

Political economy of the Rwandan Science Granting Council

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1. Introduction

The Republic of Rwanda is a densely-populated country in the central and eastern region of Africa. Formerly a colony of Belgium, Rwanda has experienced social upheavals since its independence in 1962. The major one is the civil war in 1994, which led to significant economic and infrastructure destruction. However, with a leadership of the Rwandan Patriotic Front (RPF), the country has achieved a remarkable economic growth in recent years. It has put in place major science and technology institutions with the objective of strengthening its educational and research capacity. An example is the National Commission for Science and Technology (NCST), first established in 2013 with a major mission of advising the Government on the policies, legislations and regulations of science, technology and research. Since 2015, NCST has been re-established with additional mandates, which include national research funding and management. Despite this as well as increasing efforts of improving research and educational infrastructure by the Government, Rwanda's research capacity remains limited. For example, Rwanda has only 12 researchers active in research and (experimental) development (R&D) per one million people in 2009 (World Bank, 2017). For Rwanda's research capacity to grow, the role of NCST is crucial. Yet, the NCST is new and has not yet started commissioning research as of early 2017. The major aim of this case study is to understand the political and economic constraints influencing the performance of NCST as well as research activities in Rwanda drawing on interviews of eight key informants (see Annex 1 for more information about the interviewees) and desk research.

The report is structured as follows. The preceding section sets the political, economic and science and technology context of Rwanda. Section 3 introduces the Research Granting Council (SGC) in Rwanda, including its research funding activities and policies that govern its activities. Section 4 and 5 highlight the political and economic constraints influencing the Science Granting Council, respectively. Finally, Section 6 closes the case study with a concluding remark.

2. Setting the context

2.1 Political overview of Rwanda

Before the 1900s, Rwanda was ruled by a centralized kingdom of kings through land, cattle and military chiefs, mainly from the Tutsi people. The first European influence in Rwanda occurred in 1885 when Rwanda was placed under German rule as part of German East Africa administration. Subsequently Rwanda became under the Belgian mandate in 1923 as part of Belgian Congo until it became independent in 1962. The Belgians ruled Rwanda indirectly, recognising local nobilities. Immediately after independence, Rwanda experienced increased tribal conflicts between ruling Hutu majorities (which were historically discriminated) and the newly discriminated and largely exiled Tutsis. The ethnic conflicts culminated in a civil war between the Rwandan Armed Forces (FAR) and the rebel Rwandan Patriotic Front (RPF), which led to a genocide that killed nearly a million Rwandans, mainly Tutsis and moderate Hutus, in 1994 (UNESCO, 2015; BTI, 2016).

The Rwandan Patriotic Front (RPF) won the civil war and subsequently formed a Government of National Unity (GNU) in 1994. Over the past two decades, Rwanda has achieved significant political stability and some level of political inclusivity. For example in the 2013 parliamentary elections, over 60% of the seats were taken by female candidates. The current Government, led by Paul Kagame since 2000, has undertaken major policy reforms, which led significant economic gains largely through donor support. However, it has also been criticised as putting nominal democratic institutions in which the role of civil society is stunted (Matfess, 2015; Reyntjens, 2015).

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2.2 Economic overview of Rwanda

Despite the social, economic and infrastructural destruction following the civil war in 1994, Rwanda has experienced a strong economic growth. The GDP, on average, has grown at 7.7% from 2000 to 2015 (see also Figure 1). The percentage of the population living on less than \$1.9 a day (estimated at 2011 international prices) has fallen from 77% in 2000 to 60% in 2013. There has also been rapid improvements in education, healthcare and other social services. For example, primary net enrolment rate (both sexes) has increased from 79% in 1999 to 96% in 2013. Despite this, Rwanda remains one of the poorest countries in the world with GDP per capita (current US\$) of 697 in 2015 (World Bank, 2017). With Human Development Index (HDI) value of 0.48, Rwanda is ranked 163 out of 188 countries and UN-recognized territories in 2014 (UNDP, 2015).

