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ETHIOPIA PE2 CASE STUDY - MAY 2020

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Updating the Case studies of the Political Economy of Science Granting Councils in Sub-Saharan Africa

National Case Study Report of

Ethiopia

Science Granting Council

To the International Development Research Centre (IDRC)

Science Policy Research Unit (SPRU), University of Sussex, United Kingdom

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1 Context of Ethiopia's STI System

Science, Technology and Innovation (STI) play a crucial role in national economic and social development. In an effort to strengthen STI in Ethiopia, the government has taken several measures over the last 10 years. These measures include increased funding, adoption of an STI policy and a strengthened STI governance institutional framework (TECHIN, 2019). The STI system in Ethiopia has evolved over the years as a result of various occurrences, as shown in Figure 1 below.

Figure 1: Timeline showing major historical milestones affecting the national STI system

In the 1990s, it was realized that STI could not be used as a tool for national development due to the absence of an STI policy and the unfavourable conditions for research and science and technology (S&T) management. Against this backdrop, the government commissioned the formulation of an S&T policy and the process was completed in 1993. Objectives articulated in the policy document include: ensure the efficiency of the national S&T activities and ensure they are directed towards national development; develop the national capacity for S&T to enable realization of the national socio-economic objectives; and, increase national awareness of S&T and improvement by knowledge and culture. The objectives of the

S&T policy were not fully realized due to political unrest from border conflicts (1998 to 2000) between Eritrea and Ethiopia. The S&T policy document was revised by the Ethiopian Science and Technology Agency (ESTA) formerly known as the Ethiopian Science and Technology Commission (ESTC). The review process was finalized in June 2006. The revised policy document had a new STI governance structure with the following functional levels: National STI Council; Technical Advisory Committee of the National STI Council; Ethiopian Science and Technology Agency; S&T operational Institutes and Centres (Mouton & Boshoff, 2006).

The main aim of this case study is to identify the different political, economic and social aspects affecting the performance of STI in Ethiopia. Key informants from different sectors were interviewed either via Skype/phone or in person (see the Annex for interview information). Additional information was also collected from secondary sources through literature review. This study was carried out between May and September 2019.

1.1 Contextual factors arising between 2017 and 2019

1.1.1 Political overview

In April 2018, Ethiopia elected a new Prime Minister, Dr. Abiy Ahmed Ali. His previous position as Ministry of Science and Technology in 2015 is said to ensure that STI continues to be advanced in the country.1 The country also benefits from having an inter-ministerial committee on STI issues (see below). Its STI policies also align with the Sustainable Development Goals.

1.1.2 Economic overview

The current population of Ethiopia is approximately 110,449,766 (Worldometers, 2019). In 2017/18, there was a decrease in economic growth due to political uncertainty, civil conflicts and changes in the political regime (AfDB, 2019). Currently, the government is implementing the second phase of the Growth and Transformation Plan (GTP II) 2019/2020. The plan targets an 11% GDP annual growth rate and transformation of Ethiopia into a manufacturing hub through expansion of physical infrastructure (World Bank, 2019). Manufacturing and industry sectors are expected to be the major contributors to this economic growth with the support of the education system in the provision of skilled professionals (Teferra et al., 2018)

According to the United Nations Industrial Development Organization (UNIDO), Ethiopia has the lowest level of income inequality in Africa. The rapid population growth and low starting base have been a major contributor towards the low poverty levels in Ethiopia. Recently, the country has experienced economic growth due to expansion in the agricultural and service sectors. A reduction in the national poverty level has been foreseen due to the increased economic growth (UNIDO, 2019).

Ethiopia experienced a decline in GDP growth rate in fiscal year 2017/2018 to 7.7%. This decline was attributed to a lag phase in industrial growth, increased prices of imported material and shortage in foreign exchange. Poor performance in manufacturing and agricultural sectors was also a contributing factor in the decreased GDP growth rate (World Bank, 2019). The country experienced a 10% decrease in exports during

[1] See: https://africanbusinessmagazine.com/region/horn-of-africa/the-dawn-of-ethiopian-tech/ (accessed 27/4/20)

this period, resulting from reduction in export of Ethiopia's major products: coffee, oilseeds and pulses. Agriculture remains a major contributor to GDP with a contribution of 37%. It is also the largest source of employment, employing 73% of the workforce (FAO, 2019). In addition, the service and industry sectors were major contributors to GDP growth, contributing 8.8% and 12.2% respectively (AfDB, 2019).

