



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 GHANA

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Executive summary

This baseline study sought to examine the factors that either constrain or facilitate public-private sector partnerships (PPPs) and knowledge transfer and scientific cooperation; identify capacity and skill set gaps for designing, regulating, managing and providing quality assurance to PPP and cooperation projects; and examine the legal, legislative, policy and institutional frameworks that underpin PPP projects in Ghana. The study adopted mixed-methodological approach in data collection and innovation systems framework for analyses. The findings show that the Directorate of Science and Technology (DST) in the Ministry of Environment, Science, Technology and Innovation (MESTI) is working to establish a Science, Technology and Innovation (STI) Fund by mid-2018. This will be the statutory agency responsible for funding research and development as well as innovations and PPP collaborations. It also plans to establish a Framework for commercialization of research outputs in the country by establishing a Technology Commercialization Unit (TCU) and develop an MIS system for management of research activities and funding.

Following a worldbank-supported project, the Ministry has accumulated relevant experience in facilitating public – private partnerships in research and innovation through the establishment of five (5) Technology Development and Transfer Centers (TDTC) in various universities and R & D institutions. MESTI currently has a bilateral cooperation with South Africa. While these have created opportunities for capacity building and experience, Ghana still faces challenges in technology transfer and knowledge exchange with the private sector including: Lack of human capacity to facilitate and implement various key components of the projects that the Ministry engage in, conflicting roles of different departments of the SGCs, poor integration of TTCs in existing governance structures of institutions, challenge of ownership and buy-in by researchers, limited and erratic funding of TTCs activities at the institutional levels, and delays in technology research and development activities by grantees.

The study this recommends (i) the need for technical support and capacity building for MESTI staff in implementing PPP projects (ii) the need for further supporting the Ministry in its efforts at developing a Framework/masterplan for the establishment of the envisaged STI Research Fund, the Technology Commercialization Unit (TCU) as well as a Private sector Engagement Framework.

1. Introduction and objectives of the baseline survey

Public private partnerships (PPP) project was conceived as part of the agenda to strengthen the capacity of the Africa's Science Granting Councils (SGCs) to enhance the quality of scientific research and the translation of research results into material products and services through learning by doing. The project is targeted at strengthening the capacity of the SGCs to enhance collaboration between researchers and industry among African SGCs. This baseline study sought to examine the factors that either constrain or facilitate public-private sector partnerships (PPPs) and knowledge transfer and scientific cooperation; identify capacity and skill set gaps for designing, regulating, managing and providing quality assurance to PPP and cooperation projects; and examine the legal, legislative, policy and institutional frameworks that underpin PPP and cooperation projects in Ghana.

In particular, the survey was conducted to:

- i. identify the factors that constrain or promote public-private partnerships (PPP), scientific collaboration and knowledge transfer in Ghana
- ii. take inventory of the SGC's capacity needs and skills gaps for collaboration with other organizations, especially the SGC; and supporting research - productive sectors linkages
- iii. review the legal and policy frameworks and environment under which SGCs operate (institutional and national) in so far as support to PPP and CP is concerned

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

The study adopted the innovation systems framework in its analyses and employed a mix of quantitative and qualitative methods in data collection.

Key informant and in-depth interviews were conducted with senior staff at the S&T Directorate within MESTI who formed the primary respondents. The interviews were guided by an interview protocol/checklist. Additional interviews were conducted with the private sector and staff at selected R&D institutes who participated in the TDTC programme. Heads of departments or sections dealing with different issues relating to PPPs were targeted. In cases where such respondents were not accessed in time for the study, individual practitioners/private sector actors were interviewed. The third set of respondents composed of the researchers in universities and research institutes/organizations including the Council for Scientific and Industrial Research (CSIR), University of Ghana, Legon and the Science, Technology Policy Research Institute (STEPRI). The respondents herein were conveniently sampled but

only institutions that had engaged in PPP collaboration, whether contemporary or historical, were interviewed.

Besides the interviews, the study reviewed documents and policies for STI, relevant publications and reports (both published and grey literature), websites and other electronic resources. A critical review was conducted to determine the extent to which existing policies support or constrain scientific collaborations and public private partnerships. In the documentary review, the study focused on “what are the Councils saying about themselves” (their roles, mandates, performance) in relation to scientific collaborations and PPPs; and “what others are saying about them” (their roles and performance).

