. In 'peer review', the unit of assessment is normally the 'project' or the 'individual'. However, because bibliometric analyses cannot be usefully applied across the board, to all departments in a large number of universities, peer review has become the principal method of university assessment as well. When supplemented with publication and citation data and other information, this method is called 'informed peer review' (Geuna & Martin, 2003:279).

Peer review's main virtue lies in the assumption that it is ostensibly meritocratic, rewarding success and improving quality. A performance-based system can increase efficiency in the short term whilst also providing greater accountability. It provides a mechanism to link research to policy, a way to shift priorities across fields, and a rational method of moving resources from less well-performing areas to areas where they can be used to greater effect. While these arguments have their merits, a performance-based system also has its drawbacks. First, obtaining reliable and comparable information is costly. Assessments based on peer review are especially labour-intensive, when all a nation's universities and their constituent departments have to be judged. Nor do indicator-based approaches offer a shortcut; if conclusions are to be robust, data must be accurate and reliable. Second, a performance-based funding system, because it encourages competition, may also encourage a shift towards the 'homogenisation' of research, discouraging experiments with new approaches, and rewarding 'safe' research, irrespective of its benefits to society. The resulting decrease in diversity may be harmful. Moreover, a system that has publication as a key criterion encourages 'publication inflation'. Some academics will almost certainly respond by 'game playing' without necessarily improving performance. Third, performance-based funding can widen the gap between research and teaching. If rewards for research are greater than rewards for teaching, academics will focus on the former at the expense of the latter (Geuna & Martin, 2003:296).

## POLICY

The term "policy arena" indicates that it is the function of these boards to define the 'intermediate goals' as well as the strategies to realise them by taking into account the 'constitutional' mission of the funding agency. In the policy arena we find scientific boards responsible for the second step review and, occasionally, additional boards (Braun, 1998: 815). It is within the policy arena that goal conflicts occur.

Tension between basic versus applied research is a fundamental stressor which result from a convergence between academic and mission-oriented funding sources. It is also in the policy arena that we find tension between steering and aggregation (Gulbransen, 2005) as will be discussed in the following section.

## CONTROL

In the control arena the majority of public-financed funding agencies have established a political board which functions as an interface between the funding agencies and its environment, most notably the grant-givers from the political system. Political representatives sit on the boards of the financing agencies while the research management – who is supported by scientists – defend research policy and budget decisions. It is especially in this arena where political actors may interfere with policy or funding decisions.

In sum: The literature argues that funding agencies are tasked with quality control, allocation decisions and (developing/ implementing) research policy. As intermediary public agencies, they receive public funds and seek to add value to these funds by selective distribution for high quality research. All such agencies are concerned with control for quality. All are national agencies, with national missions, albeit defined in very different ways (Caswill, 2004:8). Caswell (2005) argues the following to be the core tasks of funding agencies which then supports a large variety of research council organisations and processes in the context of different sciences and national culture. According to him these are context-free components of the late and early twenty-first-century modern research council, which we can label as 'core essential' tasks. These include: (1) providing resources for research; (2) maximising organisational resources; (3) input of ideas; (4) quality control; (5) interconnection; (6) national location; (7) resource allocation; and (8) delegation.

Our study has found that "science granting councils" in SSA perform a much wider range of functions than those identified in the literature. In fact, many of the functions that they perform are not even directly related to science funding per se. Table 7 (below) provides a brief summary of the functions performed by the science councils/funds/commissions identified in the 17 selected countries. These functions highlighted below are not derived from a strong notion of a well-functioning science granting council (as found in the literature or even from studies elsewhere), but rather derived (inductively) from the actual activities that science granting councils in sub-Saharan Africa are engaged in.

We have identified 12 areas in which SGC's typically operate. The first three can be regarded as different forms of science funding support and therefore speak to the core mission of a funding agency. But functions such as the dissemination of research findings, support for scientific publishing, collecting of R&D data and statistics are new functions that were also found to be performed by many of the science granting councils in the selected countries.

13) Disbursement of research grants (various categories)
14) Disbursements of scholarships and loans (mostly Masters and doctoral students)
15) Funding support for infrastructure development
16) Valorisation of results (Dissemination and uptake of research reports and findings)
17) Supporting scientific publishing/scientific journals

18) Advocacy to the STI
19) Collect data and statistics on S&T and R&D
20) Capacity-building/training of researchers
21) Policy advice
22) Setting research agenda/research priorities
23) Management of scientific collaborations and agreements
24) Coordination of the NIS system

### 1) Disbursement of research grants (various categories)

An important difference in the way in which different SGC's disburse funds to the scientific community has emerged from our study. Some councils function as research granting agencies in the true sense of the word (inviting applications, managing a peer-review process and then subsequently awarding funds on the basis of merit and other relevant criteria). Many of the funding councils included in this study disburse research grants in this way. For example, in Zimbabwe the RCZ funds research in all fields according to a set of national priority areas. The same applies to the NRF in South Africa.

**Grants** are non-repayable funds disbursed by one party (grant makers), often a government department, corporation, foundation or trust, to recipient often (but not always) a nonprofit entity, educational institution, business or an individual. **Commissioned** research is research requested by an external party in exchange for payment.

But in many countries research is commissioned rather than supported through research grants. Research conducted by inter-institutional and multidisciplinary teams and including short-term training is particularly encouraged. Each research team must have at least three partners with the possibility of an associate at regional or international research organisations operating in the national territory.

### 2) Disbursements of scholarships and loans (mostly Masters and doctoral students)

Supporting post-graduate students (Honours, Masters and doctoral students) is one of the traditional functions of science granting councils. Our study found that this is the case in the majority of countries investigated. However, it was surprising to note that this is not the case in all countries. In countries such as Botswana, Ghana, Ethiopia, Kenya, Uganda and Zambia such scholarships are not available through the national granting councils. It is possible that another institution (such as a Ministry of Higher Education) could perform this function in these countries. It is more likely though that international agencies provide the bulk of Masters and doctoral scholarships in many of these countries because of the lack of such support from the local government. This is an area that requires further investigation.

### 3) Support for infrastructure development

We have found few examples where science granting councils provide funding and support for scientific infrastructure and equipment. The NRF in South Africa is an exception. Another example is FIRCA in Côte d'Ivoire where FIRCA works with the agricultural sector by providing for training of producers and supporting sector-based organisations' structures. This involves developing process manuals and

development plans, as well as assisting in the consolidation of the associations. FIRCA also supports associations by funding the following:

- Generating technologies to meet the needs of producers
- Transferring and diffusing technology in the medium-term
- Increasing production
- Improving the productivity of farms
- Putting quality products on the market; and
- Training and building the capacity of farmers and their organisations for greater professionalism.

**4) Valorisation of results (Dissemination and uptake of research reports and findings)**

SGC's are increasingly getting involved in adding value to research findings and outcomes which they fund. The international trend towards issues related to maximising research uptake and impact is also evident in Africa although on a much smaller scale. Some examples were found in Burkina Faso where FONRID participates in the uptake of research results and technological innovations, by funding result-focused or uptake activities. COSTECH is mandated to take the lead in gathering and disseminating research results in Tanzania and in Zambia, the NSTC is responsible to collect and disseminate S&T information including publication of scientific reports, journals and other such documents and literature.

**5) Supporting scientific publishing/scientific journals**

Related to (4) above is an interest in supporting scientific publishing in a country. In South Africa this function is not performed by the NRF but by the Academy of Science of South Africa (with generous support from the Department of Science Technology). In Ethiopia ESTA benefitted in the past from a generous grant from SIDA that supported the publication of national science journals. In Burkina Faso FONRID also funds quality scientific and technical publications as part of research projects and the RCZ in Zimbabwe supports the publication of six national journals: the *Central African Journal of Medicine* (CAJM), *Journal of Applied Sciences in Southern Africa (JASSA)*, *Journal of Science and Technology (JS&T*), *Zimbabwe Science News*, *Zimbabwe Veterinary Journal* and *Zambezia Journal of Humanities* (see www.rcz.ac.zw). Given the precarious state of scientific journals on the African continent and the general lack of visibility of African science in international databases and indexes, this is clearly an area where SGC's could play a bigger role.

**6) Advocacy for STI**

In Ghana, the proposed National Research Funding Council will be responsible to provide STI advocacy, so that the voice of the country's STI community will be represented in the country's programmes and policies at all levels. The NCST in Kenya conducted various activities aimed at creating awareness relating to STI in Kenya. An example of this is the training, conducted in 2012, of Public Relations and Communications Officers on biosafety. The intention of this training was to create a critical mass of communicators. They can then provide factual information on biosafety issues to both policy makers and to the public. A further example is the participation of NCST staff in Strategic Trade Control and Security training of 2012, attended by 52 participants from 13 countries. In 2012, the NCST also participated in activities such as the Micro and Small Enterprise (MSE) innovation and technology exhibition and symposium. This event, whose aim was to create a forum bringing together innovators,

research institutions, technology providers and the general public, was sponsored by the NCST. Other examples include the 2012 and 2013 participation of the NCST/NACOSTI in the Agricultural Society of Kenya (ASK) show in Mombasa and in the Nairobi International Trade Fair.