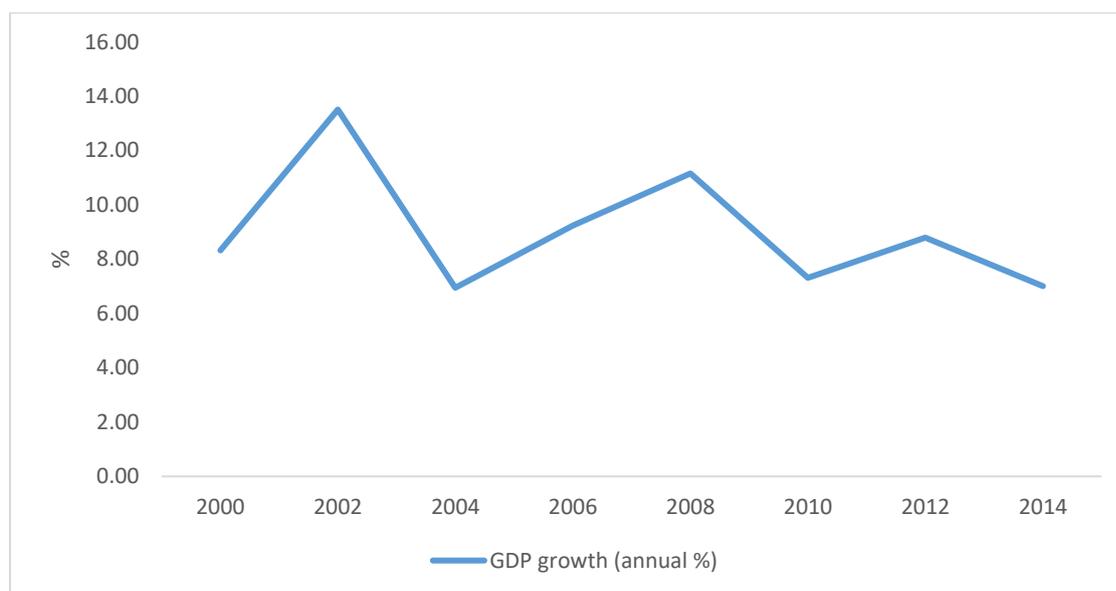


Figure 1: Rwanda's GDP growth trend, 2000-2014. Source: World Bank (2017).

Services and Agriculture are the most important economic sectors in Rwanda, contributing about 47% and 33% of the GDP as of 2015, respectively. In the same year, Industry and manufacturing contributed 14% and 4.8% of the GDP. Agriculture employs 80% the workforce. It also generates 63% of foreign exchange earnings and over 90% of food requirements. However, the agriculture sector is dominated by small-scale subsistence farming with serious challenges, such as population pressure, soil erosion, limited access to inputs and markets (Bizimana et al., 2012).

2.3 Science and Technology System overview of Rwanda

A recent study by the United Nations Educational, Scientific and Cultural Organization (UNESCO) (UNESCO, 2015) provides a detailed review of the science and technology as well as research and innovation landscape of Rwanda. Here I will only highlight the salient features of this system, especially the major science and technology research institutions, largely based on insights from key informants in Rwanda.

Although Rwanda's major policy framework on Science, Technology and Innovation mentions Rwanda to have a 'Minister with Responsibility for Science, Technology and Scientific Research' (Murenzi and Hughes, 2006:19), it does not have such institution as of early 2017. Instead, Government agencies, such as Ministry of Education (MINEDUC), coordinate science technology, innovation and research activities in Rwanda.