3. Status of partnerships and collaborations

3.1 Public – Private Partnerships (PPPs)

The research system in Ghana is mainly composed of government, research performing organizations, and intermediaries. The research – performing organizations consist of (i) thirteen institutes under the Council for Scientific and Industrial Research (CSIR), (ii) nine public universities, (iii) three government-based research entities (Cocoa Research Institute of Ghana [CRIG], Centre for Scientific Research into Plant Medicine [CSRPM] and Ghana Atomic Energy Commission [GAEC]) and (iv) two teaching hospitals (Korle Bu Teaching Hospital [KBTH] and Komfo Anokye Teaching Hospital [KATH]). This section looks at the state of the PPPs collaboration and knowledge transfer in Ghana.

Interviews with the Ministry of Environment, Science, Technology and Innovation (MESTI) revealed that from 2014-2016, the Ministry, with support from the World Bank, facilitated the establishment of five (5) Technology Development and Transfer Centers (TDTC) in various R & D institutions namely: (i) University of Ghana (ii) Ghana Telecom University College (Now Ghana Technology University College) (iii) Council for Scientific and Industrial Research (iv) Ghana Atomic Energy Commission and (v) Kumasi Polytechnic. The overall objective of the TDTCs is to foster new collaborations between supported R&D institutions and private sector for enhanced adoption and diffusion of technology. Specifically;

- To establish of institutional incentive schemes at 5 R&D organizations to better respond to technology demands from the private sector.
- To develop effective engagements between the private sector and the 5 R&D organizations.
- To build the capacity of the 5 organizations to develop, adopt and diffuse technologies to the private sectors.

As at the time of this baseline assessment (2017), the first phase of this programme had ended and following were some of the key highlights:

(1) The University of Ghana (UG)

The TDTC at the University of Ghana had engaged in the following PPP activities (i) establishing incentive grants - the Centre initiated an incentive packages consisting of grants for developing technologies and for training workshops, conferences, seminars on proposal writing, intellectual property rights,

innovation, technology transfer, entrepreneurship and other related training (ii) Capacity Building – the Centre organized 2 training programmes on Technology Commercialisation – (a) Virtual Classroom Lesson (TCVCL) co-hosted organized by the European Patent Academy and (b) a Training Workshop on Protection and Promotion of Patents, Utility Models, Industrial Designs, Trademarks and Geographical Indication delivered by Africa Regional Intellectual Property (ARIPO).

(2) The Council for Scientific and Industrial Research (CSIR)

Some of the key activities that have been undertaken by this center include (i) Awarding of Grants – eighteen grants were awarded to scientists within CSIR for technology development and transfer. Some of the technologies include Pozollana Cement Technology, Tilapia Farming Technology, Mushroom Technology, and Tomatoes Integrated Management (IPM) Technology (ii) Research-Industry Interaction Platform – in 2015, CSIR organized 4 Business Seminars thus creating an interactive platform for selected researchers and exporters in collaboration with Ghana Export Promotion Council & Interactions with Association of Ghana Industries (AGI) members. Key events at this business seminars were marketable technologies from the R&D organizations and funding opportunities from venture capitalists and other funders (iii) Capacity building workshops – training/capacity building workshops on topics such as collaboration agreements and technology licensing, technology dissemination and methodologies, technology marketing and technology partnerships, success factors for technology transfer.

(3) Ghana Atomic Energy Commission (GAEC)

GAEC awarded grants to researchers to further develop and transfer technology to industry. Some of these technologies included: (i) nutrient recovery from Solid Waste Management for Agricultural Soil Amendments (ii) Non Destructive Testing (NDT) and welding training (ii) and (iii) Geophysical technology transfer – a collaboration with Ghana Space Science and Geophysics department to set-up of geophysical survey at the Satellite Station at Kuntunse..

(4) Ghana Technology University College

GTUC set up the Technology Innovation and Research Center (TRIC) with some of the key activities including (i) Establishment of a Private Sector led Research Board (ii) Building the capacity of staff and lecturer-industry research teams - the Center organized a private sector oriented research seminar to build the capacity of faculty to develop research proposals. The Workshop aimed at providing the faculty members with the requisite skills to enable them to write good grant proposals to seek funding to support research activities at the University (iii) *Product Testing and Technology Transfer* - In 2014 TRIC selected 9 prototype technologies to be funded for product development, testing and technology transfer.

