SCIENCE GRANTING COUNCILS INITIATIVE IN SUB-SAHARAN AFRICA STRENGTHENING PARTNERSHIPS AMONG AFRICA'S SCIENCE GRANTING COUNCILS AND THE PRIVATE SECTOR

A BASELINE ASSESSMENT OF PUBLIC – PRIVATE PARTNERSHIPS IN RESEARCH AND SCIENTIFIC COOPERATION IN BOTSWANA

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Executive summary

STI in Botswana is coordinated under the Department of Research Science and Technology (DRST) within the Ministry of Tertiary Education, Research Science and Technology (MoTE). DRST was established in 2004 'to provide leadership in science and technology in Botswana through the provision of an enabling policy and legislation environment and coordination of science and technology activities in the country'. The DRST works towards globally competitive STI research for Botswana's development. STI in Botswana is guided by the National Policy on Research, Science, Technology and Innovation (2011). The NPRSTI is geared towards enhanced capacity for economic development through research, incorporation of indigenous knowledge in national Research and Development (R&D) agenda, innovation, application of STI for improved quality of life, and increased capacity in human resources for research and STI.

Botswana's public sector has collaborated with the private sector in infrastructure development but this practice does not seem to have extended to STI with only a few collaborations in existence. Botswana's small private sector and a lack of diversification with its overreliance on mineral resources is partly responsible.

Botswana has entered into collaboration with four (4) African countries with collaboration themes ranging from indigenous knowledge to ICTs and space science. It also appears that Botswana has - collaborated with South Africa and its institutions including universities and research institutions on a wide variety of projects, most of which are currently ongoing. Other national STI promotion activities and economic diversification efforts include the establishment of innovation and diamond hubs. This is a key step in not only promoting innovation in Botswana but also creating platforms for collaboration, technology transfer and knowledge exchange.

One main constraining factor to collaboration with the private sector, other players and other Science Granting Councils (SGCs) is that a ministerial department, DRST, currently coordinates STI as the country awaits the formation of an appropriate, a semi-autonomous entity directed to advise government and coordinate STI. Its establishment will foster greater collaboration with the private sector and other science granting councils. Whilst it is imported that Botswana speedily sets up and operationalize the Research Coordinating Council and the National Research Fund, focus is also in establishing recommended institutions under the National Policy on Research, Science, Technology and Innovation. Botswana initiated rationalization and reorganization of research and technology organization such as the formation of the Botswana Institute for Technology Research and Innovation, upgrading of College of Agriculture to a fully-fledged university of agriculture and natural resources and the building of an engineering science and technology university. .

1. Introduction and objectives of the baseline survey

Botswana, located in Southern Africa, has made progressive steps in developing a national system that supports and benefits from STI (science, technology and innovation). This has been achieved through enacting laws and policies, setting up institutions on STI, funding research in Botswana and fostering collaboration with both public and private sector players locally and internationally. This baseline study, looking at the state of PPP (public-private partnership) collaborations in promoting and using STI, is conducted under Theme 3 of the Science Granting Councils Initiative (SGCI) on strengthening the capacity of Science Granting Councils (SGCs) to promote scientific cooperation with each other and with other science system actors, and to foster public-private research collaboration and exchange of knowledge. The SGCI seeks to strengthen capacities of SGCs in order to support research and evidence-based policies that will contribute to economic and social development.

The objectives of this study are to:

i. Examine factors that constrain/facilitate public-private partnerships (PPPs) and international scientific cooperation and collaboration among Councils.
ii. Identify capacity and skill set gaps among the Councils in terms of designing, regulating, managing and providing quality assurance to PPP and cooperation projects.
iii. Examine the legal, legislative, policy and institutional frameworks that underpin PPPs and cooperation projects.

In the context of this baseline study PPP refers to a publicly-funded research collaboration among research and higher education organizations, such as universities, public funding agencies, such as SGCs and industry or private sector actors within a particular national context. On the other hand international collaborations of an SGC refers to a research partnership agreement that an SGC under study has formally established or started negotiations with other SGCs or international actors at the time of this study.

2. Methodology

This baseline study has been undertaken via a desktop study as one of four 'light studies' undertaken under Theme 3. Input in terms of existing collaboration was also received from the Botswana Department of Research Science and Technology (DRST). This report is expected to inform on the current status and hopefully spur Botswana to increase its collaboration and in making progress towards meeting its STI targets.