The government has made efforts to increase Ethiopia's exports through the leather and floriculture industries. However, leather sector performance has been on the decline in terms of production, employment and export volumes. This poor performance has been persistent despite the huge population of livestock herds, large labour force and government support. There have been attempts to address this challenge through policy interventions. However, such policy interventions have been unsuccessful in the creation of backward linkages to the livestock sector. Contributing factors to the sluggish performance of the leather industry include over-reliance on the road transport system, lack of diversification in tanneries and creation of a poor business environment for foreign investors due to fear of competition.

In contrast, the floriculture and horticulture sectors have experienced outstanding performance with an export value of USD 225 million in 2015/16. In addition, the sectors also attracted investments from Europe. They have also made major contributions to job creation with 50,000 and 130,000 people employed in floriculture and horticulture respectively. The high performance of the floriculture sector has earned Ethiopia a top five position in production and exportation of roses worldwide. Factors contributing to the success of both sectors include readily available affordable land, efficient air transportation, incentives, and accessible industrial financing (Oqubay, 2018).

1.1.3 Science and technology system overview

The most recent reforms made to the STI system in Ethiopia are the formation of the Ministry of Innovation and Technology (MInT) and the Ministry of Science and Higher Education (MoSHE) in October 2018. The Ministries are mandated to strengthen and orient activities in the national STI system of the key actors in the national innovation system. The MInT is divided into three parts. The first (responsible for the activities corresponding to a Science Granting Council, SGC) is the Innovation and Research Affairs wing. The other two wings are the productive improvement technologies sector and the ICT sector. There is also a science, technology and innovation policy directorate, which is a separate entity under MInT. MoSHE is responsible for universities, technical and vocational training centres, and the promotion of research centres of excellence and university-industry linkages (Gizaw, 2019).

The National Science, Technology and Innovation Policy remains the key policy document in the structuring of the national science and technology system. The main focus of the policy is the provision of strategies for the country based on its overview of the national science and technology landscape and the need for reinforcement of the linkages among the actors within the national innovation system. The national information and communication technology (ICT) policy also plays a crucial role in STI. The national research systems in agriculture and health are more advanced and well organized compared to other sectors within the economy. Research activities in agriculture are mostly focussed on crop, livestock, biotechnology, land, water, farm machinery, agricultural economics and climate. The research outputs are used to enable smallholder farmers to increase their produce though improved access to advanced technologies in agriculture. In the health sector, the focus areas are health and nutrition, modern medication and traditional drugs. Industrial research within the manufacturing sector remains low. Various industry development institutes have been established by the government for the purpose of capacity building and research development in industries. The government has also heavily invested in the establishment of

industrial parks to promote capacity in technology and innovation, resource mobilization and job creation. Ethiopia has made tremendous advances in research including vaccine transportation drones developed by the Ministry of Innovation and Technology, and water harvesting, mowing and grinding machines developed by Gondar and Bahir Dar universities. Despite these advancements, Ethiopia still lags in research and development (see below). More effort is needed to facilitate the shift from an agriculture-led economy to one led by industry (TECHIN, 2017).

As per the STI policy, the organizational structure of the National Science, Technology and Innovation System governance in Ethiopia has four functional levels:

i. National STI Council
ii. Technical Advisory Committee of the National STI Council
iii. Ethiopian Science and Technology Agency
iv. S&T operational Institutes and Centres

The National Science, Technology and Innovation Council (NSTIC) is the regulatory body for the STI policy and action plan in Ethiopia. It is mandated to establish and coordinate the general strategy and framework for the development of STI. The Prime minister is the core chair of the council and MInT is the secretary of the Council. The secretary of the Council nominates experts from S&T institutions/centres who are later appointed by the Council as NSTIC members. The Council monitors and evaluates the performance of STI activities.

