

Assessment of Knowledge Society Development in Ethiopia

June 2017

African Leadership in ICT (ALICT)

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Table of Contents

Introduction.....	6
Aims and Objectives of the study	6
Methodology	6
Overview of theoretical model.....	7
Overview of the ALICT-LATIC programme	9
Considering Sustainable Development Goals.....	10
Knowledge Society Development in Ethiopia.....	12
1. Introduction.....	12
2. Information and Communication Technology (ICT).....	18
2.1 ICT Policy Frameworks	19
2.2 ICT Infrastructure.....	21
2.3 ICT4D Initiatives	22
2.4 Key Actors and Players.....	24
2.5 Challenges in ICT Development	25
3. Education	27
3.1 ICT in Education	31
3.2 Curriculum	33
3.3 Professional Development.....	34
3.4 Key Actors and Players.....	36
3.5 Challenges facing the education sector	36
4 Science, Technology, and Innovation (STI)	38
4.1 STI Policies and Objectives.....	39
4.2 Research and Innovation	40
4.3 Human Resource Development	43
4.4 Key Actors and Players.....	47
4.5 Challenges facing the STI sector	48
5. Conclusion	50
6. References	52

Introduction

The Global E-Schools and Communities Initiative (Gesci), in collaboration with the African Union Commission (AUC) and other partners, developed an African Leaders in ICT (ALICT) capacity-building programme. The first phase of the programme ran from 2012-2013, focusing on leadership capacity-building in twelve countries (Botswana, Ethiopia, Kenya, Malawi, Mauritius, Mozambique, Namibia, Rwanda, South Africa, Tanzania, Uganda, and Zambia). A second phase of the programme ran between 2014 and 2016 and included four countries (Ghana, Ivory Coast, Morocco, and Senegal). ALICT has built the capacities of 487 mid and senior government leaders in 16 Anglophone and Francophone African countries, as well as officials from the AUC between 2012 to 2015. The Francophone version of the ALICT Programme is referred to as *the Leadership Africain pour les TIC et le développement de la société du savoir (LATIC)*.

The course presented a multi-stakeholder approach for awareness-raising and capacity-building of African leaders around issues of Knowledge Society (KS), Information, Communication Technologies (ICT), Education, and Science Technology and Innovation (STI) in support of the AUC Action Plan and the EU-AU P8. Courses comprised of contextualized, modular content, founded upon country research and reflecting the identified needs of country governments.

The programme is currently under review to integrate leadership for sustainable development components in line with international frameworks and AU continental strategies for achieving 2030 sustainable development goals and objectives. The focus is on a continent-wide expansion of the programme through a wider access model.

Aims and Objectives of the study

To inform future development of the ALICT programme, it is important to understand where the participating countries are at in terms of developing a KS. Thus, Gesci commissioned Neil Butcher and Associates to prepare updates on the status of the KS in the 16 participating countries. Specifically, the focus was to update the situational and needs analysis of each country to keep abreast of developments since 2013 regarding the KS and its pillars of Education, STI, and ICT.

The specific objectives of the study were to:

- Update briefs of country KS pillars for the ALICT-LATIC Database.
- Update the ALICT KS country study database of the KS pillar status in each country, which involved:
 - Desk review of country KS documentation, identifying essential policies, strategies, plans, and papers on KS;
 - Review of KS pillar documentation sets related to Education, ICT, and STI; and
 - Identification of major actors, stakeholders, and partners and their role in KS pillar development.

Methodology

The report methodology involved a desk review of various government policy and strategy documents. Additionally, documents from development partners, research and academic papers, news articles, websites, and publications from various organizations were consulted. Further, data from the 2013 report were included where relevant. A framework for the country reports was

prepared, outlining what the various sections would cover. This was done to ensure uniformity in the type of information collected. The major areas and themes covered included policies and plans in ICT, Education, and STI. Additionally, socio-economic background information and indicators were reviewed to obtain an understanding of the context of each country. After receiving approval from Gesci for this framework, draft reports were prepared for each of the 16 countries. The reports were sent to Gesci for review and, based on feedback received, the reports were then finalized.

Overview of theoretical model

Modern economies are transforming from agricultural and industrial economies to information and knowledge-based economies. Such rapid transformation has had significant impact on social, economic, political, and cultural development across the world. For such development and growth, ICT is seen as both a driver and an enabler towards establishing and developing the various sectors in an economy that contribute to stronger, more developed, and richer societies. Africa is on a journey of transformation towards information and knowledge societies. During any such transformational journey, the leaders of a society and policy makers are likely to undergo a paradigm shift that involves developing their capacity and providing tools and direction for accepting relevant changes in mindset.