### 7) Collect data and statistics on S&T and R&D

It is imperative that reliable and regular statistical information on R&D in a country is produced. There are very different national models of how and where this function is performed. In some countries (such as Canada) the R&D statistics is gathered and analyses by StatsCanada. In the USA, the NSF produces such data on a regular basis. In South Africa a unit within the Human Sciences Research Council (CESTII) performs this function although it used to be housed in the precursor to the NRF. Our research showed that the collection and analysis of R&D statistics is housed in a few SGC's. The UNCST in Uganda is one of the few organisations that collect and analyse scientific and technological statistics and indicators to facilitate measurement and provide advice to government. The NCST regularly evaluates sector performance using conventional and standardised STI indicators and publishes these in the annual STI status reports.

### 8) Capacity-building/training of researchers

Given the lack of research culture in the Francophone countries, many of the SGC's studied in West Africa are concerned with training of researchers, particularly with regards to proposal writing and technical support. FONRID in Burkina Faso offers support to public and private research and technological innovations, laboratory equipment or workshops as part of specific programmes of research and development approved by the Fund.

### 9) Policy advice

The literature shows that some SGC's do in fact play a role in advising government on science and innovation policy. It is important to emphasise that this does not usually involve the development of policy, but more typically advising on policy (and in some cases evaluating policy). In Rwanda, the NCST is currently operational with the mandate of providing informed policy recommendations to the government and advice on human capacity building strategies in order to ensure that Rwanda is equipped with a critical mass of highly qualified skills in science and technology to support the achievement of a competitive and sustainable socio-economic development based on science, technology and innovation. The RCZ in Zimbabwe is also mandated to advise Government on matters of research. COSTECH, in Tanzania, is the principal advisor to the government on matters pertaining to science and technology and their relevance to socio-economic development of the country. In Uganda, the UNCST is responsible for preparing policy notes to inform policy-makers, scientists and the public on matters related to technology forecasting, assessment and transfer. In Zambia, the NSTC is mandated to (a) regulate research in S&T in Zambia, (b) register institutes and centres and (c) advise the government on S&T policies and activities in Zambia.

### 10) Setting research agenda/research priorities

Because of their strategic position within national science systems, SGC's typically advise government on national research priorities and new initiatives. This advice is often grounded in research projects funded and feedback from peer review process, but also based on regular reviews of scientific fields and

disciplines. The NRF is a good example where this is regularly done. Over the past ten years it has commissioned various studies that reviewed its funding instruments (THRIP, Focus Areas programme, Rating System) as well as evaluations of specific fields (such as Mathematics and Physics). The fact that it also houses a directorate on "new knowledge fields" is another indication of the role that it performs in co-constructing the national research agenda. Other examples from our study include the NRIC in Nigeria which is mandated to set national priorities on R&D as well as setting direction to coordinate STI activities, including R&D, in line with national priorities and the Zambian NSTC which identifies and determines national R&D priorities in S&T.

### 11) Management of scientific collaborations and agreements

Various bodies in the national science system are typically involved in the management of international agreements and collaborative networks. It is uncommon to find that national academies of science perform this role. In many countries this functions is performed by the Ministry or national department of Science and Technology and – as we found – also by national granting councils. In South Africa, the NRF has traditionally played a central role in managing bilateral and multilateral science agreements. In More recent years it has increased its involvement in this arena by appointing "national contact persons" to mediate between the SA scientific community and the EU (and its various frameworks and funding instruments).

Other examples of SGC's which perform a similar function were found in our study. FONRID in Burkina Faso is responsible, among other things, for the mediation between national partners, bilateral or multilateral structures and public or private research structures in the negotiation, development and implementation of projects or research programmes.

In Uganda, the UNCST is responsible for developing partnerships and networks among different stakeholders through the creation of technical working groups to steer and oversee particular NSTP programmes and projects and the NSTC in Zambia is responsible to establish and maintain a relationship with corresponding scientific organisations in other countries.

### 12) Coordination of the NIS system

Many of the country analyses revealed a weak or fragmented NIS system. There has been an effort to rectify this constraint with the proposal of many new councils/funds/commissions. An example is the National Research Funding Council in Ghana will be responsible to ensure coordination and harmonisation of the country's STI policies, so that STI activities are comprehensive, complementary, and reinforcing across all sectors and ministries.

We summarise the results of our investigation into the range of functions performed by the SGC's in Table 7 below.

TABLE 7 FUNCTIONS OF THE SELECTED ORGANISATIONS

| Countries | Funding Agencies/ Councils/ Commissions/ Funds | Functions | | | | | |
|---|---|---|---|---|---|---|---|
| | | Disbursement of research grants (different categories) | 'Valorisation' of results/ dissemination /uptake? | Collect data / statistics - R&D surveys etc. | Capacity Building/ Training (individual/ researchers) | Disbursement of scholarships / loans (different categories from Honours to PhD) | Advocacy for STI |
| BURKINA FASO | FONRID | ✓ | ✓ | | ✓ | | |
| | FARES | ✓ | ✓ | | ✓ | | |
| | FONER | | | | ✓ | ✓ | |
| BOTSWANA | NCST | ✓ | | | | | |
| | TEC | ✓ | | | | | |
| | BIH | | | | ✓ | | |
| | *NRF* | ✓ | | | | | |
| | *BRSTFA* | ✓ | | | | | |
| | *BNRDCC* | ✓ | | | | | |
| CAMEROON | FRBC | ✓ | | | | | |
| | FARP | ✓ | | | ✓ | ✓ | |
| | *FNRI* | | | | | | |
| | FUDIST | | ✓ | | | | |
| CÔTE D'IVOIRE | FIRCA | ✓ | ✓ | | ✓ | | |
| | PASRES | ✓ | | | ✓ | ✓ | |
| | *FNRST* | | | | | | |
| ETHIOPIA | *NSTIC* | | | | | | |
| GHANA | CSIR | | ✓ | | | | |
| | STREFUND | ✓ | | | | | |
| | GETFUND | | | | | | |
| | *NRFC* | | | | | | ✓ |
| KENYA | NACOSTI | | | | | | |
| | NRF | ✓ | | | ✓ | ✓ | ✓ |
| | KENIA | | | ✓ | | | |
| | NCST | ✓ | | | | | ✓ |
| MOZAMBIQUE | NRF | ✓ | ✓ | | ✓ | | |
| NAMIBIA | *NRF* | ✓ | | | | | |
| | NCRST | | | | | | |
| | *CRI* | | | | ✓ | | |
| NIGERIA | TETFUND | ✓ | | | | | |
| | *NRIF* | | | | | | |
| | *NRIC* | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | *SSTIC* | | ✓ | | | | ✓ |
| | *NCSTI* | | ✓ | | | | |
| | ETF | ✓ | | | | | |
| RWANDA | RIEF | ✓ | | | | | |
| | *NRF* | ✓ | | | | | |
| | NCSTI | | ✓ | ✓ | ✓ | | |
| SOUTH AFRICA | NRF | ✓ | ✓ | | ✓ | ✓ | |
| | MRC | ✓ | | | | ✓ | |
| | WRC | ✓ | ✓ | | ✓ | | |
| SENEGAL | FIRST | ✓ | | | | ✓ | |
| | FNRAA | ✓ | ✓ | | ✓ | | |
| | *FNRI* | | | | | | |
| TANZANIA | COSTECH | ✓ | ✓ | ✓ | | | |
| | NFAST | ✓ | ✓ | | ✓ | | |
| | *NRF* | | | | | | |
| UGANDA | UNCST | | | ✓ | | | |
| | STIF | ✓ | | | | | |
| | NIF | ✓ | | | | | |
| ZAMBIA | NSTC | ✓ | | ✓ | | | |
| | *NRC* | | | | | | |
| | NTBC | | | ✓ | | | |
| | NTBF | ✓ | | | | | |
| | SRF | ✓ | | | ✓ | | |
| | *NTIA* | | | | | | |
| | *NRIF* | | | | | | |
| | STIYF | ✓ | | | | | |
| ZIMBABWE | RCZ | ✓ | | ✓ | | ✓ | |
| | RDCIF | ✓ | | | | | |