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MINEDUC has been responsible for backstopping the implementation of the National Science, Technology, and Innovation (STI) Policy. With support from donors, MINEDUC's Directorate of Science, Technology, and Research (DSTR) has been funding a number of research initiatives and facilities. This, for example, include the establishment of a tissue culture laboratory as well as a botanical garden for traditional healers. However, a major research project, which DSTR has been coordinating, is the Rwanda Innovation Endowment Fund (RIEF). RIEF is a pilot project launched in 2012 following the African Ministerial Conference on Science and Technology (AMCOST) in Cairo in November 2010. It was implemented by the Ministry of Education (MINEDUC) in partnership with United Nations Economic Commission for Africa (UNECA), Kigali Office. The major objectives of RIEF, among others, are to promote innovation within productive sectors and services, and to develop strategic technological innovations with high social and economic value. RIEF targeted mainly young graduates in Rwanda with skills and interest in entrepreneurship, innovation, and business. With funding from UNECA and the Rwandan Government, an awareness campaign was conducted in 30 districts of Rwanda in 2012. The advertisements led to 370 proposal submissions. Applications were evaluated with the help of technical committees, composed of DSTR staff and other professionals, appointed by the Education Minister. In May 2013, The Ministry of Education (MINEDUC) awarded eight successful applicants (around USD 50,000 each) under first phase RIEF project (RIEF-I). RIEF-I only selected projects in three priority areas of the National STI Policy: Agriculture, Information, Communication and Technology (ICT) and Manufacturing. Successful projects, among others, focused on production of potato flour and starch from locally produced potatoes, complimentary food production techniques for infants, and local chees promotion and packaging.

The Ministry of Education (MINEDUC) also carried out a second round of funding process, RIEF phase two (RIEF-II). The Funding criteria for the second round is extended to include the energy sector. Similar to RIEF phase I, the proposal submission entailed awareness campaign from October to November 2013, resulting in 299 proposal submissions. From these, only six projects were ultimately funded in February 2015. Some of the projects under the two phases are underway as of February 2017.

Other key science, technology, research and training institutions include: National Industrial Research and Development Agency (NIRDA), NCST, Rwanda Agriculture Board, University of Rwanda (UR), Rwanda Biomedical Centre and the African Institute for Mathematical Sciences (AIMS-Rwanda).

2.4 Science and Technology indicator overview of Rwanda

A recent UNESCO study (UNESCO, 2015) shows that Rwanda with the support of UNESCO had conducted series of R&D surveys from mid-1960s to mid-1990s. However, the country did not continue to carry out such surveys until recently. In 2007, the African Science, Technology and Innovation Indicators (ASTII) was launched following the endorsement of the need to compile R&D indicators in four sectors at the national level by a number of African counties (see NPCA, 2014, for details). While several African countries carried out ASTII surveys relatively earlier (e.g. Algeria, Angola, Burkina Faso, Cameroon, Egypt, Ethiopia), Rwanda embarked on a national survey in 2015 under the Directorate for Science, Technology and Research (DSTR) of the Ministry of Education (MINEDUC). At the time of the fieldwork of this study, the survey report was finalised. However, its official release is pending upon approval of relevant Government officials. Key informants indicated that the Gross Expenditure on Experimental Research and Development (GERD), excluding the private sector R&D investment, is about 0.17% of the Rwandan GDP in 2015, which is significantly lower than

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the 0.5% of GDP target set by the National Science, Technology and Innovation Policy (UNESCO, 2015; Murenzi and Hughes, 2006). Only few and fragmented R&D data are available for major sectors (i.e. public, business, higher education, and private non-profit) for recent years. A recent data on number of research personnel in Agriculture, reported in the Agricultural Science and Technology Indicators (ASTI) database, for example, shows that there are only 20 and 22 researchers with PhD Degrees employed in Government sectors in 2009 and 2011, respectively (see also UNESCO, 2015: 89 for a similar observation).

3. Science Granting Council (SGC) in Rwanda

NCST was established in 2013 under the Law N° 80/2013. It was mandated with, among others: (a) advising the Government on the policies, legislations and regulations of science, technology, research and innovation and monitoring the implementations of such policy frameworks; (b) to create partnerships with relevant institutions to advise the government on national human resource needs and development in the areas of science and technology, and (c) to undertake analysis of skills, resources and infrastructural needs to support science and technology in Rwanda. Through such mandates, it served as a semi-autonomous think tank in analysing skills gaps and development strategies and providing policy recommendations to the Government. NCST was active in skills assessments in the areas of energy, agriculture, and ICT. It also developed concept notes and proposals in priority sectors. An example is a grant proposal it developed in collaboration with the University of Rwanda (UR) and funded by the World Bank to establish a Centre of Excellence on Bio-medical Engineering.