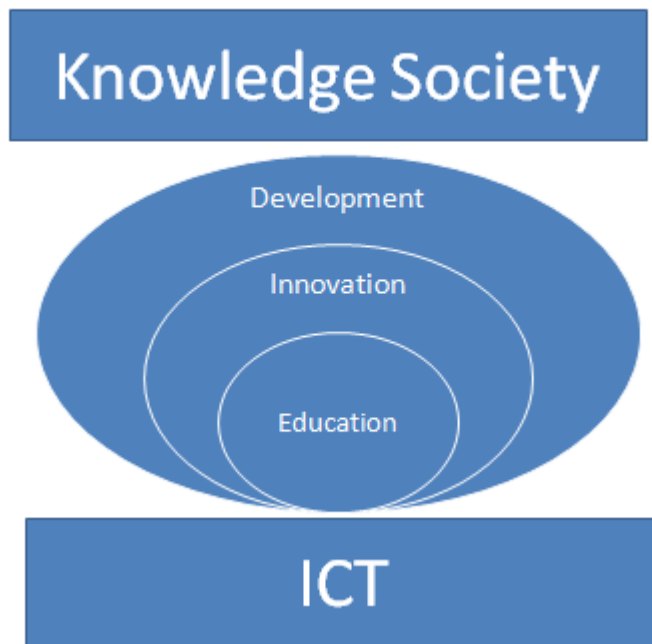
Dahlman (2011) defines a KS as a society that values the creation, dissemination, and effective use of knowledge, and has the institutions, infrastructure, norms, social interactions, and culture that support this.¹ UNESCO (2005) describes a KS as one that is nurtured by its diversity and its capacities. It further argues that, in the increasingly knowledge-based world, it is critical to embrace knowledge and innovation-related policies to spur competitiveness, growth, and improvements in welfare.²

Gesci believes that ICT, education, and innovation are the critical pillars and key elements for development towards a knowledge-based future. Butcher (2010) visually captured the inter-relationship between the three pillars as follows:

¹ Dahlman, C. J. (2011). What is the Knowledge Economy and Society and How Can it Help Jamaica? Retrieved July 17, 2017 from http://www.knowledgesocietyfoundation.com/images/Dahlman_C_2011_What_is_the_Knowledge_Economy_and_Society_-_How_can_it_help_Jamaica,_Jam_KE_C_Conf,_Ssn_1-2.pdf

² UNESCO. (2005). Towards Knowledge Societies. Retrieved July 17, 2017 from <http://unesdoc.unesco.org/images/0014/001418/141843e.pdf>

Figure 1 Framework for reflecting on ICT, Education, Innovation and Development Support of a Knowledge Society³



The innovation pillar incorporates the fields of Science, Technology, and Innovation (STI) in a single pillar. The education and innovation pillars are presented as interrelated drivers for development. The ICT pillar is the enabler for Education and Innovation dynamics that will drive Development towards the Knowledge Society.⁴

ICT is regarded as an engine for growth and a tool for empowerment, which has profound implications for education change and socio-economic development. UNESCO (2007) defines ICT as *Forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means. This broad definition of ICT includes technologies such as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, and computer and network hardware and software, as well as the equipment and services associated with these technologies, such as videoconferencing, e-mail and blogs.*⁵

ICT is considered a critical tool in preparing students with the skills required for the global workplace. Thus, technology integration is becoming a key element in almost every plan for the restructuring and re-engineering of education systems.⁶ This enables continuous adaptation to a

³ Neil Butcher and Associates. (2011). Thematic Paper: ICT, Education, Development, and the Knowledge Society. Gesci. Retrieved July 17, 2017 from http://gesci.org/fileadmin/user_upload/4_ICT_in_STEM_Education_Files/ICT_Education_Development_and_the_Knowledge_Society_1_1_.pdf

⁴ Hooker, M. (2011). African Leadership in ICT and Knowledge Societies: Issues, Tensions and Opportunities for Learning for Gesci. Retrieved July 17, 2017 from http://gesci.org/fileadmin/user_upload/1_African_Leadership_in_ICT_and_Knowledge_Society_Development_Files/2013_-_african-leadership-knowledge-societies-issues-tensions-opportunities-learning.pdf

⁵ UNESCO Bangkok. (2007). The UNESCO ICT in Education Programme. p.1. Retrieved July 17, 2017 from <http://unesdoc.unesco.org/images/0015/001567/156769e.pdf>

⁶ Scheffler, F.L., and Logan, J.P. (1999). Computer Technology in Schools: What Teachers Should Know and Be Able to Do. Journal of Research on Computing in Education, Vol 31, Issue 3. Available from <http://www.tandfonline.com/doi/abs/10.1080/08886504.1999.10782257>

work world of continuous technological innovations and makes it easier for students to access knowledge.