The STI policy is under review by the Ministry of Innovation and Technology in collaboration with the United Nations Conference on Trade and Development (UNCTAD) (Tralac, 2019). The revised STI policy is aimed at transforming Ethiopia into a technology-led economy. It is hoped that the revised policy will help drive Ethiopia from "consumer" status into a manufacturing country. Revision of the policy was stimulated by a number of reasons from the previous version: non-compliance to economic reforms, misalignment with various sectors, and non-progression towards an industrial economy. Within the revised policy, science and technology are targeted to contribute USD 2 billion to GDP, create 20,000 technical jobs and 2000 SMEs. These targets are to be achieved within 2 years (Tralac, 2019).

In March 2019, a declaration on enabling an equitable research system in Ethiopia was launched by the Ethiopian Academy of Sciences (EAS) in collaboration with the International Network for the Availability of Scientific Publications (INASP). The declaration is aimed at creating a holistic, equitable and collaborative research system. It also aims at identifying the factors hindering the creation of an equitable system. The then Minister for Innovation and Technology emphasized the need for researchers to focus on research that addresses community issues. He also added that their research output should be shared widely for public input (EAS, 2019).

2 Challenges affecting the STI system

In the first Political Economy (PE1) Study, it was observed that Ethiopia's STI landscape was fragmented (Chataway et al., 2017; 2019). This was due to a number of issues highlighted in the PE1 study:

- Limited mandates and weak policy implementation
- Competing interests and weak collaboration between stakeholders
- Inappropriate funding mechanisms and significant bureaucracy
- Insufficient funding and/or incentives for researchers
- Limited human resources and infrastructure deficits

Several of these issues were raised in this follow up study during interviews conducted for fieldwork and from the literature review. These are discussed below.

2.1 Recap of STI system issues: Evolution of STI system 2017 to 2019

2.1.1 Fragmentation of the STI system

According to an informant in the MInT, there is weak coordination of research activities among institutions/organizations undertaking STI. This has led to duplication of research in universities. Respondents also pointed out the presence of a weak legal framework for technology transfer and lack of a formal innovation system in product and service sectors. It should be noted that the restructuring of the ministries and the creation of the MInT would question this. One informant, a researcher, pointed out that the limited involvement of the government, private sector and academia in STI has resulted in insufficient funding, and poorly qualified human resources. Academics have an understanding of STI but are not motivated to promote awareness of STI to the public.

On the policy front, an informant from a government STI organisation stated that the policies needed more work to ensure they adequately suited the needs of Ethiopia. Another informant from a local university also pointed out that the people involved in policy formulation and implementation lack expertise on policy issues. According to a researcher in one of Ethiopia's universities, policy formulation should be contextualized, and all the relevant stakeholders should be involved in the implementation process. In addition, he also pointed out that the frequent change of government officials in the institutions mandated to do policy formulations and implementation slows down the implementation process because the new officials need to familiarize themselves with the processes first. New government officials should be taken through rigorous capacity building and orientation before the previous officials leave office.

2.1.2 Limited capacity building, human resource and infrastructure

A university informant emphasized the need for capacity building in terms of training and infrastructure development in STI. This will increase expertise in STI and create a conducive environment for researchers. This will in turn lower the risk of researchers moving to other countries, thus reducing brain drain. This is in line with the response from a representative in the leather industry who mentioned that most inputs required for innovative activity – e.g. latex and equipment – are not locally available and have to be imported at a high cost. He also referred to high taxation fees and high transport cost due to the limited transport infrastructure. Furthermore, on capacity, it was pointed out that the majority of the personnel

working in STI are educated about theory but lack the technical skills to effectively execute their duties. There are very few highly skilled professionals in innovation studies. Nevertheless, a researcher in one of Ethiopia's universities pointed out that universities do not yet have courses that focus on training students on innovation.

According to the Higher Education Proclamation (2009), for academic staff to qualify for a promotion/salary increment, they are required to engage in research. This approach does not seem to be effective compared to incentives. Incentives could be more effective in encouraging researchers to produce high quality research output. The incentives should have a particular component that cushions researchers from economic pressures. This will reduce the need for researchers/academic staff to seek alternative sources of income (Woldegiyorgis, 2019). That said, there has been a national level reform process through adjustments to various policies. The government has implemented strategies towards the creation of research universities. For instance, in 2014, Adama University and the Addis Ababa University of Science and Technology were transformed into science and technology universities. These universities are central institutions to the national industrial strategy. Their main focus areas are applied research and technology transfer. Education Sector Development Programme (ESDP V's) targets to establish three research universities with 50% PhD-holders as staff and 20% postgraduate students. This is a clear indication of the increased experience and relevance of local STI institutions over the years (Tamrat, 2019).