NCST was re-established in 2016 by the Law N° 20/2016 with a modified mandate that includes managing a National Research Fund (NRF) and regulating research activities in Rwanda. The NRF is not essentially new. The Science, Technology and Innovation policy had proposed that the country allocates about 0.5% the total annual budget as NRF to be managed by NCST (Murenzi and Hughes, 2006). Rwanda was also among African countries that endorsed allocation of 1% of the national GDP to R&D in 2007 (UNESCO, 2015).

Therefore, in addition to their existing mandates, the following additional mandates were given to NCST: (a) advising the Government on setting national priorities on science, technology, research and innovation, and recommend on modalities of financing such priority areas; (b) identifying and promoting high-impact technology innovation and research areas; (c) regulating science, technology innovation and research; and (d) mobilizing funds for science and technology research. The new mandates have effectively conferred NCST a responsibility to be a Science Granting Council in Rwanda.

According to key informants in Rwanda, the new organisational structure of NCST is as follows (see Figure 1). The National Science and Technology Council, which is composed of the Minister of Education, Chief Executive Officer (CEO) of the Rwanda Development Board (RDB) and other key individuals from the public and the private sector report to the Office of the President (in the old mandate the Commission used to report to the Prime Minister). The Commission members on the other hand approve the agendas and decisions set by the Secretariat. A Director General, appointed by the President, manages the Secretariat's day-to-day activities. The Secretariat is composed of two departments: a department in charge of Science and Technology and Promotion, and another in charge of managing the (proposed) National Research Fund (NRF) scheme.

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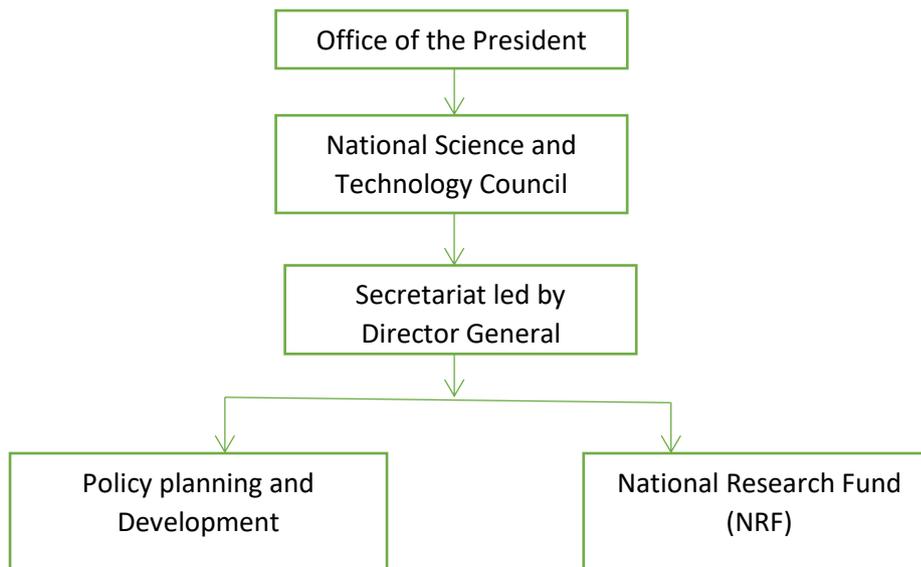


Figure 2 New organizational structure of NCST. Source: Key informant interview.

In early 2017, the Secretariat has 13 staff who will manage and facilitate research and research funding in accordance with the new mandate. An interviewee from NCST indicated that the Secretariat staff are capable of running and managing the new mandate with good understanding of science and technology policy issues as well as good project management skills.