Challenges of ICT within Africa often relate to lack of human and financial resources, which translate into inadequate and insufficient skills supply, irrelevant or incomplete regulatory frameworks, including policies and legislation, and inadequate infrastructure and communication platforms.⁷ To embrace a KS, Gesci believes that there is a requirement to ensure that leaders develop skills to make informed policy and investment decisions to support socio-economic development effectively. This encompasses building both leadership ICT skills and ICT management skills.

Lifelong learning is regarded as a requirement to keep pace with the constantly changing global job markets and technologies. Education contributes to all other sectors by providing required skills and knowledge for economic development. Thus, it is not limited to formal education in traditional structures, but encompasses the broader societal learning necessary for development. Preparation for lifelong learning involves an emphasis, in primary and secondary schools, on learning general skills and competencies (communication, mathematics and science skills, new literacy skills, problem-solving and interpersonal skills, and self-directed learning skills to learn other subjects) and at tertiary level on capacity-building in science and technology, discipline-specific skills, research, and development.⁸ Additionally, there is a need for postgraduate programmes to build specific research capacity to handle knowledge-innovation process development – to meet needs and demands for national and regional competitiveness and growth. Education plays critical roles in imparting learning skills.⁹

Innovation is described as a process of creation, exchange, evolution, and application of knowledge to produce new goods. It involves adapting, adopting, or using knowledge to produce new goods and services in local contexts or to advance society in general.¹⁰ The UN Economic Commission for Africa (UNECA) (2010) regards innovation and change as fundamental when developing a KS to drive economic growth and advancement. It has been argued that the basic ingredient for nurturing the innovation dynamic is setting up systems to enable cross-fertilization of ideas between the fields of Science, Engineering, Technology, and Innovation (SETI).¹¹

Overview of the ALICT-LATIC programme

The ALICT Programme is conceptualized to model a methodology and multi-stakeholder approach for capacity building and awareness raising of African leaders on the issues of the KS, ICT, Education, and STI.¹² The programme is based on the premise that investments in ICT, Education, and STI contribute to socio-economic development and a shift towards the development of a KS.

The programme's focus is to build absorptive capacity of current and potential future African leaders to acquire, assimilate, transform, and exploit the benefits of knowledge. It aims to foster dynamic

⁷ Hooker, M. (2011). African Leadership in ICT and Knowledge Societies: Issues, Tensions and Opportunities for Learning for Gesci. Op cit

⁸ Neil Butcher and Associates. (2011). Thematic Paper: ICT, Education, Development, and the Knowledge Society. Op cit

⁹ Hooker, M. African Leadership in ICT and Knowledge Societies: Issues, Tensions and Opportunities for Learning for Gesci. Op cit

¹⁰ Hooker, M. (2010). Concept note: Building Leadership Capacity for ICT and Knowledge Societies in Africa. Gesci. Retrieved July 17, 2017 from http://gesci.org/fileadmin/user_upload/1_African_Leadership_in_ICT_and_Knowledge_Society_Development_Files/2012_-_ConceptNoteALICTFinal.pdf

¹¹ Hooker, M. (2011). African Leadership in ICT and Knowledge Societies: Issues, Tensions and Opportunities for Learning for Gesci. Op cit

¹² *ibid*

organizational capability through knowledge sharing, collaboration, and exposure to technology. It is hoped that, through participation in the ALICT-LATIC course, future African leaders will demonstrate knowledge, skills, and attitudes that promote their role as change agents. These are expected to translate into positive benefits for their respective countries in pursuit of inclusive knowledge societies.