3. State of collaborations in Botswana

3.1 Overview

STI in Botswana is coordinated under the Department of Research Science and Technology (DRST) within the Ministry of Tertiary Education, Research Science and Technology (MoTE). DRST was established in 2004 'to provide leadership in science and technology in Botswana through the provision of an enabling policy and legislation environment and coordination of science and technology activities in the country'. The DRST works towards globally competitive research STI for Botswana's development. Other STI players in Botswana include the Botswana Institute for Technology Research and Innovation (BITRI), Botswana Vaccine Institute, National Food Technology Research Centre, Botswana Innovation Hub, Botswana International University of Science and Technology, University of Botswana, Botswana University of

Agriculture and Natural Resources, Botswana Academy of Science, Department of Agricultural Research and the Botswana National Association of Scientists and Technologists (BNAST).

3.2 State of PPP collaborations

The Botswana government has extensively collaborated with the private sector in infrastructure development (Rao and Vokolkova, 2016) but that line of collaboration does not seem to extend to other sectors (e.g. Research with a few exceptions). This can be explained by Botswana's small private sector and a lack of diversification with its overreliance on mineral resources. Some of the PPP research collaborations in Botswana are given by Table 1 below.

Table 1: Highlights of PPP research collaborations in Botswana

	Project Name	Partner	Year(s)	Theme	Outputs	Notes
1	Secure the Future (STF)	Bristol-Meyers Squibb Harvard Aids Institute	March 1999	HIV/AIDS research to prevent transmission, reduce impact and increase access to treatment		The initiative worth USD 100 million involved other Southern African countries (Namibia, South Africa, Lesotho and Swaziland
2	International AIDS Vaccine Initiative (IAVI) Southern African Program	International AIDS Vaccine Initiative (IAVI)		Development of a vaccine to prevent HIV infection and AIDS,		
3	African Comprehensive HIV/AIDS Partnership (ACHAP)	The Merck Company Foundation/Merck & Company Bill and Melinda Gates Foundation,	2000	HIV/AIDS anti-retroviral treatment		

3.3 State of collaboration with other SGCs

Botswana has entered into collaboration with at least four (4) African countries with collaboration themes ranging from indigenous knowledge, to ICTs and space science, according to data we can be able to gather online (See Table 2). It also appears that Botswana has heavily collaborated with South Africa and its institutions including universities and research institutions on a wide variety of projects most of them currently ongoing as shown in the table below.

Table 2: Highlights of international collaborations of Botswana.

Country	Collaborating Institution	Year (s)	Theme (s)	Output (s)	Notes
South Africa			Indigenous Knowledge Systems, mechanisms for IPR protection, human		There is an MoU in existence with a Joint Committee in

			capital development & high performance computing, public understanding of S & T, development & management of Science Centres Research Fund Management _ fund raising & fund management Resource Mobilisation and multi-lateral funding		charge of implementation
Mozambique		21 July 2011	**Science and Technology:** ICTs, scientific research and innovation, technological development, development of human resources, exchange of experts in S&T and technology transfer through joint seminars, workshops and research projects, cooperation between institutions and information exchange		An action plan between the two countries was agreed on. This collaboration is currently dormant
Zambia			Exchange of scientists, research workers, technical experts and scholars; the exchange of scientific and technological information and publications; organization of bilateral scientific and technological and technological seminars, symposia, conferences and		An MoU will be signed

			workshops in areas of mutual interest; joint identification of scientific and technological priority fields; formulation and implementation of joint research programmes; technological and capacity building initiatives on STI, as well as facilitation of technological transfer management; application of the research results		
Kenya			Public Works (MIST) Information Communication Technology (MOPAPA) Education, Science and Technology (MoTERST) Energy (MMEWR)		MoU (Implementation of Action Items). This collaboration is currently dormant
Kenya		**4 Nov 2011**	**Cooperation in Education, Science and Technology** through developing a legal framework for consultations and cooperation Under education: the establishment and development of direct relations between universities and mid-level institutions of higher learning in both countries and the sharing of expertise in training mathematics and science teachers. Under Science and Technology:		

			exchange of scientists, research workers and technical experts		
India		17 June 2010	**Science and Technology** through the exchange of scientists, information and joint formulation and implementation of R&D programmes, seminars and joint research projects		
China		1 Dec 2011	**Science and Technology** through formulation and implementation of major S&T plans and programs, design and plan of high-tech parks, ICTs, water technology, food technology, indigenous knowledge systems, environment technology		
South Africa	CSIR, MINTEK, NORTH SAFETY/ARMSCOR (South Africa) BIH, BITRI, BUIST (Botswana)		**Technology and Innovation Development:** Information & staff exchange, exchange of experiences and information on technology development, workshop on advance tooling manufacturing & technology stations establishment, funding and commercialization, capacity building, joint technology development and joint research	Technology Stations/Platforms established	Ongoing collaboration