However, the lack of experience and knowledge of university board members has been seen to be a contributing factor hindering university-industry relationships, resulting in the misalignment of research to the national agenda. Tamrat (2019) has put forward different strategies to address this issue including: capacity building and accountability requirement of board members; and the Ministry of Science and Technology should play an intermediary role between the board and government (Tamrat, 2019). Currently, Ethiopia has 50 public universities, 174 private institutions of higher learning, and 1547 TVET colleges (Gizaw, 2019).

2.1.3 Limited funding for implementing STI activities

There is a sense among respondents that insufficient funding for STI has also slowed down the implementation process of the STI policy. According to an informant from one of the universities, there is a lot of bureaucracy involved in accessing government funding for R&D. This discourages researchers from seeking government funding, opting instead for partnership-based funding from foreign universities/organizations. An informant from the public sector mentioned that private sector funding for R&D is continuously diminishing. The private sector is not familiar with the benefits of R&D and so does not see the value in investing in it. A private sector representative also pointed out that private sector priorities lie elsewhere and R&D is seen as a poor investment choice due to the long waiting period for output.

Despite increased investment and infrastructure for higher education, the research and innovation quality and quantity remains low compared to other African countries. Most universities allocate less than 2% of their annual a budget to research. This has a direct impact on the research output. During the 8th research week at Addis Ababa University, the Minister of Science and Higher Education, Prof. Hirut Woldemariam, outlined strategies taken to address this challenge. These strategies include holding various dialogues with the aim of improving allocation of resources and creating a conducive environment for research in public universities, restructuring of research at directorate level, and digital repository development. In accordance with the higher education proclamation, institutions of higher learning are mandated to have a fund for

research and innovation where research resources are mobilized and managed. Part of the funds can be used to provide incentives to researchers in alignment with the institution's quality assurance protocol (Woldegiyorgis, 2019).

2.1.4 Low technology transfer

A number of interviewees highlighted the difficulty of technology transfer; one even argued that local innovations are not supported. According to a representative from a government STI organisation, most of the machinery used in Ethiopian industries is imported and the human resources needed to operate it are also from outside the country. The interviewee went on to argue that this discourages local innovators from developing new innovations due to lack of market and capacity. The basic level of technology in the country has been attributed to lack of innovativeness, lack of a national technological infrastructure, limited access to finances and lack of technology market. However, this may be changing, given the MInT's mandate is focussed on supporting local innovations and technology development through a product and services engineering directorate, incubation centre development directorate, an incubator and a start-up strategy.

Technology transfer should be enhanced through importation of machinery from developed countries into lower developing countries. The machinery should be fabricated locally, and local human resources should be trained to use the machinery. This will narrow the wealth and technology gap and ensure sharing of knowledge and technical skills. Use of new technologies introduces techniques of production of cheaper goods, and accumulation of capital (TECHIN, 2019b). It was also recommended by an industry representative that the government should offer more scholarships to researchers and support innovators through provision of financing and establishment of more incubation centres.