The core concepts of the programme are as follows:

- **Capacity Building:** The ALICT capacity-building model aims to build and enhance the knowledge, skills, and attitudes of future leaders to manage transformation and change, manage institutional pluralism, enhance coordination, foster communication, and ensure that data and information are shared and used in planning, resource mobilization, implementation, and evaluation processes.
- **Knowledge Society:** The ALICT model focuses on the role all facets of ICT play in building the absorptive capacities of current and potential future African leaders to acquire, assimilate, transform, and exploit the benefits of ICT and knowledge to produce a dynamic organizational capability through peer knowledge sharing and exposure to technology. The ALICT approach to KS development focuses on the interconnection between leadership, policy development, and future-proof planning and how they contribute to KS development through Education, STI, and ICT.
- **Leadership:** A prerequisite for leadership development for knowledge societies is policy coherence between the three pillars (ICT, Education, and STI) that form the basis of any KS. For future African leaders to be able to steer their countries towards that goal, it is essential for them to not only be well versed in management, leadership, project formulation and project management skills, but also to acquire comprehensive knowledge about the interrelationship of the three KS pillars (Education, STI and ICT) and then be able to apply that knowledge in the African context.
- **Policy Coherence:** Policy coherence is the development and implementation of conjointly supportive policy actions across all sectors of the economy and society and, more specifically across government departments and agencies. Policy coherence pursues the creation of synergies across policies that advance the achievement of shared and agreed objectives. Within national governments, policy coherence issues arise between different types of public policies, between different levels of government, between different stakeholders, and at an international level.
- **Futures Thinking:** Futures Thinking was first theorized by Jim Dator (Bezold, 2009). Among its many uses within complex and rapidly shifting economic and social systems is its relevance to policy development and implementation. Futures Thinking requires the revisitation of plans and policies at regular intervals to take into consideration any new signals that appear in the environment that may affect a sector or number of sectors.¹³

Considering Sustainable Development Goals

The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development officially came into force in January 2016. These new goals apply to all countries when mobilizing efforts to end all forms of poverty, fight inequalities, and tackle climate change over the next 15 years.

¹³ Taken verbatim from African Leadership in ICT Model Document 2013 - The Future of African Leadership is here. Retrieved July 17, 2017 from http://gesci.org/fileadmin/user_upload/1_African_Leadership_in_ICT_and_Knowledge_Society_Development_Files/ALICT_Model_final_Juho.pdf

They recognize that ending poverty must go hand-in-hand with strategies that build economic growth and addresses a range of social needs including education, health, social protection, and job opportunities, while tackling climate change and environmental protection.¹⁴

While the SDGs are not legally binding, governments are expected to take ownership of, and establish national frameworks to achieve, the 17 Goals: no poverty; zero hunger; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice, and strong institutions; and partnerships for the goals.

Primary responsibility for follow-up and review of progress made in implementing the SDGs rests with countries. Implementation and success of the SDGs depends on countries' own sustainable development policies, plans, and programmes. However, regional follow-up and review will be based on national-level analyses and contribute to follow-up and review at the global level.¹⁵

Whilst implementation of SDGs is still in early phases, it provides an opportunity to frame the ALICT programme as a mechanism for countries to address SDGs, due to the programme's cross-cutting nature. Specifically, KS development relies on the progress made in many of the SDGs.

¹⁴ United Nations. (no date) Sustainable Development Goals – 17 Goals to Transform our World. Retrieved July 17, 2017 from <http://www.un.org/sustainabledevelopment/development-agenda/>

¹⁵ Ibid

Knowledge Society Development in Ethiopia

1. Introduction

Ethiopia, officially known as the Federal Democratic Republic of Ethiopia, is located in the Horn of Africa and covers about 1,104,300 km². Ethiopia is landlocked between the Sudan, South Sudan, Eritrea, Djibouti, Somalia and Kenya.¹⁶

Figure 2 Map of Ethiopia¹⁷



In 2015, the population of Ethiopia was estimated to be at 99,390,750. Ethiopia is a predominantly agricultural country – more than 80% of the population lives in rural areas.¹⁸

Amharic is the official language of Ethiopia, although other languages are official amongst the various ethnicities in their respective regions. Languages spoken in the country include Oromo (official working language in the State of Oromiya), Somali (official working language of the State of Sumale), Tigrigna (official working language of the State of Tigray), Sidamo, Wolaytta, Gurage, Afar (official working language of the State of Afar), Hadiyya, Gamo, Gedeo, Opuuo, Kafa, English (major foreign language taught in schools) and Arabic.¹⁹