South Africa	CSIR (SA) BIH, BIUST, UB, DTPS (Botswana)		**ICT R&D and Infrastructure:** Workshop with the Meraka Institute at the CSIR and development of a plan of cooperation, National stakeholder HPC Systems Administration Workshop held at UB, Rollout of a SKA/AVN Newton Fund Computing Cluster in Botswana, Capacity building, Joint research, Information & staff exchange, Consultation workshop on IKS recordal system	TV White Spaces used for broadband communication , HPC Capacity and Infrastructure	Ongoing collaboration
South Africa	HSRC, South African National Accreditation Society SANAS, CSIR NFTRC, BNVL, BIH, DAR, (Botswana)		**Biotechnology and Indigenous Technologies**: Staff and students exchange, Capacity building, Laboratory accreditation, Joint Research, Consultation workshop on IKS recordal	1.Laboratory Capacities developed and standardized 2.Improved disease control 3.Botswana National Recordal System for IKS established	Ongoing collaboration
South Africa	North West University NFTRC, BNVL		**Food Security:** Agro-processing, Capacity building, Joint Research projects, Information and Staff Exchange, Sharing of Facilities	1.Value Chains for selected indigenous food products developed. 2. Quality Assurance and Compliance to International Standards Achieved. 3. MSc Programmes in Food Science established	Ongoing collaboration
South Africa	KwaZulu Natal BNVL (Botswana)		**Veterinary Services:** Animal Disease and Control, Capacity building, Staff and	1.Disease Control Improved 2.Fast-track	Ongoing collaboration

			Student Exchange, Workshop to synergize Biosafety policies, Residue monitoring in animal products and food of non-animal origin, R&D capacity building, Strategic partnership alliances on vaccine research and development	(rapid) Molecular diagnostic techniques established	
South Africa	Academy of Science of South Africa (ASSAf) BITRI, Botswana Academy of Science, BIUST		**Science Engagement:** Participation in the annual Science, Engineering and Technology weeks, Capacity Building for Science Communicators, Joint Research, Information and Staff Exchange, Learner/Educator Human Capital Development		Ongoing collaboration
South Africa	SKA, Newtown Fund BIUST		**Space Science and Astronomy**: Finalization of the Space Science Strategy, Finalization of the MoU on Earth Observation, Capacity Building, Joint Research, Information and Staff Exchange, Industrial Development (EO), Submit proposal for funding for AVN new-build programme to ARF-DIRCO fund, Provision of a miniature telescope for Capacity Building at UB and BIUST	1. Botswana National Space Science Strategy developed 2. Botswana New-Build AVN Telescope 3.Post Graduate Programme in Space Science established	MoU to be signed
South Africa	University of Johannesburg		**Energy:** Public Understanding of renewable energy,	1.Joint Collaboration research on	

	, UNISA, SANEDI BITRI, UB, BIUST		Participation in the Energy Workshop, Capacity Building, Joint Research, Information and Staff Exchange	solar, biofuels and clean coal established	

4. Factors constraining and enabling collaboration and knowledge transfer between SGCs

Botswana does not have a Science Granting Council (SGC) and the Department of Research Science and Technology (DRST) in the Ministry plays the facilitative role towards the SGC. The envisaged Botswana National Research, Development and Innovation Coordinating Council which shall be semi-autonomous is meant 'to advise the country's leadership and coordinate decision-making related to research, science, technology, and innovation'. This council is not yet in place but once established will become an apex body for STI in Botswana with relative autonomy to make decisions and implement its mandate (NPRSTI, 2012).

Botswana's pursuit to diversify her economy is propelled largely by the realization that dependence on minerals alone forms a narrow economic base. The diversification challenge has also been driven by issues of sustainable use of natural resources, especially that there is evidence of a decline in species, and land degradation. Therefore the drive to diversify economy through research science technology and innovation stands out as one priority area. The National Policy on Research Science Technology and Innovation (2011) policy objective 4.4.5 (RSTI 2011) is bold on importance of collaborations;

"…to promote the establishment of collaborations, partnerships and linkages among stakeholders, private sector and international science, research and development community"

As a consequence the establishment of institutions such as: Hubs (Innovation Hub and Diamond Hub), Centers of Specialization (National Food Technology Research Centre, Botswana Vaccine Institute, Agricultural Research, Botswana Institute for Technology Research and Innovation), Specialized Universities (Botswana International University of Science and Technology, and Botswana University of Agriculture and Natural Resources) lead in the pursuit to diversify economy through research and development that leads to increased diversification.