3 Research funding

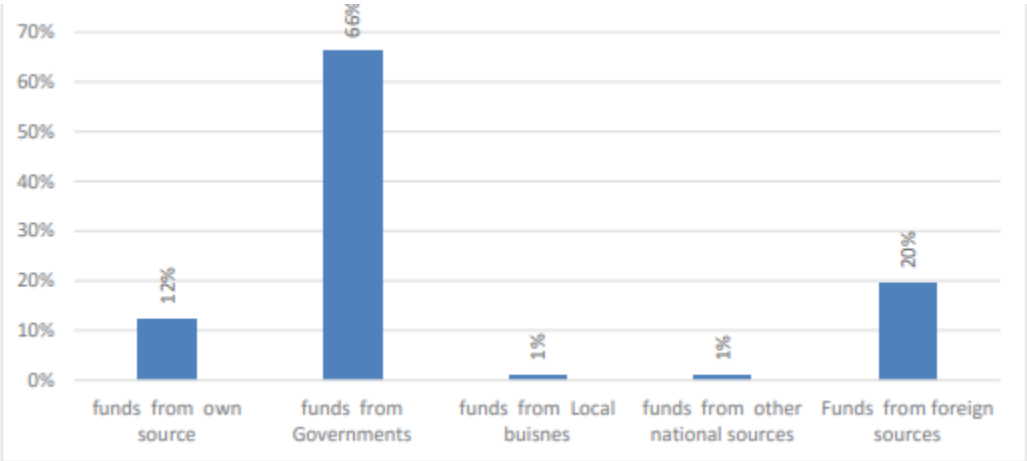
3.1 Science funding

	2017	2019	Notes
R&D expenditure as % of GDP	0.60%	No data	UNESCO, 2015: Ethiopia
- Distance to national target of 1.5%	0.9%	No data	
- Distance to regional target of 1%	0.4%	No data	
- % from government	79.07%	No data	UNESCO, 2015: Ethiopia
- % from business enterprise	0.75%	No data	UNESCO, 2015: Ethiopia
Role of foreign funders over the past five years	↑	No data	

↑↑↑ high and increasingly on agenda; ↑ on agenda and slow increase in attention; --- no change

There has been mixed commitment by the Government to increase R&D investment to the 1% AU target. In fiscal year 2016/ 2017, ETB 5.02 billion was allocated to R&D. This is a decrease from the GERD in the fiscal year 2013/2014, which was ETB 5,242,890,110. The largest contributor to the GERD is the government, who contributed 66% of the total amount, as seen in Figure 2 below (TECHIN, 2017).

Figure 2: Sources of the Gross Expenditure on Research and Experimental Development (GERD)

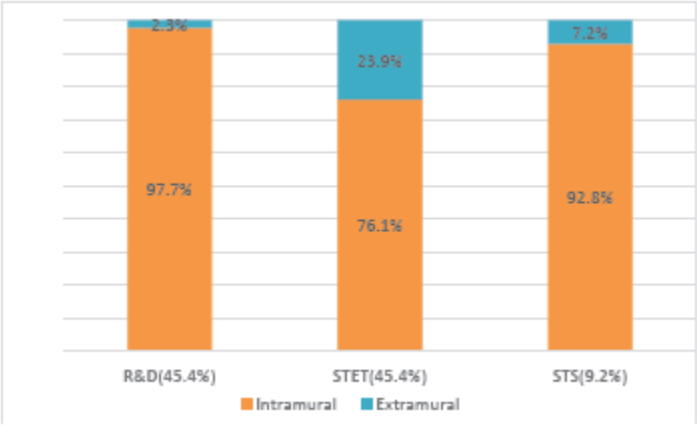


Source: TECHIN (2017)

Local business and other national sources contributed the least percentage (1%) to the GERD. A substantial percentage of 20% was contributed by external/foreign sources, as shown in Figure 2 above.

A recent report (TECHIN, 2019a) on the status of STI in Ethiopia notes that science and technology activities (STAs) are categorized into three groups in the country: Scientific and Technical Education and Training (STET); Scientific and Technological Services (STS); and Research and Experimental Development (R&D). In the fiscal year 2016/2017, R&D and STET received equal amounts of ETB 2.25 billion, while STS received the least amount (ETB 456.3 million) of the federal government expenditure, as shown in Figure 3.

Figure 3: Categorized government expenditure on STAs



Source: TECHIN (2019a)

According to a survey done by the TECHIN in 2016/2017, intramural activities took up the majority of the funding in R&D (97.7%), STET (76.1%) and STS (92.8%), as shown in Figure 3 above. This indicates the low level of government funding for R&D activities in non-governmental organizations and businesses.

The survey further revealed that the current expenditure (labour and other current costs) for all the STAs was allocated more funding compared to the capital expenditure for infrastructure development. The intramural expenditure for STS, STET and R&D was ETB 292.6 million, ETB 1,397.5 million, and ETB 1,801.7 million respectively, while capital expenditure was allocated less than 21% in each category, as shown in Table 1. For the extramural expenditure, 52% of the STET funding was allocated for overseas entities payment, while 48% was outsourcing domestic entities. Within the R&D expenditure, applied research received the majority (64%) of the funding compared to basic research (28%), as shown in Figure 4. Experimental development received the lowest amount of funding (8%) from the Federal government R&D expenditure (TECHIN, 2019a).