Ethiopia has been pursuing pro-poor policies and implementing development plans that include the Millennium Development Goals. Achievements in economic growth, social development and environmental management have been made. Ethiopia has accepted and endorsed the 2030 Agenda for Sustainable Development with national commitments and ownership to implement the 2030

¹⁶ Central Intelligence Agency – The World Factbook. (2016). Ethiopia. Retrieved March 9, 2017 from <https://www.cia.gov/library/publications/the-world-factbook/geos/et.html>

¹⁷ Ibid

¹⁸ Ibid

¹⁹ Ibid

Agenda and its sustainable development goals (SDGs) as integral part of its national development framework.²⁰

Ethiopia's second Growth and Development Plan (GTP II), that came into effect in 2016 for the 2015/16 – 2020/21 period, seeks to implement the national vision of becoming a low middle-income country by 2025.²¹

Ethiopia has integrated the SDGs with GTP II, and in the formulation of its 15 Year Perspective Development Plan spanning the period 2015/16-2029/30 currently under preparation and aligned with the period of the SDGs.²²

GTP II is built on existing sectoral policies and strategies. GTP II will focus on “ensuring rapid, sustainable and broad-based growth through enhancing productivity of agriculture and manufacturing, improving quality of production and stimulating competition in the economy”. GTP II pillars include: sustaining rapid economic growth; increasing productive capacity and efficiency; transforming the domestic private sector; building the capacity of domestic construction industry; proactively managing ongoing rapid urbanization; accelerating human development and technology; continuing to build democratic and good governance; promoting women and youth empowerment and building climate resilient green economy.²³

Though unemployment and poverty in Ethiopia are still high, performances in economic growth, economic infrastructure development, social development and environmental development have been impressive. There is still a high unemployment rate of women and youth but there are concerted efforts to accelerate inclusive economic growth, infrastructure development, social development and building of democratic systems that would lead to eradicate poverty in all its forms and adequately address unemployment issues. In this regard, the SDG-integrated GTP II has prioritized unemployment issues of women and youth.²⁴

In 2001, acknowledging that capacity building is crucial for achieving the nation's developmental goals, the government put in place the Public Sector Capacity Building Programme (PSCAP). The strategy addresses deficiencies in human and institutional capacity required for supporting sustainable development, focuses on institutionalizing capacity building to ensure efficiency and sustainability, and aims at the comprehensive development of human resources, organizations, systems and processes as means to reach Ethiopia's development goals. Special efforts are being made within the PSCAP programme to develop the capacities of human resource development institutions such as universities and colleges, vocational training institutes, research and other similar institutions in both the public and private sectors.²⁵

Leadership development in Ethiopia is focused on grassroots development, and democratizing leadership on issues such as health, female leadership, youth, and HIV/AIDS.²⁶

²⁰ United Nations. (2017). Ethiopia. Retrieved June 28, 2017 from <https://sustainabledevelopment.un.org/memberstates/ethiopia>

²¹ National Planning Commission. (2015). Growth and Transformation Plan II (2015/16 - 2020/2021). Retrieved March 10, 2017 from <http://dagethiopia.org/new/national-development-strategies>

²² United Nations. (2017). Ethiopia. Op cit

²³ National Planning Commission. (2015). Growth and Transformation Plan II (2015/16 - 2020/2021). Op cit

²⁴ United Nations. (2017). Ethiopia. Op cit

²⁵ Ministry of Capacity Building. (2006). The National ICT for Development (ICT4D) Five Years Action Plan for Ethiopia [2006-2010]. Retrieved March 10, 2017 from <http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan040825.pdf>

²⁶ Center for Creative Leadership. (2017). Africa. Retrieved June 30, 2017 from <https://www.ccl.org/our-locations/africa/>

The economy of Ethiopia has grown at a rate between 8% and 11% annually for over a decade, and is one of the fastest growing non-oil economies in Africa. This growth has been driven by sustained progress in the agricultural and service sectors. Almost 80% of Ethiopia's population is still employed in the agricultural sector, but services have surpassed agriculture as the principal source of GDP.²⁷ Ethiopia's GDP in 2015 was US\$61.54 billion representing a per capita GDP of just over US\$1,628, and growth of 9.6%.²⁸

Inflation in Ethiopia in 2015 was 10.1%.²⁹ The country's Gini Coefficient Index (which measures inequality in the level of income) was recorded at 33.17 in 2010.³⁰ Ethiopia received US\$2.168 billion of foreign direct investment during 2015, up from the 2012 figure of US\$278 million.³¹