*Note: All acronyms in Italics indicate planned councils/commissions/funds etc. i.e. which are not operational at the date of writing the report.*

| Countries | Funding Agencies/ Councils/ Commissions | Functions | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Policy advice | Priority / agenda setting | Collaboration through administration of scientific agreements | Advise on and facilitate /establish implementation of proposed S&T institutions | Support national scientific journals | Support for infrastructure development (institution level) | Coordination of the NIS system |
| BURKINA FASO | FONRID | | ✓ | ✓ | | | | |
| | FARES | | | | ✓ | | | |
| | FONER | | | | | | | |
| BOTSWANA | NCST | ✓ | | ✓ | | | | |
| | TEC | ✓ | | | | | | |
| | BIH | | | | ✓ | | ✓ | |
| | *NRF* | | | | | | | |
| | *BRSTFA* | | | ✓ | | | | |
| | *BNRDCC* | | ✓ | | | | | |
| CAMEROON | FRBC | | | | | | | |
| | FARP | | | | | | | |
| | *FNRI* | | | | | | | |
| | FUDIST | | | | | | | |
| CÔTE D'IVOIRE | FIRCA | | | | | | ✓ | |
| | PASRES | | | ✓ | ✓ | | ✓ | |
| | *FNRST* | | | | | | | |
| ETHIOPIA | *NCSTI* | ✓ | ✓ | | ✓ | ✓ | ✓ | |
| GHANA | CSIR | | | | | | | |
| | STREFUND | | | | | | | |
| | GETFUND | | | | | | ✓ | |
| | *NRFC* | ✓ | | | | | | ✓ |
| KENYA | NACOSTI | ✓ | ✓ | ✓ | ✓ | | | ✓ |
| | NRF | | | | | | | |
| | KENIA | | | ✓ | ✓ | | ✓ | |
| | NCST | ✓ | | | | | | |
| MOZAMBIQUE | NRF | | | | | | ✓ | |
| NAMIBIA | NRF | | | | | | | |
| | NCRST | | ✓ | ✓ | ✓ | | | ✓ |
| | *CRI* | | ✓ | | | | ✓ | |
| NIGERIA | TETFUND | | | | | | ✓ | |
| | *NRIF* | | | | | | | |
| | *NRIC* | | ✓ | | ✓ | | ✓ | ✓ |
| | *SSTIC* | | | | | | ✓ | |
| | *NCSTI* | | | | | | | ✓ |
| | ETF | | | | | | | |
| RWANDA | RIEF | | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *NRF* | | | | | | | |
| | NCSTI | ✓ | | ✓ | | | | |
| SOUTH AFRICA | NRF | | | ✓ | | | ✓ | |
| | MRC | | | | | | | |
| | WRC | | ✓ | ✓ | | | | |
| SENEGAL | FIRST | | ✓ | | | | ✓ | |
| | FNRAA | | ✓ | | | | ✓ | |
| | *FNRI* | | | | | | | |
| TANZANIA | COSTECH | ✓ | | ✓ | | | ✓ | |
| | NFAST | | | | | | ✓ | |
| | *NRF* | | | | | | | |
| UGANDA | UNCST | ✓ | ✓ | ✓ | ✓ | | | |
| | STIF | | | | | | | |
| | NIF | | | | | | | |
| ZAMBIA | NSTC | ✓ | | | ✓ | | ✓ | |
| | *NRC* | | | | | | | |
| | NTBC | | | | | | ✓ | |
| | NTBF | | | | | | | |
| | SRF | | | ✓ | | | ✓ | |
| | *NTIA* | | | | | | | |
| | *NRIF* | | | | | | | |
| | STIYF | | | | | | | |
| ZIMBABWE | RCZ | ✓ | ✓ | ✓ | ✓ | ✓ | | |
| | RDCIF | | | | | | | |

*Note: All acronyms in Italics indicate planned councils/commissions/funds etc. i.e. which are not operational at the date of writing the report.*

We present a summary analysis of the different functions that are performed (or being envisaged in the establishment documents of SGC's) in Figure 5 overleaf. The functions are listed in descending order from the highest to lowest incidence. Although we studied 17 countries only, the actual number of science and research funding organisations/agencies add up to more than 17. This explains why we identified 35 bodies that indicated that they disburse research funds (which emphasize the challenge of co-ordination within many of these countries). Funding for research infrastructure (including scientific equipment) and capacity-building (support training of scientists and researchers) are the next most frequently found functions in our sample.

This summary presentation is valuable not only because it highlights which functions are most frequently performed, but the sheer range of functions that such councils perform raises questions about the internal capacities to perform all these functions equally well. To perform these functions effectively and efficiently in well-established science systems would be daunting; in more fragile and developing systems, this poses serious challenges.

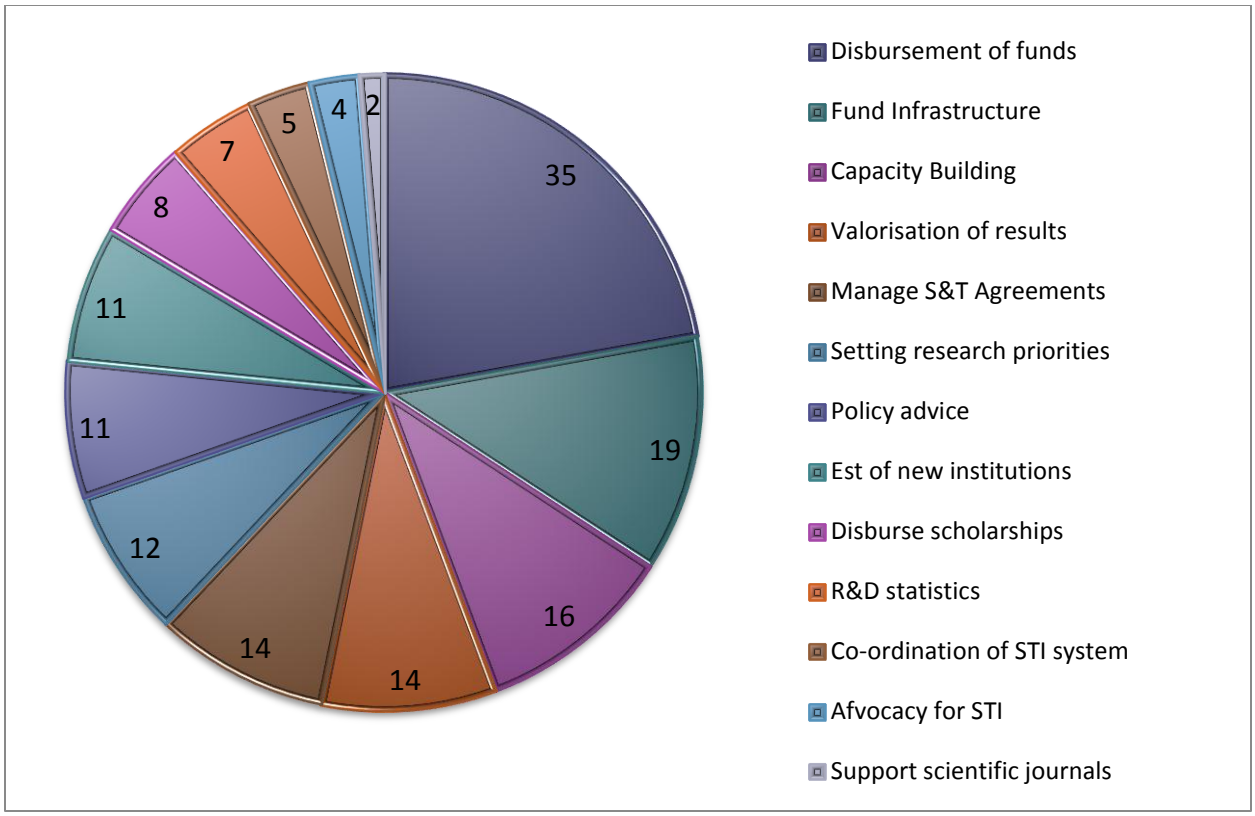



FIGURE 5: SUMMARY PRESENTATION OF FUNCTIONS PERFORMED

# 6. PROJECT OUTCOMES

The first and main aim of the study was to generate new knowledge as well as obtain a deeper understanding of the landscape of science granting councils in 17 SSA countries. The project team would argue that this aim has been achieved. The study has generated very detailed and rich descriptions and analyses of SGC's in SSA: their origins, missions, functions and challenges. Our review of the existing scholarship in the field showed that no such study had previously been done on the African continent. This is in many respects a first of its kind. Not only does the study contribute new information about the institutional landscape in the sciences systems under investigation but it also advances our knowledge of the different and possible SGC-configurations.

But the beneficiaries of this knowledge are not confined to the project team or the IDRC. Through a continuous process of consultation with key stakeholders in the respective countries we established a new network of co-operation. This culminated in a very successful consultative workshop in November 2013 where more than 30 delegates from all the participating countries participated and presented. Through further dissemination (and a possible follow-up project), it is anticipated that the results and knowledge gained from the study (which includes 17 detailed customised country reports) will be further disseminated and ultimately used by the staff of the SGC's in the different countries.

The consultative workshop in November 2013 also provided participants in the project with a much-needed forum to share ideas learn from each other and establish and strengthen networks. One of our recommendations is that this "informal" forum be formalised in the future in order to create even more benefits to a larger community of science granting managers and practitioners.

The IDRC is a direct beneficiary of this study as it has gained new information and knowledge that could guide it in its future grant making as well as who to partner with in such endeavours. An immediate outcome of this study has been a closer working relationship between the IDRC and the NRF in South Africa and the real possibility of a co-funded initiative that would aim to strengthen SGC's in SSA.

In the final analysis, despite all the gains of the study, we have also established more clearly where there are existing gaps in our knowledge of this new and emerging domain. This "benefit" will inform the future work of CREST and other scholars in the field and help to focus future commissions of this nature. In addition CREST has also taken notice of the main challenges and priorities that SGC's on the continent are facing. We have summarised these in the sections below:

## 6.1. CHALLENGES AND PRIORITIES

A number of suggestions and future priorities were gauged from the country visits as well as the consultative workshop. These have been organised around three main areas: (1) Technical support and capacity building; (2) Systemic priorities; and (3) Public funding.