3.1 Research funding activities of the Science Granting Council

As of early 2017, NCST has not mobilized, funded or regulated research in Rwanda. However, with the new mandate, it is being prepared to assume such responsibilities by developing manuals, frameworks, and strategic plans. These include:

- A National Innovation and Research Agenda. The agenda is not yet finalised at the time of the fieldwork of this report.
- An online data collection system through which call for proposals will be managed.
- A National Innovation, and Research Framework, which provides a guideline for managing the NRF. In Rwanda, there has not been a centralised research funding system. Sectors often set their agendas and manage their research activities. An example is the Rwanda Agriculture Board (RAB), which manages its own research centres and activities. Similarly, the Ministry of Education (MINEDUC) funds its postgraduate study projects. The Rwanda Biomedical Centre also manages health research activities. The new National, Innovation, and Research Framework provides a way of integrating, coordinating, monitoring and evaluating research activities across such sectors.
- Research Funding Manual, which provides selection criteria of funding applications.
- Revised Science, Technology, Innovation and Research Policy.¹ The policy has been developed and validated by stakeholder consultations. However, it is pending for a cabinet approval.

NCST Secretariat envisages to fund mainly basic research since applied research is taken care of by other funding institutions within sectors. For example, in the agriculture sector, the Rwanda

¹ The revised Science, Technology, Innovation and Research Policy refers to the revised form of the original STI policy of Rwanda that was developed in 2005 whereas the National Innovation and Research Agenda is a framework developed by NCST to guide its research funding priority.

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Agriculture Board (RAB) is funding applied research through funding obtained from both the Government and international donors. According to an interviewee from NCST, informal feedback to NCST suggests that researchers are struggling to find sufficient funding for basic research, especially in universities. NCST therefore aims to fill such gaps. However, research areas should be in line the priority areas of the Research and Development Agenda of NCST, which is under development at the time of fieldwork of this study.

The Ministry of Education (MINEDUC) has until early 2017 been coordinating and managing research activities in Rwanda at the national level. When the Commission is ready, there will be a transfer of all those mandates and on-going projects. This is expected to take place in July 2017. The Commission has already requested finances for NRF from the Ministry of Finance and Economic Planning (MINECOFIN) for the 2018 fiscal year. Major research funding projects, such as RIEF, currently under the Ministry of Education (MINEDUC) will also be transferred NCST.

3.2 Policies governing the Science Granting Council and R&D in Rwanda

Above, it is indicated that the Research Granting Council has not yet started funding activities as of February 2017. However, interviewees have largely indicated policy frameworks that influence the overall science, technology, and research landscape of Rwanda.

One of the major policy frameworks is the Rwanda Vision 2020 (Republic of Rwanda, n.d). The Vision 2020 sets an ambitious target of becoming a “prosperous knowledge-based, technology-led economy” by 2020. Science, Technology & Research are among crosscutting enabling pillars of achieving this vision².

Another major framework that directly governs STI activities in Rwanda is the Science, Technology and Innovation Policy, which was developed in 2005 through technical support from international organizations, such as UNESCO and the World Bank (UNESCO, 2015; Watkins and Verma, 2008). One of the major goals of the Science and Technology Policy was integrating “Science, Technology, Scientific Research, and Innovation in a framework that shall include capability building, technology transfer initiatives, and the promotion of innovation, in the context of the issues facing Rwanda.” It further stated that “Science, Technology and Scientific Research shall be catalyst to underpin all public and private sector activities to enable Rwanda’s Vision 2020 to be realised” (Murenzi and Hughes, 2006: 6). It also aimed at improving skills and knowledge among the population, enhancing opportunities for growth in rural areas, and integrating technical education with commerce, industry and the private sector in general. Human capability development is considered a key aspect of the specific policy objectives of the policy, which is founded on knowledge acquisition and deepening, knowledge creation, knowledge transfer and innovation culture (Murenzi and Hughes, 2006). The policy further aims at building bridges among training institutes, industry, commerce, and governance systems (UNESCO, 2015). Building on other major development policies, plans and strategies, the policy focuses on infrastructure upgrading, modernizations of key sectors and increasing overall economic efficiency (Murenzi and Hughes, 2006). In order to achieve its objectives, the STI policy has adopted major strategies. These include:

² The pillars of the Vision 2020 include reconstruction of the nation, efficient State, capable of uniting and mobilising its population, human resources development, town and country planning and development of basic infrastructures, development of entrepreneurship and the private sector, and modernisation of agriculture and animal Husbandry (Republic of Rwanda, n.d).