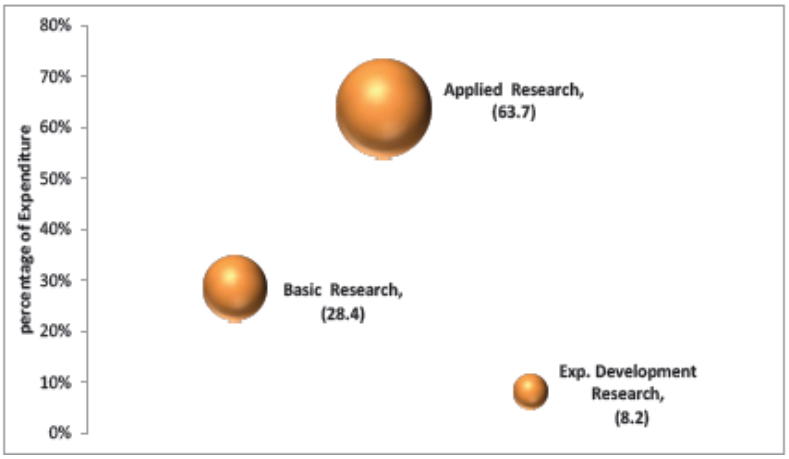
Table 1: STAs fund allocation in the Federal government expenditure

(Details)		R&D *(n=96)*		STET *(n=52)*		STS *(n=28)*		Total STAs (n=121)	
		In million ETB	%	In million ETB	%	In million ETB	%	In million ETB	%
Intramural	• Current expenditure	1,801.7	81.8	1,397.5	82.5	292.6	79.3	3,491.8	81.8
	• Capital expenditure	388.7	17.6	296.8	17.5	76.6	20.7	762.1	17.9
	• Unspecified	12.2	0.6	0	0	0	0	12.2	0.3
	Total Intramural Expenditure	**2,202.6**	**100**	**1,694.3**	**100**	**369.2**	**100**	**4,266.1**	**100**
Extramural	• Domestic payments	50.2	100	255.6	48.1	23.4	81.2	329.2	54.0
	• Overseas payments	0	0	275.4	51.9	5.4	18.8	280.8	46.0
	Total Extramural Expenditure	**50.2**	**100**	**531.0**	**100**	**28.8**	**100**	**610.0**	**100**
Unspecified		0		25.8 (1.2%)		58.4 (12.8%)		84.2 (1.7%)	
Total Expenditure		2,252.8		2,251.1		456.3		4,960.2	

n = number of sectors engaged in each STAs category

Source: TECHIN (2019a)

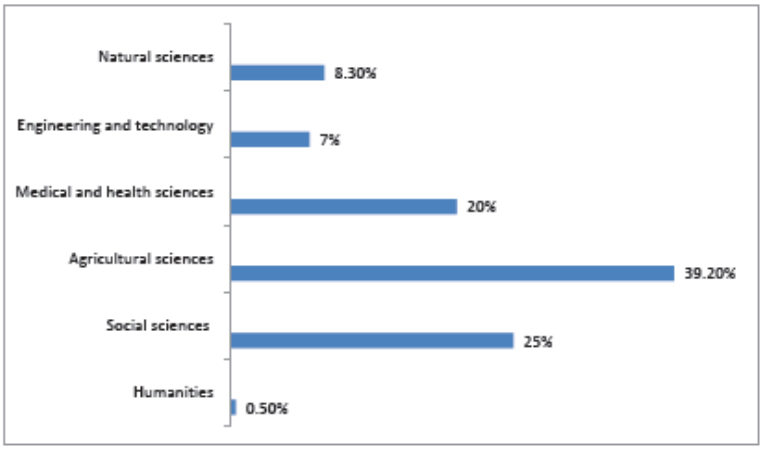
Figure 4: Categorized R&D expenditure for the Federal government



Source: TECHIN (2019a)

According to a survey by TECHIN, agricultural sciences received 39.2%, which was the largest portion of the R&D expenditure of the Federal government in fiscal year 2016/2017, as shown in Figure 5. Social sciences, and medical and health sciences, received 25% and 20% respectively, while humanities received the lowest percentage at 0.5% (TECHIN, 2019a).