### 6.1.1. TECHNICAL SUPPORT AND CAPACITY BUILDING

With regards to training and capacity building, there seems to be a clear need to create opportunities for the SGC's to share information and learning on a regular basis

There are a number of areas where capacity-building for the programme officers and staff of these councils should be addressed in a systematic way. The possibility of accredited training courses and workshops that could contribute to a Continuous Professional Development initiative should be investigated. Some of these areas as identified at the workshop are:

- Peer review and evaluation procedures
- Grant-making procedures
- Management of S&T international agreements
- STI policy analysis and research and innovation priority setting
- Basics of R&D management and bibliometrics

The individual country analyses clearly demonstrated that the majority of countries experience a lack of skilled researchers, and particularly within the Francophone countries, a lack of skilled proposal writers.

In Rwanda, *human capacity development* is one of the major challenges in research areas. This includes a lack of expertise in conducting research and writing research funding proposals. A lack of a research culture and limited R&D facilities further hamper the execution of good research. In Senegal, it was highlighted that Research offices at the various universities and research institutes need to be more involved in preparing their students and staff members for writing successful proposals in preparation for annual calls for proposals. Across the board, there is thus a need for good proposal writing capacities as well as quality research.

This need was also highlighted in both Côte d'Ivoire and Burkina Faso. In Côte d'Ivoire, despite the inadequate financial allocation to research activities at national level being an obstacle for researchers, young researchers also face many other challenges. A lack of experience in writing competitive grant proposals across the research sector has limited the opportunities open to young researchers. National research financing institutions also tend to favour more experienced researchers: this makes it extremely difficult for young researchers to obtain funding. In Burkina Faso the following challenges were also identified: (1) Inadequate infrastructure and weak equipment/technical platforms, (2) Inadequate dissemination of research results; (3) Inadequate and outdated research infrastructure (such as laboratories) and installations; (4) A lack of appropriately skilled human resources (due to recruitment difficulties in research structures and brain drain); (5) The absence of a genuine training policy and integration of research staff; (6) Not taking into account the research facilities and staff of other departments in the formal research system; and (7) Lack of information and communication on the results of research, statistics and performance indicators on the sector.

Given the importance of capacity building and training, systemic challenges significantly hamper the work of SGC's in SSA.

### 6.1.2. SYSTEMIC CHALLENGES

The following section describes the challenges identified in the country analyses with regards to systemic challenges. Six challenges have been identified:

1) Weak coordination within the national STI system;
2) Weak partnerships with industry;
3) Need for a formal funding mechanism;
4) Lack of legislation and poor implementation of policies;
5) Marginal status of research councils; and most importantly,
6) Inadequate and non-sustainable public funding. I

In our discussion below we give illustrative (not an exhaustive list) examples of points highlighted.

**1. Weak coordination within the national STI system**

Cameroon's NSI is characterised by weak coordination and leadership of scientific research activity in the country. In Ghana the STI system is stretched thin and is overburdened in relation to resources available. This leaves many of the country's important STI institutions unable to carry out their mandates effectively. Current resource allocations cannot sufficiently support the range of activities that the country assigns to the STI system. Coordination across the entire STI system is inadequate, resulting in gaps in support and duplication of efforts. Ghana may find that a coordinating body for STI is necessary to avoid gaps and overlaps in its STI policies and programmes. Botswana faces fragmented, uncoordinated and untargeted research activities.

In Uganda, due to the cross-cutting nature of STI, the responsibility for science is currently distributed between line ministries. This has resulted in a fragmented system that has not well-served the need to ensure effective coordination for STI development, its associated R&D processes and its outputs.

In Kenya there have been a great number of fundamental changes taking place that will have an impact on the STI environment and on the functioning of the national science commission. It has also resulted in an increase of the number of public universities, from 7 to 22 within the last 18 months. The enactment of the STI policy, which restructured the NCST into three new entities, will undoubtedly have a number of ripple effects on how the Kenyan national system of innovation is managed; and on the extent to which the functions of each of these stakeholders can effectively be delivered. Time is needed for the structural elements to be consolidated and reconfigured. After this, it may be necessary to review and update some of the elements of this profile.

**2. Weak partnerships with industry**

In Ethiopia R&D activities in the industrial sector are largely neglected, with serious implications for the country's future innovative capacity and economic growth. In Nigeria, based on available data, only 0.2% of the national R&D fund is from the industrial sector. This shows that the industrial sector's

contribution to R&D is very limited in Nigeria. Government can easily achieve this by providing tax incentives, as well as by directly funding some projects in industrial firms.

### 3. Need for a formal funding mechanism

There is no formal mechanism in place for funding research in Cameroon. The absence of a formal mechanism for funding research is probably due to the economic crisis that shifted the interest of the state to other priorities such as basic education. There is an urgent need to validate a national strategy for research and innovation, to adopt a law related to the development of scientific research and innovation and to establish a National Fund for Research and Innovation (FNRI).

In Senegal, there are plans to establish a national research fund for Research and Innovation (FNRI) in Senegal to replace FIRST. This proposed fund should have a significantly greater chance of success if it is to be given an autonomous status similar to FNRAA and placed outside the ministry in charge of research. A non-public, more flexible status is highly advocated in order to be able to implement procedures more suitable for funding research projects. One of the specificity of FNRAA is that it is trying to position itself equally between the government, research activities performers and end users. A similar approach should be used by FNRI. Yet an important constraint for the effective functioning of the FNRAA is the partitioning between the functions of research, extension and education. If Senegal wishes to enhance S&T and R&D activities, it will be useful to emphasise the synergy of these functions. Specific calls for proposal could be instrumental in enhancing synergies between these functions.

### 4. Status of research councils

In Côte d'Ivoire a national funding body should preferably be given an autonomous status (similar to that of FIRCA) with an autonomy of management with enough flexibility to put in place a peer review system independent from the government subsequently ensuring an undisputed selection process, disbursement of funds and follow up of disbursed funds (control a posteriori and not a priori) and research activities.

### 5. Lack of legislation and poor implementation of policies

Nigeria is faced with the challenges of ineffective policy instruments, poor R&D coordination and inadequate funding. The Nigerian government should also ensure that the recently approved STI policy is fully implemented to allow it to bridge the gap between the educational sector and the industrial sector. If this policy is well implemented, Nigeria's NSI will be strengthened; and an improvement in developmental experiment research conducted and funded will result.

### 6. Inadequate and non-sustainable public funding

The biggest obstacle facing NSIs in SSA is a lack of adequate and sustainable public funding. In Côte d'Ivoire one sees a case of unbalanced research funding. The majority of researchers in Côte d'Ivoire are based at the National Centre of Agronomic Research (CNRA), which also absorbs around three quarters of R&D funding (UNESCO Science Report, 2010). It is therefore imperative that the Ivorian government ensure that adequate and sustainable funding be made available also to sectors outside that of agriculture. In this respect the proposed creation of a National Fund for Scientific and Technological Research (FNRST) building on the experience of PASRES, is a welcome development. Researchers' efforts to obtain private funding absorb time and energy, limiting their input on institutional research activities.

This situation has caused a gradual decrease in research activity in recent years. The small amount of state funds available for research has been poorly managed because of unduly bureaucratic procedures. The relative stagnation of state funding has led to equipment not being replaced and self-financing decreasing. Despite the tangible stagnation of state funding, Côte d'Ivoire remains one Sub-Saharan African countries where the capacity for research on STI is available. But, except for forestry and agricultural research, national research is more and more depending on external funding with the inherent difficulty of developing a national research strategy supporting national research priorities.

Research projects in Cameroon are generally still driven by foreign donors or local researchers seeking to fulfil their own research objectives. Despite the existence of an institutional research framework, many inconsistencies occur with regards funding actually made at the level of public funding in the field of research. In Zimbabwe constraints are primarily financial, in that a limited amount of funding is available for disbursement.

In Burkina Faso there is lack of public funding for the implementation of research programmes as well as low private sector participation in the financing of research activities. In Ethiopia S&T development requires a clear funding commitment from the government. Although the national S&T policy stipulates that the government be committed to allocate up to 1.5 % of the GDP annually for S&T activities in the country, no mechanism has been developed to earmark a national budget chapter for the implementation of national S&T programmes and projects. The draft discussion document to establish the NCSTI will be a first step towards addressing this gap.

In the case of Namibia, there is lack of government funding and commitment towards establishing planned institutions Despite the *de jure*, legal, commitment of the Namibian government towards the restructuring of the Namibian STI system, the government's lack of funding of the establishment of the National Research Fund hampers their commitment towards R&D in Namibia.

In Tanzania, government expenditure on R&D is very low. This, together with the dependency on international funding for S&T, has meant that there is no real growth in S&T capacity in the country. Furthermore, where funding has been available, it has not been adequately focused towards addressing societal problems.

The research and innovation system of Uganda face considerable financial deficits resulting from national economic constraints as well as the low priority attached to research and knowledge production in the eyes of the custodians of political power and national resources in most African countries. Ugandan universities experience acute shortage of research funding. Every year, public universities prepare and submit a budget for research to the government for funding but eventual government funding allocations for research often fall far below 50% of the university budgets (Jowi & Obamba). In the absence of private-sector funding and competitive grants, public universities and research institutes in the sub-Saharan region predominantly depend on dwindling public subsidies as well as unpredictable international donor support. This narrow funding base suggests that research and innovation systems face severe financial deficits and lack the capacity to formulate and drive their own domestic research agendas. National policymakers and university leadership need to be encouraged to work in closer partnership and to prioritise the strategic importance of research and innovation in national economic growth and competitiveness by investing more significantly in strengthening research capacity, infrastructure, and research opportunities in universities (Jowi & Obamba).