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- Employing a ‘national integrated innovation framework’ that emphasises the integration of Vision 2020 aspirations, human resource development and ICT. It also utilises a ‘cluster approach’ to national policy design and implementation and international partnerships.
- Undertaking reforms, which, among others, include designing ‘enabling legislations’ to encourage innovative activities, staffing each ministry with competent personnel in science and technology, empowering women, use of advanced information and communication systems in industry.
- Providing incentives that facilitate science and technology policy implementation. This includes science and technology prize to individuals that have made significant contributions in science and technology.
- Encouraging public-private-partnerships (PPPs) in R&D, and
- Establishing effective intellectual property (IPR) protection systems.

The Rwandan STI policy also highlights sectoral science and technology policies and strategies for education, health, agriculture and animal husbandry, biotechnology, environment, water sanitation, energy, transport, ICT, geo-information, tourism, industry and private sector. In April 2013, the Ministry of Education (MINEDUC) and its Directorate of Science, Technology, and Research in partnership with the United Nations Economic Commission for Africa (UNECA) initiated the revision of the National Science, Technology, and Innovation Policy. However, the newly revised policy framework is not yet approved by the Government.

Another framework mentioned by interviewees that govern the activities of NCST is the law that established NCST, since it articulates, mission, functions and mandates of the institution

A relevant policy, which is expected to have a key role, is the draft National Research Policy (RNRP). Falling within the Rwanda STI Policy, the framework’s mission is building “lasting foundations for a solid national capacity for scientific research and innovation, increase the performance, competitiveness and equity of Rwanda’s economic, social and cultural development’. It also aims addressing three of the major problems affecting research activities in Rwanda: lack of coordination, lack of skilled research personnel and lack of sufficient financial resources and funding for R&D (UNESCO, 2015:143/4).

3.3. Science Granting Council’s interactions with other actors

An interviewee from NCST indicated that NCST collaborates with nearly all public ministries, which have agendas in science and technology, in Rwanda under its old mandate. This was demonstrated by the fact that NCST is often invited in major workshops and project seminars in the country since science and technology are crosscutting issues. An interviewee from the National Industrial Research and Development Agency (NIRDA) also stated that participatory processes among stakeholders is among the preconditions to receive annual budget from the Government.

With regard to research funding, the newly established research Commission has not yet started partnerships. Instead, NCST is developing a Science, Technology, and Innovation Ecosystem framework, which guides how academia, Government, private sector and civil society can collaborate. As of February 2017, the framework has been finalised, and is expected to be validated following a stakeholder consultation workshop.

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When NCST practically launches its new mandate, it is expected that it will most closely collaborate with National Industrial Research and Development Agency (NIRDA), Capacity Building and Employment Services Board (CESB), Ministry of Education (MINEDUC), Ministry of Finance and Economic Planning (MINECOFIN), Rwanda Agricultural Board (RAB), Ministry of Infrastructure (MININFRA) and University of Rwanda (UoR).

4. Political (and social) constraints influencing R&D in Rwanda

Since the Science Granting Council in Rwanda is new and has not yet started funding research in accordance with its new mandate, most interviewees were rather asked to identify political constraints that influence R&D activities of universities, research centres, and other institutions in Rwanda. Nearly all interviewees stated that there is a strong political will and recognition of the role of science and technology in economic development in Rwanda. Six of the interviewees indicated that the Government does not interfere with research agenda setting and decision-making processes of research institutes in Rwanda. With respect to NCST, an interviewee from NCST stated that Research Granting Councils in the East African region “are ‘jealous’ of Rwanda” in terms of political commitment “because NCST directly reports to the Office of the President.”