Figure 5: Distribution of R&D expenditure across various disciplines.



Source: TECHIN (2019)

3.2 Science impact

	2017	2019	Notes
Field of science receiving most R&D funds	Agricultural science	No change	UNESCO Science report 2015
Place of STI on policy agenda over the past five years	---	No change	
Importance of applied research over the past five years	↑	No change	
Importance of multidisciplinary research over the past five years	↑	No change	
Importance of user-integrated research over the past five years	No data	No change	

↑↑↑ high and increasingly on agenda; ↑ on agenda and slow increase in attention; --- no change

There is very little evidence of significant changes in the place of STI on the policy agenda since 2017. The introduction of a dedicated Ministry of Science and Technology occurred before the 2017 data collection period of the first study (Chataway et al., 2017) and the change to the new MInT has not changed the enhanced focus on STI. That said, the study did find a few examples of where STI activities had been shown to address current societal/national issues, specifically:

- The Nutritious Maize for Ethiopia project, which involves conventional crossbreeding, aims to improve food security and nutrition for approximately 3.98 million people through the promotion of the cultivation and consumption of the quality protein maize (QPM) varieties. These maize varieties are of high nutritive value and are highly productive. The government/project implementers have sensitized farmers and consumers on the benefits of the maize through 1233 learning events (UNCTAD, 2017).
- A start-up called Flowius has been developed to build affordable water pipelines using solar power, microfinance and surveillance tools. According to Markos Lemma (co-founder), this innovation was developed to curb the need for people to walk long distances to access water. GroHydro developed by Wondim, a young female entrepreneur, is a start-up company that manufactures a hydroponics system that enables farmers to grow their crops in the absence of soil (BBC, 2019).

3.3 Science capacity

	2017	2019	Notes
Researchers in R&D (per million people)	45.12	No data	UNESCO, 2015: Ethiopia
# of staff in SGC	5	No data	
- Distance to target	No data	No data	
Improvement in science system to absorb funds in terms of researcher quality	No data	No data	
Improvement in science system to absorb funds in terms of fund manager quality	No data	No data	

We found no additional data on science capacity in this round of the political economy study.

4 Conclusion and recommendations

Since the last report, Ethiopia's policy landscape has not significantly changed. The place of STI on the policy landscape was noted to have significantly improved during the PE1 study and the focus on STI has not diminished in the last three years. In fact, it has probably strengthened a little. However, there are still capacity and performance issues, as noted by the issues raised by interviewees and from recent data sources examined for this study update.

4.1 Recommendations for the STI actors in Ethiopia

Science Granting Council: MInT's Innovation and Research Affair's wing

MInT must ensure that the STI Policy revisions are completed and implemented. The lack of clear policy documents will hinder the movement towards improved productivity in the area of STI. Increasing funding for research must also be a priority.

Private sector actors

Ethiopia has vibrant export oriented agro-processing and manufacturing sectors, which benefit from many supportive government policies. The private sector must see value in research and innovation, and be provided sufficient incentives to work, for example, with universities.

Policymakers

Consideration of improved implementation of policies, as well as reducing staff turnover, will be imperative to build stakeholder trust in the organs of government. For example, the government could provide clearer guidance for foreign investors who might participate in STI activities.

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Annex: Interview details

Interviewee	**Interview mode**	**Interview date**
Ministry of Science and Technology staff	Phone	15 July 2019
Researcher at the University of Addis Ababa	Phone	1 August 2019
Ministry of innovation and Technology staff	In person	3 September 2019
Ethiopia textile Industry Development Institute staff	In person	3 September 2019
Research fellows at the Technology and innovation Institute (TECHIN)	In person	4 September 2019
Research fellow at the Addis Ababa University	In person	4 September 2019
Researcher at the Ethiopian Academy of Sciences (EAS)	In person	4 September 2019
Leather Industry Development Directorate, Senior Leather Technologist Leather Industry Development Institute staff	Phone	9 September 2019