In Zambia, Apart from financial constraints – more money to support more promising research projects from public R&D institutions – the NSTC also faces infrastructure challenges. Office space for the Programme Development and Implementation (Technical) Department is a major challenge, specifically as far as Programme Assistants and Interns are concerned (NSTC 2012).

Despite tangible recent increases, the state budget for research and innovation in Senegal is insufficient and marginally used for research activities, particularly within the higher education institutions. It is also still heavily dependent on external funding (approx. 40%) even if the Senegalese government's funding share is approaching 50%. The share of government funding and of the national private sector should increase further if Senegal is to be in full control of its research agenda.

*Given the evidence above, it is clear that the two most significant challenges facing STI in SSA is firstly weak, uncoordinated and fragmented STI systems. Many countries, however, has attempted to rectify this situation with new STI policies, although the implementation thereof has been inadequate. Secondly, almost all of the country analyses indicate a lack of public funding for research activities. This has resulted in international donors playing increasingly bigger roles in setting up the research agendas of countries in SSA. A general increase in GERD in SSA however would not be an immediate solution, without targeted initiatives to direct funding to where it is most needed, whilst simultaneously, ensuring that such an increase is sustainable.*

# 7. ETHICAL CONSIDERATIONS AND LESSONS LEARNED

The study methodology consisted of a combination of desktop work, reviewing existing data and statistics, in situ-country visits and interviews and a consultative workshop. Within the broad scope and terms of reference of the study, we believe that this was the appropriate methodology and would not suggest a different approach for studies of this nature.

There were numerous challenges that we faced as a team: accessing grey literature and key documents on the sciences systems in some countries, verifying statistical information on R&D investment and gaining access for interviews with high-level managers in the Ministries of Science and Technology. A crucial lesson learnt relates to the importance of having a senior French-speaking researcher on our team (Dr Gaillard) who – because of his existing networks in the Francophone countries – managed to open doors for interviews that would otherwise have been impossible. CREST also utilised its extensive networks in many of the Anglophone countries to gain access to key information and informants.

No specific ethical issues or challenges emerged during the study.

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# APPENDIX A

# LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

> *"The scientific system becomes the place for the advancement of knowledge. To create new knowledge, special procedures, norms, rewarding mechanisms, and institutionalisations are put into place characterising scientific activities and distinguishing them from other professional activities in society. The establishment of such science-specific mechanisms has allowed an unprecedented rise in knowledge of modern societies". (Braun, 2003:310)*

Funding and scientific systems have evolved and transformed over time. Historical trajectories and political and social climate change create shifting spaces in which funding councils and scientific systems need to function. Context is vital to the functioning of these funding bodies (Rip, 2000: 469) and funding bodies need to adapt to survive. "Funding agencies, with their aggregation machines, function in a particular historical context and translate contextual changes…" into their functioning (Rip, 2000:471). Contextual changes within institutions are contingent on (1) historical conditions: attitudes and trajectories of institutions and scientific communities; (2) responsiveness: institutions respond to changing contexts in order to survive and adapt themselves; (3) ecological effects: changes in systems and modes of knowledge production (opportunities and pressures) to which these institutions need to adapt (Rip, 2000:471). Generally, the scientific arena has undergone some changes in recent years. General changes include firstly, a shift in the delegation modes of funding allocation from blind delegation to the scientific community, to the research councils, to more responsive modes where the state sets more specific targets. Secondly, a shift in the general objectives from support to academic science to support to research oriented to social and economic needs, linked to the evolution of the overall models of research policy from 'science push' to policies oriented to social relevance and later to economic innovation, has occurred (Lepori, van den Besselaar, Dinges, Potì, et al., 2007).

A review of the literature shows that there exists a clear consensus regarding the definition and main functions of science granting councils. Science granting councils[5] are intermediary, quasi-public, institutions which are positioned between the state and individuals/institutions that perform research (Rip, 2000:467). The primary purpose of research councils, traditionally, has been to "organise part of the funding relationship between government and universities as a peer-review based competition for project funding" (Van der Meulen, 2003:323). They are "expected to mediate the political and policy interests in scientific research into the world of science and technology and promote the interests of science and technology in the policy world" (Van der Meulen, 2003:323). Lepori et al. consider the funding agency as the body that attributes the grants, irrespective of the origins of the funds (Lepori, Van den Besselaar, Dinges, Van der Meulen, et al., 2007:252). Caswill (2004) considers research councils

[5] The terms science granting councils, research councils and science funding councils will be used interchangeably.

to be the collective of public sector agencies that allocate state resources to high quality academic research in the natural sciences, social sciences, arts and humanities. These agencies operate in the intermediary position between the knowledge production system and state policy, between state and academy.

This intermediary role, however, has become more complex in many countries as research councils need to align their tasks with governmental priorities and societal and user needs. In addition, conceptions about the role of science in society has changed which demanded research councils to develop new policy instruments and redefine their relationships with science, policy and society (Van der Meulen, 2003:323). Important to note is that funding agencies are not independent organisations with resources, but merely act as an advising agent to the state in assigning resources to interested parties within the scientific community. The position of the research councils depends, on the one hand, on the level of delegation of authority and funds by the government and, on the other hand, by the extent to which scientists and their organisations subject themselves to monitoring by the council, 'their' ministries and researchers (Van der Meulen, 2003: 325).

There is also an on-going and growing debate, particularly in Europe, about whether the increasing reliance on competitive project funding at the expense of core funding may result in giving priority to short term and low-risk projects to the detriment of longer term fundamental research and/or high-risk projects as well as non-priority areas. There are also concerns that this trend may impact the capacity of an institution to invest in infrastructure and long-term institutional and capacity building activities (OECD, 2011). While some authors find no straightforward connection between the degree of competitive funding and publication performance (Auranen and Nieminen, 2010) others claim that competitive project funding has a positive impact on scientific production measured in number of publications (Carayol and Lanoe, 2013). Some recent reports also point to a correlation between the decline of a national research systems and the increase reliance on competitive project funding (see e.g. Royal Swedish Academy of Sciences, 2013).

Increased competitive funding also impact the organisation of the scientific work itself, professional autonomy and altogether transform the profession of scientists and redistribute the strategic steering of research (Hubert and Louvel, 2012). In addition, increased competitive funding may weaken laboratories strategic capacities and organisational solidarities and lead to the reorganisation of divisions of work and occupational hierarchies (Jouvenet, 2011). It also contributes to a bureaucratisation of scientific work (Brunet and Dubois, 2012) and to the difficulty to adjust professional temporalities with management temporalities (Barrier, 2011). Increased competition for funding tends also to increase conformism thus discouraging the submission of high-risk projects (Chubin and Hackett, 1990) and reinforcing risk aversion (Laudel, 2006). As a consequence, project funding is therefore constraining research priorities and the overall research agenda (Laudel, 2006; Laudel and Weyer, 2013). These constraints and limitations should also be taken in consideration when considering the best possible option or model for supporting research activities.

## RELATIONSHIP BETWEEN SCIENCE AND STATE

A funding council's relationships with its surroundings are seldom characterised by a distinct or unambiguous relationship to the state or government. Its responses to science policy will thus not depend solely on the relationship with the government, but also partly on the relationships between council and scientists, and partly on the internal organisation of the council, its dependencies and abilities to exert strategic actions. These elements are difficult to analyse, as they are constituted by a complex mix of history, legitimacy, use and balance of power and institutional perceptions (Slipersæter, Lepori, & Dinges, 2007).

The literature on science granting councils provides us with two prominent assumptions on the relationship between government and science: steering (top-down) and aggregating (bottom-up). These two strands are often considered to be mutually exclusive (Van der Meulen, 1998:398). However, "in the actual development of research policies, the two intertwine and make up the fabric of institutional structures, of frameworks or rules, procedures and arrangements, to prepare, implement and perform" (Van der Meulen, 1998: 398). Van der Meulen (1998:399) considers science funding to be a contractual relation with an (i) explicit contract, i.e. the reviewed proposal and funding decision and (ii) an implicit contract, i.e. the expectations about the expertise of the scientist/scientific institution.

In our consideration of the horizontal and vertical relationships of funding agencies we can distinguish between four organisation layers: the policy layer, funding agencies, performing organisations and research groups/individual researchers. We can also look at the two main allocation methods: core funding to research organisations and project funding to research groups. It is important to notice that layers represent functions and not organisational structures: even if in most cases they are organisationally distinct. With regards to funding agencies and their relationships with the state Lepori et al. (2007:252) devised a simple classification in four groups:

1. *National government*

   Agencies which are directly part of the national state administration, such as ministries, offices and other similar bodies.

2. *Intermediary agencies*

   Agencies enjoying strong autonomy in respect to the state in their management and decision-making process, the typical case being research councils managed by the scientists themselves (corresponding largely to the notion of 'intermediary agencies' in science policy).

3. *Regional government*

   Agencies that are part of the regional and local state administration.