The commitment of the government to science and technology and research more broadly was portrayed by the following three cases. First, an interviewee from the National Industrial Research and Development Agency (NIRDA) indicated that the Government has allocated 30 billion Rwandan Francs (RWF)³ for technology acquisition to NIRDA to establish local manufacturing industries in dairy, honey, banana, potato, and ceramics. Indeed the Rwandan Government wants each of its 30 districts to have one factory based on available raw materials, skills and other sets of competitive advantages by 2021. Second, Rwanda has adopted a university training system in which 80% of new undergraduate students are enrolled in Science, Technology, Engineering and Mathematics (STEM) fields. This is planned to be increased to 90% progressively. Third, the Government has shown a strong interest towards ICT and e-systems. A case in point is a laptop initiative for university students, which started in 2017, through a loan scheme facilitated by the Government. Despite the clear political will and enthusiasm for science, technology and research by the Government, interviewees have mentioned several constraint, which are grouped into five themes as follows.

4.1 High expectations of public officials

An interviewee from the National Industrial Research and Development Agency (NIRDA) mentioned that the problem might be the increase of expectations associated with the potential impacts of investing in science and technology due to the high enthusiasm of Government officials. He stated that “if you talk to the Ministry of Trade [and Industry of Rwanda], for example on the role of NIRDA, they will tell you that it is creating new industries and exporting more products. These are huge expectations that may lead to disappointments. Some of the politicians are not well aware of the research processes, including the associated uncertainty and risk of doing research and venturing into new markets.”

4.2 Aftermath effects of the civil war of the early 1990s

Loss of human resources and economic collapse, due to the genocide against the Tutsi population by members of the Hutu majority government in 1994, was mentioned to be responsible for the underdevelopment of research and experimental development (R&D) in Rwanda. An interviewee from

³ 1 US Dollar equals to 821 Rwandan Francs at the time of the fieldwork of this study.

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the Ministry of Education (MINEDUC) stated that rehabilitation of the Rwandan economy and educational and research infrastructure took significant time and resources.

4.3 Legacy of colonial education policies

A key informant from the Ministry of Education (MINEDUC) also reported that the persisting legacy and influence of colonial education policies and syllabus being responsible for lack of capable human resources to undertake R&D in Rwanda. The informant, for example, stated that Rwanda is often regarded as a small, land-locked, and resource-poor state in Africa, while its neighbours, such as the Democratic Republic of the Congo, are viewed to have significant mineral resources. However, there has been an increasing revelation that Rwanda also has some minerals. The major challenge is lack of trained workforce in the country to explore and mine such resources.

4.4 Absence of central research regulatory agency

Lack of an autonomous national institution that regulates research activities is mentioned as one of the challenges that contributes to research resource utilisation inefficiency in Rwanda. Key informants from the National Industrial Research and Development Agency (NIRDA) and the University of Rwanda (UR) reported that research is often duplicated, leading to resource wastage. They also reported that because of absence of central research regulatory agency, there is often lack of alignment between research activities and national development needs. However, this role will soon be taken care of by NCST under its new mandate.

5. Economic constraints influencing R&D in Rwanda

Here again, cognizant of the absence of a functioning Science Granting Council during the fieldwork of this study, most key informants were asked to provide insights into the economic constraints influencing research and development activities in Rwanda. This was assumed to reflect potential constraints that a functioning Science Granting Council might have faced in Rwanda. Interviewees identified the following three major economic constraints.