(5) Kumasi Technical University, Centre for Research & Development for Technology Incubation (CRDTI)

Kumasi Technical University restructured its Business Development Unit (BDU) and merged it with the newly created CDTI into a single strategic unit for private sector oriented research and products

transfer. Some of the key activities include (i) awarded grants to 9 researchers to develop and transfer their technologies such as (a) production of Standardized and Shelf-Stable “Sobolo” Beverage (b) Modification and Fabrication of an Improved Fish Smoker (c) Production of improved attrition Discs for Reducing Milling Related Metal Contamination in Processed Food (d) Production of a Stand-Alone Solar System for Small Businesses (e) Product and Process Enhancement for Soap and Detergent Production (f) Design and Development of an Electronic (No fuel) Automobile Magnetic Drive using a Four Stroke Engine and (g) Fuel oil production from mixed plastic waste in pyrolysis reactor.

3.2 Regional and International Collaborations

A study conducted by Owusu-Nimo and Boshoff (2017), which sought to determine the factors that influence research collaboration in Ghana, presented a number of reasons/incentives that make Ghanaian researchers collaborate with other researchers. Such incentives include the need to (i) enhance productivity, (ii) access to expertise, (iii) access to funds, (iv) the need for collective knowledge to tackle complex problems, and to (v) have access to the collaborators’ data equipment. The study established that within Ghana (71- 80%) of the respondents collaborated with other researchers in order to have access to their expertise, while (45-51%) collaborated with others to enhance their productivity. Further, the study showed that 46 % of the respondents who collaborated with international researchers did so in order to improve their chances of accessing funds; 42% did so in order to have access to the collaborators’ data equipment; while 41% collaborated with the international researchers due to the need for collective knowledge to tackle complex problems.

Further, a study titled, *“Challenges of Research Collaboration in Ghana’s Knowledge-based Economy”* conducted by Mensah, Enu-Kwesi, and Boohene (2017) also revealed that there are some factors that inhibit research collaboration in Ghana. This study sought to examine the challenges of research collaboration from the perspective of academic researchers who engage in research collaboration with knowledge users. On the basis of responses from 127 academics with collaborative research experience and 11 key informants, this study established that collective assets, such as lack of common values and trust, followed by structural and positional factors, such as limited funding and inadequate infrastructure, were key challenges of research collaboration

Through the Technology Transfer and Marketing Center (TTMC) at the Ghana Atomic Energy Commission (GAEC), the Ministry has bilateral agreements with other institutions. For instance, there is collaboration between South Africa (SKA) and Ghana (GAEC) to train and certify the trainees (participants). The training would be conducted regionally for artisans. Further, through the leadership of the Center, MoUs has been signed with Agona Swedru Municipality for the establishment of Gamma Irradiation facility and with Federation of Association of Ghanaian Exporter (FAGE) and Selasi foods to irradiating their food stuff for export. TTMC also currently manages a highly equipped GAEC Mechanical Engineering and thus has secured a contract of GHC 12 million from Ghana Oil Company Ltd (GOIL) for fabrication of fuel storage tanks which uses NDT technology.

Ghana also signed a Science and Technology Bilateral Agreement with South Africa on 3 September 2012 in Accra, Ghana. This S & T Bilateral agreement details out programmes and activities to be jointly implemented by the two parties aimed at strengthening research and development in the two countries. The Ministry of Environment, Science, Technology and Innovation of Ghana and the Department of Science and Technology (DST), South Africa, are leading the implementation of this agreement.

4. Factors constraining and enabling collaboration and knowledge transfer

The results of the interview conducted have shown that the main factors that are enabling collaboration and knowledge transfer between Ghana and RSA include (i) Funding/implementation of joint projects by R & D institutions of both Countries; (ii) Capacity building of staff the Ministry through study visits, exchange of information and participation in knowledge sharing conferences/workshops and conflicting roles and responsibilities.

Mobilization of funding by the Ministry to implement some of its joint projects with the DST is the main obstacle that constrains these collaborations. For instance, MESTI is currently funding research projects directly through budget allocations from the Ministry of Finance (MoF) directly to the R & D institutions. It only advocates, and where necessary, facilitates accessing of the funds from MoF.