4. *International agencies*

International organisations and bodies which would include bodies such as the European Commission and intergovernmental agencies.

## MODES OF PUBLIC FUNDING

It is generally assumed that there are a limited number of modes of public funding. At the highest level a distinction is made between CORE and PROJECT funding of research conducted at public research organisations and universities.

**Core funding** (also referred to as "Block" funding) for universities is usually channelled through a Ministry of (Higher) Education. The term "core funding" is used as this refers to state support of the core business of universities (and other public research bodies) which is usually understood to be teaching and learning, research and community engagement. There are basically two ways in which core funding to universities is calculated: formula-based core funding and performance-based core funding (or some combination of the two). Formula-based core funding consists of calculating the core funds to a specific university on the basis of an agreed-upon formula. Such a formula usually takes into account student numbers, growth in student numbers, staff numbers, and infrastructure and so on. Performance-based core funding is based on the (past) performance of a university. In the field of research, this is usually linked to the research output of the university; in the field of teaching and learning, this could involve any number of "measures" such as student completion rates, student throughput rates and absolute numbers of graduates and post-graduate students.

But it is not uncommon to have a system of core funding which consists of both block funding and performance funding. South African universities receive an annual core funding amount that is both calculated in terms of students, staff and infrastructure as well as performance based funding (introduced in 2005) which rewards the most research productive universities.

**Project funding**, which involves directly supporting research (projects) at public research organisations, can either be directly channelled (which is not the norm in most countries) or channelled through an "agent" such as Funding Council or Foundation (or even Fund) that is usually accountable to a Ministry of Science and Technology (but also sometimes a Ministry of Higher Education). Project funding is often referred to as competitive funding as such funds are usually disbursed on the base of open competition (even where some priority areas are designated or ring-fenced) which involves calls for proposals, subsequent peer review and monitoring of project deliverables and outcomes.

We have summarised the strengths (advantages) and weaknesses (limitations) of these different funding modes in Table 1:

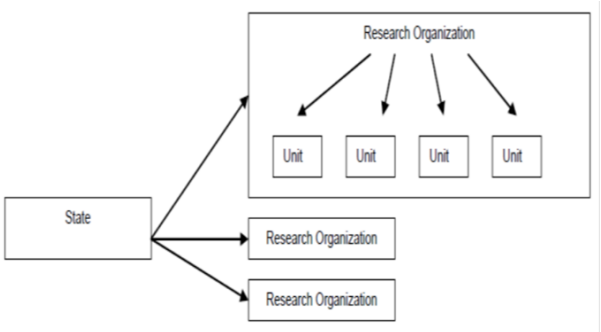
TABLE 1 STRENGTHS AND LIMIATIONS OF FUNDING MODES

| Mode | Sub-category | Strengths/ advantages | Weaknesses/ limitations |
|---|---|---|---|
| *Core funding* | *Formula-based* | Normalise for size of institutions<br>Relatively easy to administer (but requires credible institutional data) | Preserves the status quo (does not reward excellence or innovation) |
| | *Performance-based* | Principle of fairness<br>Performance rewarded acts as incentive to improve performance | Requires additional administration on part of universities and responsible Ministry of Government Department |
| *Project funding* | *Direct* | Government can steer high-priority research directly | Non-transparent and may lead to preferential and biased funding (and forms of patronage) |
| | *Channelled through agent* | Principle of fairness<br>Principle of transparency | Administrative costs can become prohibitive<br>Danger of inefficient bureaucracy |

1. Core funding to public research organisations

In this mode, the state allocates a global budget to research organisations, such as universities or large public research organisations, for their normal functioning. Funding is attributed to ensure the existence of the organisation and, in principle, is not limited in time; also, it is usually left to the steering body of the organisation to decide how to allocate funds internally to individual units (earmarking might be present, but is typically limited to a low share of funding). Funding to HEIs is assumed by a single ministry at national level.

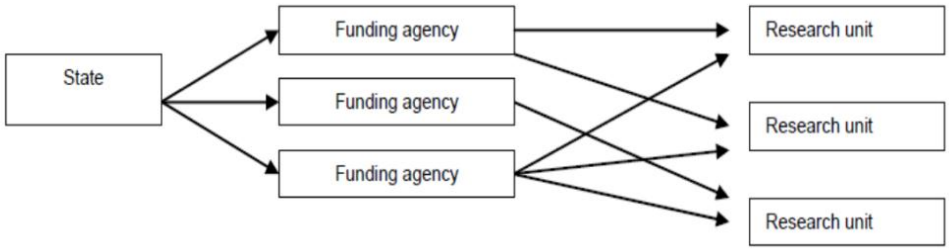
FIGURE 1 CORE FUNDING TO PUBLIC RESSEARCH ORGANISATIONS




2. Project (competitive) funding

In this mode, funding is allocated directly to a research group or an individual by a funding agency. Research projects are usually limited time and scope. The state controls the repartition of funds between agencies and instruments — the definition of the portfolio — and to some extent the allocation criteria, while it has little control on the selection of beneficiaries.

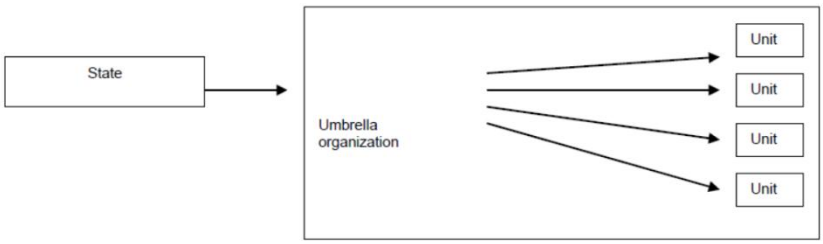
FIGURE 2 PROJECT FUNDING




3. Vertical integration

In this mode an umbrella organisation with a generic research mandate is delegated by the state and attributed a global budget which is then allocated to its internal units either as institutional funding or using competitive means. Funding is allocated either to academic-oriented organisations or Mission-oriented organisations focused on specific fields.

FIGURE 3 VERTICAL INTEGRATION




The groups described above are involved to a varying degree in priority setting and determining science policy. It is therefore imperative to explore the nature of the relationships between them and how this affects scientific outcomes. One of the most prominent theoretical approaches to studying the relationship between funding agencies and the state is that of principal-agent relations.

## PRINCIPAL AGENT THEORY

Principal-agent relations describe the relationship between two actors where the principal awards resources to the agent which the latter uses to attain the former's objectives. The principal therefore

depends on the agent as the principal cannot realise these objectives himself and therefore, with the transfer of resources, has the right to monitor the doings of the agent (Van der Meulen, 1998).

Science policies as principal-agent games are considered to follow a steering approach. This involves that institutional infrastructure and competencies of scientists be aligned with the objectives of the state. The dimension of steering refers to institutional infrastructure and competences, not to actors' behaviour. Steering always has a principal, the state, with its own aims who creates incentive structures for agents (Rip & Van der Meulen, 1996:347).

Principal-agent relations have four important and distinct features. Firstly, agents have their own professional objectives and interests. It is often the case that these intentions overlap or contend with those of the principal. Agents use the resources awarded by the principal to realise their own goals. This is often the rationale for agents to enter into this type of relationship with the principal. It is, however, the role of the funding agency to mediate possible conflicts between the principal and scientific community as the latter's first interest lies in looking after their own interests within the scientific system rather than aiming to please the funding agency (Van der Meulen, 1998:400).

Secondly, the principal does not possess the relevant and appropriate expertise to effectively obtain its objectives and therefore draws on the competence of the agent; "governments are considered to be incompetent to judge *ex ante* and *ex post* the value of scientific research" (Van der Meulen, 1998:400). To compensate, the principal (state or government) incorporates experts and outside advisors to aid them – often in the form of scientific advisory councils.

Thirdly, as previously mentioned, the principal has the right to monitor how the agent, or science council, allocates the principal's resources. This process, however, is costly and timely to the state as there exists little incentive for agents to self-report. There are two kinds of cost for the principal. First costs that are related to decision-making if policy-makers decide to use the directed mode of allocating funds. In this case they have to specify some goals and conditions that scientists have to respect if they want to obtain these funding resources. Second, if policy-makers decide to control what is done with their money they have monitoring-costs (Braun, 2003:311).

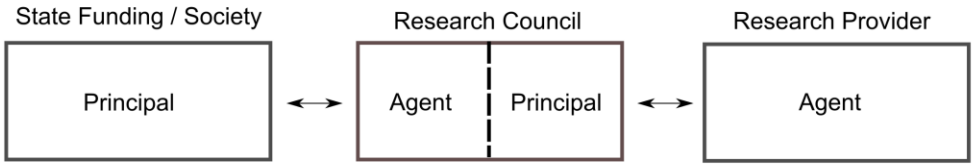
Fourthly, there needs to be reciprocal trust between the agent and principal. The fortification of trust between state and science council is very often neglected which compromises the stability of the relationship in the long-term (Van der Meulen, 1998:400). Van der Meulen (2003:333) provides us with four configurations of principal-agent relations:

> In the first, principals and agents have transferred critical resources to the intermediary, giving it the opportunity to take a strategic role. In the second

configuration, the principal has transferred funds and authority for a strategic role, but the agents have not, resulting in an intermediary identifying itself as an organisation of agents. If the agents transfer monitoring rights, but principals keep control over the actions of the intermediary, the intermediary is identified with the principal. In the last configuration, the intermediary gets sufficient resources for developing a strategy and is oriented on a third party.