5.1 Insufficient financial resources

The most frequently mentioned economic challenge for scientific research in Rwanda is lack of sufficient financial resources for research activities. Interviewees from the University of Rwanda (UR), East African Science and Technology Commission (EASTECO) and Rwanda Environment and Climate Green Fund suggested that most of the research funding for universities and research centres is mobilized from donors, foreign universities and international research partners. Some of the research laboratories and research excellence centres are established through donor assistance. For example, the World Bank has supported the establishment of four Centres of Excellence at the University of Rwanda in the areas of energy, internet of things (IoT), innovation in teaching science and mathematics, and data sciences. Key informants indicated that donor dependency in many aspects of Rwandan development activities is a key challenge⁴. Realising this, the government has initiated the 'Agaciro' Fund Initiative in 2011, in which Rwandans voluntarily contribute to the development of their country more generally. Besides, because of financial limitations, priorities are set at the expense of other urgent and pressing challenges. For example, top on the Government's agenda, as of early 2017,

⁴ Despite donor's support, there is still a perception among some interviewees that donors' finance is generally tied to specific development challenges and financing research is not often their priority.

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is developing energy infrastructure while natural resource management and agriculture are equally viewed to be key areas for Rwanda's economic development.

5.2 Insufficient human resources and research infrastructure

Lack of sufficient trained human resources, laboratories and poor research facilities are also mentioned as major challenges of conducting high quality R&D in Rwanda. For example from the total of about 34 research staff of National Industrial Research and Development Agency (NIRDA), only four are PhD holders (and three of these PhDs are in administration) whereas the Rwanda Agriculture Board (RAB) only has 103 researchers and 86 technicians across 15 research centres as of 2017, of which only 20 are PhD holders. In order to meet human resource demand, RAB has to increase its PhD staff number by at least 60%. Similarly, only 19% of the 1481 University of Rwanda staff are PhD holders as of 2015, and most of them are over-burdened by teaching and management responsibilities (UNESCO, 2015). Such problems with human resources for research in Rwanda has also been corroborated by a recent report by Mouton et al. (2014:49) who have specifically stated that "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." Indeed lack of research facilities, such as modern laboratories, have been frequently cited as one of the major challenges hampering research in Rwanda by all interviewees.

5.3 Insufficient incentives for researchers

Incentives to do research and supervise postgraduate students are also viewed as unsatisfactory by PhD holders at universities. Besides conducting research is not mandatory and as such some lecturers look for other alternative ways of generating additional income. Due to such challenges, the average per capita research output is 0.08 papers per year at the University of Rwanda (UNESCO, 2015). However, interviewees indicated this level of achievement is not low compared to universities in the East African region. The University of Rwanda is ranked second (next to Makerere University) in its research performance among universities in East Africa.

6. Concluding remark

Triggered by longstanding ethnic animosity and state dictatorship, Rwanda suffered a major civil war in the early 1990s, resulting in the loss of nearly a million lives. This led to obliteration of Rwanda's economy and skilled human resource base. However, since the Rwandan Patriotic Front (RPF) assumed power in 1994, the country has achieved significant stability and economic transformation. This was achieved through major development policies and strategies, such as the Vision 2020, which envisions transforming Rwanda from an agrarian economy to a modern knowledge-based economy by 2020. The Government has identified that human resources development and promoting science, technology and innovation are key enablers of attaining the Vision 2020 development goals. It has also put in place science and technology institutions that encourage scientific research in the country. Yet, Rwanda's research intensity remains marginal. This case study has sought to explore the political (social) and economic constraints influencing the performance of science granting councils as well as research activities in Rwanda. The results show that there is an overall political will to support research in Rwanda. However, the aftermath effects of the genocide in 1994 and lack of autonomous national institution that regulates research activities have been mentioned as major challenges. Besides, lack of financial resources and skilled human resources, lack of sufficient and quality research facilities and

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logistics, such as modern laboratories, and limited research incentives are reported as major economic challenges constraining research activities in Rwanda.

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Annex 3

Annex 1

Interviewees
National Commission for Science and Technology (NCST) staff
National Industrial Research and Development Agency (NIRDA) staff
Lecturer and university management staff at the University of Rwanda (UR)
Ministry of Education (MINEDUC) staff
Ministry of Education (MINEDUC) staff
Rwanda Environment and Climate Green Fund (FONERWA) staff
Management staff at the Rwanda Agriculture Board (RAB)
Management staff at the East African Science and Technology Commission (EASTEKO)