In a self-administered SWOT analysis, Botswana outlines among its strengths as having the highest number of scientific publications per capita in Africa, a good investment climate and well-established communications infrastructure (NPRSTI, 2011). These are seen as enablers for collaboration with other SGCs. Its weaknesses include low innovative capability, low research collaborations and failure to utilize indigenous knowledge. Identified opportunities include capacity building on STI, adherence to local, regional and international IP laws and the presence of the hubs and centers of specialization. Threats include overreliance on state funding for STI, low participation by private sector and lack of proper monitoring and evaluation. (UNESCO, Namibia GO-Spin Profile)

4.1 SGC related policy frameworks

Botswana currently has a National Policy on Research, Science, Technology and Innovation (NPRSTI 2011). The NPRSTI is geared towards enhanced capacity for economic development through research, incorporation on indigenous knowledge in national R&D agenda, innovation, application of STI for improved quality of life; and increased capacity in human resources for research, science, technology & innovation.

The policy prioritizes the establishment of the following:

1) Botswana National Research Development and Innovation Coordinating Council;
2) Parliamentary Committee on Research, Development and Innovation;
3) Directorate on Research, Science and Technology;
4) National Research Fund; and
5) Botswana Research Centers of Excellence.

All but one priority (Botswana Research Centers of Excellence) has witnessed significant and remarkable progress through reorganization and alignment of institutions. However, plans are underway for establishing a National Research Fund. The Department of Research, Science and Technology is playing an active and pivotal role in the realization of the above milestones. Once established, the Botswana National Research Development and Innovation Coordinating Council would be the STI coordinating agency in Botswana. It must be noted that in the interim, the Ministry of Tertiary Education Research Science and Technology has established an RSTI advisory committee to the minister responsible. The Advisory Committee performs some of the functions envisaged upon the commissioning of the substantive council. The Botswana National Research Development and Innovation Coordinating Council would be responsible for advising government on STI, steering the national STI agenda and implementing the NPRSTI, determining national R&D priorities, devising a funding strategy for research and development and monitoring and evaluation of research projects.

The National Research Fund on its part will be responsible for funding research that aligns with national priorities to researchers in both the public and private sector. It is envisaged that such a fund would be led by a board managed by the Botswana National Research, Development and Innovation Coordinating Council. Alongside the Research Fund, Ministry of Tertiary Education Research Science and Technology (MoTE) finalized the formalities of establishing Innovation Fund in 2018. It is expected the fund will be operational in the current year.

4.2 SGC capacities and capabilities

In its economic blueprint Botswana states that it is targeting at the development of human resources to enhance its competitive edge (Vision 2036) and set up the Human Resource Development Advisory Council in 2009 with the mandate of steering this process. The Human Resource Development Council is fully functional and one of its achievement to date is the determination of sector committees with a view to address human resource development needs based on sector needs. The sectors include agriculture, research science and Technology, Health to mention but a few.

In 2012, the Botswana International University of Science and Technology officially opened, admitting an initial batch of 267 students. The University was created by an act of parliament in 2006 to train globally competitive students on STI.

4.3 External policy and legal frameworks

Botswana has an Industrial Property Act enacted in 2010 and Copyright and Neighboring Rights Act. It provides for 'the protection of new, industrial applicable solutions to problems in any field of technology that involve inventive steps' and 'the protection of utility models, industrial designs, layout circuits of integrated circuits, traditional knowledge and handicrafts'. Copyrights and Neighboring Rights Act copyrights and other related aspects to literary and artistic expressions.

Botswana is also party to other regional and international IP frameworks. These include TRIPS, the Patent Cooperation Treaty, the World Intellectual Property Organization, the Paris Convention for the Protection of Industrial Property, Protocol Relating to the Madrid Agreement Concerning the International Registration of Marks and the African Regional Industrial Property Organization (ARIPO) and its protocols (the Harare Protocol on Patents and Industrial Designs, Banjul Protocol on Marks and Swakopmund Protocol on the Protection of Traditional Knowledge and Expressions of Folklore).

5. Recommendations for SGC

It is recommended that Botswana goes ahead with setting up the institutions envisaged in the National Policy on Research, Science, Technology and Innovation (NPRSTI) especially the Botswana National Research Development and Innovation Coordinating Council and the National Research Fund whose role is pivotal in guiding the STI sector in Botswana.

It is also imperative that Botswana looks to the private sector for partnerships on STI given its success with PPPs on infrastructural projects. Effectively knowledge and experience from the transport sector may well inform how best they can move the agenda forward.

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