The specific form of the configuration depends on the interests of the principal and those of the agent in the relationship as well as in their interest in having an intermediate body to mediate it. Such interest depend, among other things, on the possibilities of principals finding other agents, and of agents working for other principals, and on the possibilities for direct interactions between principals and agents and the existence of alternative, competing mediation structures (Van der Meulen, 2003:325). Figure 4 presents an illustration of principal-agent relationships:

FIGURE 4 ILLUSTRATION OF PRINCIPAL-AGENT RELATIONSHIPS




Research councils can be seen as a link in a chain of principal-agent relationships, with the government as principal to the research council, and the research council as principal to the scientists. A research council would be both agent (in relation to the government) and principal (in relation to the scientists) at once. In simple terms, research councils are positioned both as agents of state funders/societal interests (their task it to deliver the goods), and as principal with respect to individual research providers and scientists.

However, this neglects the specific feature of an intermediary body, in which the needs and interests it formulates towards the agent are actually someone else's interests, and, likewise, the performances of others. Within the tripartite configuration, the research council as intermediary body differs from the government as a principal and the research performing sector as agent, because its interest is defined in terms of the interests of the other two actors.

We can distinguish three sets of problems in science policy and funding procedures, in the various arenas, in a principal–agent analysis. The first are fundamental and long-term (the policy arena), the second occurs 'pre-contract' (the selection arena), while the third can be termed 'post-contract' (the control arena) (Gulbrandsen, 2005:200) (Klerkx & Leeuwis, 2008):

1. Goal conflicts:

The principal and the agents can have conflicting or only partly overlapping goals. A research council may require concrete economic and social benefits and a high degree of efficiency, while the scientists require autonomy and a stable and high level of funding.

2. Adverse selection:

As a result of information asymmetry, the principal does not have full information about the agents. This often requires the principal to rely on the agents' judgements when selecting the appropriate agent that is most likely to contribute to realising the objectives. A delegation and review process is necessary, which is also in the interests of the scientists as they use each other's results and need a process of quality assurance and control. This process does not come without costs, however.

3. Moral hazard:

The delegation gives the agent an incentive not only to carry out the required tasks, but also to act in unacceptable ways.

APPENDIX B

WORKSHOP REPORT

# SCIENCE GRANTING COUNCILS IN SUB-SAHARAN AFRICA:

# REGIONAL STUDY AND WORKSHOP

## *Workshop Report*

**26-27 November 2013**

**Lord Charles Hotel, Somerset West**

**SOUTH AFRICA**

## Introduction

The Centre for Research on Evaluation, Science and Technology (CREST) at Stellenbosch University has conducted a comprehensive research programme on science granting councils in sub-Saharan Africa. This project was commissioned by the International Development Research Centre (IDRC) in Nairobi. CREST, at Stellenbosch University, in partnership with the French *Institut de Recherche pour le Développement* (IRD), envisioned a study that will constitute the first comprehensive and in-depth analysis of the roles and functioning of science granting councils (or equivalent bodies) of 17 countries in sub-Saharan Africa. These countries include: South Africa, Namibia, Botswana, Zimbabwe, Mozambique, Zambia, Ethiopia, Tanzania, Uganda, Rwanda, Kenya, Nigeria, Ghana, Côte d'Ivoire, Cameroon, Burkina Faso and Senegal.

The study, which commenced in February 2013, culminated into an interactive workshop hosted by CREST at the Lord Charles Hotel in Somerset West on the 26th and 27th of November 2013 that hosted delegates from all over sub-Saharan Africa. The purpose of the workshop was to consolidate and finalise the results and recommendations that will be made to the IDRC. The workshop was very successful in identifying the primary opportunities and subsequent challenges for science funding bodies across sub-Saharan Africa. The workshop concluded with delegates' vision for the way forward in addition to strategies and plans to strengthen collaboration on the continent as well as platforms for sharing of knowledge and experiences.

The workshop welcomed the Vice-President of the Programme and Partnership Branch of the IDRC, Dr Stephan McGurk as well as his colleagues, Dr Ellie Osir and Mr Naser Faruqui. The workshop was also be attended by senior persons within the Science, Technology and Innovation landscapes of the 17 selected countries. The study will be completed in February 2014 with which CREST will present the challenges as well as good practices of funding for research, science and technology in sub-Saharan Africa.

## Administration of Workshop

The workshop was hosted at the Lord Charles Hotel in Somerset West which provided both the accommodation for all delegates as well as the conferencing facilities. 41 delegates were hosted at the workshop. Interpreters were used for the translating of English to French and vice versa to accommodate the French speaking delegates. Three members of the media, ResearchAfrica, as well as the South African correspondent of the University World News attended the events (c.f. appendixes B for the list of participants).

## CREST's progress

At the commencement of the workshop CREST had completed the following:

1. A review of the literature (February – April) – resulting in a separate literature study report
2. A desktop review of country science systems (February to May)
3. Country site visits (in all but three countries) (April – October)
4. Draft country reports compiled and circulated for comments to key readers
5. Discussion document drafted as background document to workshop (26 – 27 November)

The discussion document was circulated to all delegates prior their arrival in Somerset West as a background document to advise their presentations. On arrival each participant received all the draft country reports for their information as well as the subsequent validation of information collected. The country reports will subsequently, with the conclusion of the workshop, be distributed once more to all the attendees of the workshop to correct any errors in the reports.

### Workshop objectives

Given the Terms of Reference provided by the IDRC, the workshop set out to do the following:

1. To identify salient and common issues across the different science systems
2. To identify the main challenges that science funding councils in SSA face
3. To identify and share learnings and good practice in the management of science funding under different conditions
4. To discuss and reach agreement on the priorities for the way forward and possible follow-up activities/ projects

It was emphasised, during the planning meeting (10-12 April 2013) that the workshop should be an interactive process of which an outcome of the workshop should be to identify key areas in which the IDRC could assist funding councils ("How could IDRC help with development challenges in SSA?"). The IDRC therefore anticipated that the workshop will generate a number of issues, particularly new and innovative proposals, which the IDRC could support.

The following section provides a summary of the suggestions made and needs for intervention identified during the workshop.

### Suggestions and needs for intervention

It was suggested that the way forward following the workshop identified many issues that would not be possible to address in the current study, but would necessitate further projects. It was again highlighted during the workshop that the onus is not on the IDRC to determine the way forward, but rather that all the delegates should come up with the way forward with the IDRC facilitating this movement.

It was suggested that there is a need to look at the STI landscapes in SSA, to identify issues and trends that are not just descriptive, but will look at solutions. It was also suggested that there is a need for a

forum to promote the share of knowledge and experiences to promote interactive learning – an open space where people can share ideas, knowledge and lessons. There is also a need for policies and mechanisms to finance STI in addition to an ongoing need to strengthen national STI systems on the continent – Africa lacks behind in national innovation systems – or if it is there it is not really functional, important to take a close look at universities, private sectors, social actors as well as intermediaries.

It was emphasised that one cannot strengthen councils alone and neglect other actors in the system and that issue of understanding of supporting organisations is very important. A significant issue was raised with regards to the coordination of efforts to avoid duplication of efforts and look for synergies in the underway activities. The role of the private sector was also an important discussion point as many delegates made mention of the fact that understanding of linkages with the private sector needs attention.

There are many regional and sub-regional organisations that support research at national level and it is critical actors within STI understand exactly how they do their work and how the nationally based councils can collaborate with these organisations. This particular study focusses largely on a national level, but there is a need to look at other regional or sub regional organisations

The IDRC was interested in the comparison of similar studies concluded in South Asia and South East Asia, as well as the ongoing studies in Latin America, North Africa and the Middle East as well as the current study in SSA. These regional reports will ultimately be compiled into a book and circulated to all relevant actors to advise decision making on how to engage in the recommendations made in the specific regions.

Given that the workshop was conducted over two days, the programme of the workshop was very intensive (cf. Appendix A). Each delegate was asked to present a ten minute presentation on the challenges and opportunities their country/institution faces vis-a-vis funding for STI. The second day of the workshop allowed for participants to break into small groups and discuss the following three questions posed by the CREST and IDRC teams.