Another obstacle to the collaborations and technology transfer between the two SGCs is lack of human capacity to facilitate and implement various key components of the projects that the SGCs engage in. For instance, MESTI has six staff managing collaborations with the SGCs and two staff managing collaborations between researchers and the private sector. This inadequate human capacity in key support systems such as procurement, financial management and M & E made the coordination of the Ghana Skills and Technology Development Project (GSTDP), a challenge. Further, this inadequate capacity hampered the implementation of key activities required administrative and operational assistance by the various departments.

A third key obstacle is the conflicting roles of different departments of the SGCs can be among the factors that constrain knowledge transfer and collaboration with other SGCs. For instance, when there are lack clear guidelines in the roles and responsibilities for implementation of an activity under the various departments and dockets.

From the interviews with key informants in the context of this assessment, it was established that other factors that either facilitate or hinder knowledge and technology transfer between SGCs and the private sector include (i) integration of TTCs in existing governance structures of institutions, (ii) challenge of ownership by researchers, (iii) limited sustainable funding of TTCs activities at the institutional levels, and (iii) delays in technology research and development activities by grantees.

4.1 Policy and legal frameworks

The ¹National Science, Technology and Innovation Policy (2010) provides that “the Government will adopt all necessary measures to consolidate and widen bilateral and multilateral programmes to the benefit of its science and technology plans, especially the flow of scientific and technological information in the national innovation system” (Republic of Ghana, 2010). It further states “Ministry of Environment Science Technology and Innovation will lead in engaging development partners and other international actors in the development of Ghana’s national innovation system”. Section 5.2 of the policy indicates that “the private sector will be encouraged to contribute to financing of STI application and development in Ghana through various schemes. A key strategy will be the initiation of Public-Private Partnerships (PPPs) in the application and development of STI”.

Ghana also has educational policies, such as Ghana has ICT Education policy, which supports and strengthens of training and research capacities. The main strategy for this thematic area is the development of ICT Human Resources & Enhancement of practical training in tertiary institutions and one of the main indicative activities is the implementation of a programme to promote research in Computer Science & ICT at the country’s tertiary institutions.

The Ministry is working to establish a Science, Technology and Innovation (STI) Fund by mid-2018. This will be the statutory agency responsible for funding research and development as well as innovations and PPP collaborations. It also plans to establish a Framework for commercialization of research outputs in the country by establishing a Technology Commercialization Unit (TCU) and develop an MIS system for management of research activities and funding.

5. Recommendations

From the forgoing, it is clear that Ghana have strong an enabling policies for technology transfer and international collaborations in the form of National Science, Technology and Innovation Policy (2010), which provides a road map on necessary measures for consolidating public-private partnerships. The main benefits derived from the promotion/facilitation of public – private partnerships in research and innovation is the strengthening of the capacities and incentives of selected research institutes, universities, and technology providers to develop, adapt and diffuse technologies to private sector enterprises on a demand-driven basis. In addition, the collaborations has helped the STI directorate and by extension, the Ministry to share knowledge on the expectations on the research institutions as well as bring key officers who handle technology transfer issues in the selected R & D institutions closer to the policy makers. Consequently, these officers have helped influence policy decisions especially on funding for research, technology transfer and commercialization activities. Further, through these

¹ The document is available at http://chet.org.za/manual/media/files/chet_hernana_docs/Ghana/National/Ghana%20S%20and%20T%20policy%202010.pdf

collaborations, Research Management division of the Ministry has enhanced its capacity on knowledge transfer, IPR issues, research management, profiling of technology, and technology transfer activities.

Moreover, through the PPP programme, the STI Directorate worked with the institutions to develop M & E framework and key indicators for technology transfer activities and impact.

The above success factors duly noted, it is important to recognize that the Ministry still faces a number of challenges:

- (1) **Capacity strengthening/technical support:** Even though key staff of the Directorate were trained both locally and internationally on mechanisms of research –industry collaborations, Intellectual property Rights and commercialization of research outputs as part of the World Bank – supported PPP projects, there still remains the need for technical support/capacity strengthening to MESTI in implementing PPP programmes targeting the commercialization of research outputs.
- (2) **Developing the Framework/Master plan for establishment and implementation of the envisaged Technology Commercialization Unit (TCU):** MESTI is in the process of instituting a TCU to guide and facilitate is private sector engagement agenda, support technology commercialization and guide its coordination functions.

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