**Question 1**

*Given what you've learnt and heard, what are the areas for further analysis and research beyond this project, STI collaboration that you would like to see addressed? The presentations stated that there are many questions. Please contribute to a research agenda for further projects – priorities for further research in this area.*

- More detail is needed on the relationships between line ministries and the type of research they provide – mapping of funding – sources of funding and where it is going – interesting to have that in every country. Therefore a comprehensive mapping of the flows of funding (national, regional, international etc.)
- Audit of infrastructure to support science
- Contribution of research to development – impact studies
- Relationship between funding and research priorities

- Comparative studies on the impact of national and donor funded research

**Question 2**

*Issue of collaboration between science granting councils – at three levels. Greater need for collaboration within the countries. What would you put on the agenda for enhancing collaboration? And collaboration between national funding agencies and regional agencies as well as international agencies. How can that be managed and improved, what could help you, partnerships?*

- Coordination at a national level
- Understanding the flow of research funding, tracking and coordinating
- Identifying common priorities and themes at national levels
- Idea of a regional forum where colleagues could discuss issues of themes of common interest, formalising that and doing it regularly
- Focus on understanding information and data flows – specific, type of data is collected needs to be valid and useful
- Need a degree of consensus

**Question 3**

*What about the challenge of looking at funding agencies in SSA and other parts of the world. Similar studies in SEA and LAC, northern Africa. Body of knowledge being build, how does SGCs operate and how would you see SSA feeding into that growing network, how can be benefit and work from that?*

- Don't invent new structures. One needs ensure that we take opportunities to work through existing organisations, NEPAD etc.
- Opportunities to work with BRICS and emerging countries, the opportunities in councils in Africa to establish links with other parts of the world – knowledge to go the other way, contributing to think tanks across the world.
- Questions on how to leverage the opportunities

## The way forward for CREST

### Immediate follow-up

- Further work on the country reports
- Correction of factual errors and errors of interpretation
- Filling of gaps (from the PPT slides and any other documents/information you could provide to us)
- Further work on the final report
- The current report focussed on the following:
- The descriptive mapping of the science systems and the place and role of SGC's in these systems
- Developing and refining an emerging typology of types of granting bodies (in line with the theory in the field)
- Trends in STI policy development and institutional mandates in each country over the past 60 years
- Detailed descriptions of the SOP's of active SGC's (where available)

### Deepening the analysis

- Terminological clarification: meaning of words such as "council", "foundation", "commission" and "fund" require further clarification
- Core and periphery functions – and how the "classification of these functions" are related to issues of governance, history and the overall landscape of STI in a country
- Analyse more closely the relationship between thematic/sectoral funding arrangements and more comprehensive/ generic funding arrangements
- Analyse the relationship with regional funding/granting bodies: and again especially in thematic areas
- Differences in the way that science funding bodies are governed and operate are historically "determined". So we need to look more closely at the historical trajectories in different countries and how that continue to impact on SGC's
- Politics and science: A common theme - political commitment not translated into political action. In addition political vagaries impact directly on the science system and therefore also on the way in which science granting councils do their work
- The relationship between core funding and project/competitive funding of R&D is quite different across countries. In addition the issue of whether running costs are captured in R&D surveys). Similarly in a very fragmented system (with multiple principals) it is not always easy to capture in different line ministries

- We will analyse  all the “opportunities” and “challenges” that the individual presentations have identified and incorporate that in the final analysis
- We will also incorporate any further suggestions that you have made from the final session in our final report

## Conclusion

The completed workshop was very successful in that many suggestions for the way forward were raised. All 17 countries selected for the study was present and engaged in a meaningful and enlightened way. Issues that were not focussed on (as was the case in the regional studies in Asia) were that of addressing brain drain as well as the issue of open access. The opportunities for networking amongst delegates proved fruitful and allowed for the interaction of Anglophone and Francophone countries. CREST is hopeful that the final report will provide relevant and obtainable suggestions for the IDRCs cooperation in sub-Saharan Africa.

## Workshop Programme

| Tuesday 26th November 2013 | | | |
|---|---|---|---|
| **Session 1**<br>**9h00-10h30** | Welcome on behalf of Stellenbosch University<br>Overview of workshop, logistics etc. | Prof Johann Mouton (Stellenbosch) | Director: CREST |
| | Welcome on behalf of the IDRC | Dr Stephen McGurk (Ottawa) | Vice-President: Programme and Partnership Branch; IDRC |
| | General overview of the project by IDRC – aims and objectives of workshop. | Mr Naser Faruqui (Ottawa) | Director: Science and Innovation; IDRC |
| | Introduction of each participant | | |
| **10h30-11h00** | **TEA** | | |
| **Session 2**<br>**11h00-12h30** | A presentation on the main findings of the study followed by a general discussion | Prof Johann Mouton | Director: CREST |
| **12h30-13h30** | **LUNCH** | | |
| **Session 3**<br>**13h30-15h00** | 1st Plenary Session<br>1. Kenya<br>2. Tanzania<br>3. Rwanda<br>4. Ethiopia<br>5. Uganda | Prof Lucy Irungu (Kenya) | Deputy Vice-Chancellor (Research, Production and Extension); University of Nairobi |
| | | Dr Moses Rugutt (Kenya) | Deputy Director: National Council for Science, Technology & Innovation |
| | | Dr Nicholas Nyange (Tanzania) | Acting Director of Research Coordination and Promotion: COSTECH |
| | | Mr Vianney A.Kavutse (Rwanda) | Skills Development Analyst: National Science and Technology Commission |
| | | Prof Shibru Tedla (Ethiopia) | Executive Director: Ethiopian Academy of Sciences |
| | | Dr Paul Nampala (Uganda) | Grants manager: RUFORUM |
| | | Mr Edward Tujunirwe (Uganda) | Assistant Executive Secretary: Uganda National Council for Science and Technology |

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| **15h00 – 15h30** | **TEA** | | |
| **Session 4**<br>**15h30 – 16h45** | 2nd Plenary Session<br>1. Senegal<br>2. Cameroon<br>3. Côte d'Ivoire<br>4. Burkina Faso | Prof Amanita Sall Diallo (Senegal) | FIRST / Technical Committee for Research and Cooperation |
| | | Dr Likiby Boubakar (Cameroon) | Permanent Secretary: National Committee for Technology Development (CNDT); Ministry of Scientific Research and Innovation |
| | | Dr Yaya Sangare (Côte d'Ivoire) | Executive Secretary: PASRES |
| | | Dr Roger Nébié (Burkina Faso) | Director General: FONRID |
| **Session 5**<br>**17h00 – 18h00** | 3rd Plenary Session<br>1. Senegal<br>2. Cameroon<br>3. Côte d'Ivoire | Dr Pape Sall (Senegal) | Director General: FNRAA |
| | | Dr Anselme Kameni (Cameroon) | Director: Institute of Agricultural Research for Development (IRAD) |
| | | Mr Yao Léon Atsin (Côte d'Ivoire) | Deputy Executive Director: FIRCA |
| **19h00-** | Dinner at the Lord Charles Hotel: Hosted by Prof TE Cloete, Deputy-Vice-Chancellor: Research and Innovation, Stellenbosch University | | |

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| **Session 6**<br>**09h00 – 10h30** | **4th Plenary Session:**<br>1. Zambia<br>2. Botswana<br>3. Zimbabwe<br>4. Mozambique<br>5. Namibia | Dr Alfred J.Sumani (Zambia) | Acting Executive Secretary: National Science and Technology Council (NSTC) |
| | | Mr Oabona Monngakgotla (Botswana) | Chief Research Science and Technology Officer: Department of Research, Science and Technology; Ministry of Infrastructure, Science and Technology |
| | | Mr Willie Ganda (Zimbabwe) | Director Research Development and Innovation; Ministry of Higher & Tertiary Education, Science and Technology Development |
| | | Mrs Susan Muzite (Zimbabwe) | Executive Director: Research Council of Zimbabwe |
| | | Ms Dirce Manthenga Madeira (Mozambique) | Monitoring and Evaluation Department Coordinator, Fundo Nacional de Investigação |
| | | Mrs Thiru Swettenham (Namibia) | Programme Coordinator for Southern Africa Innovation Support Programme |
| **10h30 – 11h00** | **TEA** | | |
| **Session 7**<br>**11h00 – 12h45** | **5th Plenary Session**<br>1. South Africa<br>2. Nigeria<br>3. Ghana | Dr Aldo Stroebel (South Africa) | Executive Director: International Relations & Cooperation (IRC); NRF |
| | | Dr DM Ibrahim (Nigeria) | Director: Technology Promotion and Commercialisation Department; NOTAP |
| | | Prof William Siyanbola (Nigeria) | Centre for Energy Research and Development; Obafemi Awolowo University |
| | | Mr Evans Ankomah-Asare Takyi (Ghana) | Assistant Secretary: Coordinator Universities and Polytechnics; National Council for Tertiary Education |
| | | Dr George Essegbey (Ghana) | Director: CSIR-STEPRI |

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| **12h45 – 13h00** | Group photo | | |
| **13h00 – 14h00** | **LUNCH** | | |
| **Session 8**<br>**14h00 – 15h30** | Small group discussions and feedback | | |
| **15h30 – 16h00** | **TEA** | | |
| **Session 9**<br>**16h00 – 17h00** | **Conclusions, recommendations, the way forward**<br>Conclusions and recommendations | | |
| | IDRC response and the way forward | Dr Ellie Osir (Nairobi) | Senior Programme Specialist, Nairobi; IDRC |
| **19h00** | Dinner: Moyo, Spier Estate, Stellenbosch | | |

## Workshop Participants

| SCIENCE GRANTING COUNCILS IN SUB-SAHARAN AFRICA | | | | | |
|---|---|---|---|---|---|
| **Workshop participants** | | | **Position** | **Country** | **E-mail** |
| **Ankomah-Asare Takyi** | Evans | Mr | Assistant Secretary: Coordinator Universities and Polytechnics; National Council for Tertiary Education | Ghana | e.takyi@ncte.edu.gh |
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