In 2015, Ethiopia ranked 31 out of 54 African countries on the Mo Ibrahim Index which offers a comprehensive assessment of governance that informs and empowers citizens, civil society, parliaments and governments as a tool of measuring progress in governance. Currently, Ethiopia enjoys a positive trend in this measure. Specifically, it has moved 2.4 points up with regards to participation and human rights, 1.8 points up in Sustainable Economic Opportunity and 2.9 points up in human development indices³²

The Global Competitiveness Index (GCI, 2016-17) which assesses the ability of countries to provide high levels of prosperity to their citizens through measuring the set of institutions, policies, and factors that set the sustainable current and medium-term levels of economic prosperity ranks Ethiopia 109 out of 138 countries with a score of 3.8.³³ The index points to corruption, access to financing and foreign currency regulations as primary limiting factors.

The World Bank's "Ease of doing business" index, a measure of the relative ease for starting a running a local business, for 2017 ranks Ethiopia as 159 out of 190. Getting credit and resolving insolvency are still constraints.³⁴

According to the Heritage Foundation report, Ethiopia's economic freedom score is 52.7 making it the 142nd freest economy out of the 178 ranked countries and rated as "mostly unfree". Its score is 1.2 points higher than the previous year. Ethiopia is ranked 31st out of 46 countries in the Sub-Saharan Africa region, and its overall score is below the world average of 60.7. According to the Heritage Foundation, Ethiopia underperforms in many key areas that are critical to long-term economic development. The poor quality and efficiency of government services are made worse by weak rule of law and pervasive corruption. State distortions in prices and interest rates undermine monetary stability.³⁵

According to the International Telecommunication Union (ITU), Ethiopia's (IDI) score for 2016 was 1.51, placing it 169 out of 175 countries. This is up from 172nd place and a score of 1.29 in 2015. So,

²⁷ Central Intelligence Agency – The World Factbook. (2016). Op cit

²⁸ The World Bank. (2015). Ethiopia. Retrieved March 9, 2017 from <http://data.worldbank.org/country/ethiopia>

²⁹ Ibid

³⁰ The World Bank. (2010). GINI index (World Bank estimate). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SI.POV.GINI?locations=ET>

³¹ The World Bank. (2015). Foreign direct investment, net inflows (BoP, current US\$). Retrieved March 10, 2017 from http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=ET&year=2016&year_high_desc=false

³² Mo Ibrahim Foundation. (2016). Ibrahim Index of African Governance. Retrieved March 10, 2017 from <http://iiag.online/>

³³ World Economic Forum. (2016). Global Competitiveness Index - Ethiopia. Retrieved March 10, 2017 from <http://reports.weforum.org/global-competitiveness-index/country-profiles/#economy=ETH>

³⁴ The World Bank. (2016). Doing Business. Retrieved March 10, 2017 from <http://www.doingbusiness.org/rankings>

³⁵ The Heritage Foundation. (2017). Ethiopia. Retrieved March 10, 2017 from 2017 Index of Economic Freedom: <http://www.heritage.org/index/country/ethiopia>

while Ethiopia's score improved slightly, the pace of development lagged its competitors and Ethiopia is only ranked 33rd in the region.³⁶

The World Economic Forum's Networked Readiness Index for 2016 ranked Ethiopia 120 out of 139 countries, moving up ten places, with a score of 3.1. Ethiopia's ranking is led by the government sector, and the business sector is starting to catch up as executives feel innovation capacity in the country is increasing and businesses are starting to explore the use of the internet to interact with consumers. Setting up a new business seems to be getting tougher. The private sector is also still constrained by a very small base of online consumers: only 31% of the population had a mobile phone subscription in 2014. Yet, because prices are falling significantly, ICTs will become accessible to a larger part of the population. In addition, Ethiopia has been edging forward on the skills dimension, although a large gap remains to be closed. Importantly, the figures suggest that there have been significant improvements in giving schoolchildren access to the internet.³⁷

In 2016, 55% of Ethiopia's population was between the ages of 15 and 64.³⁸ The country has a fertility rate of 4.4 children per woman.³⁹ Ethiopia's measured overall unemployment rate was 5.2% in 2014⁴⁰ and youth unemployment rate was 4.6% for males⁴¹ and 9.7% for women⁴² in 2014.

Ethiopia is experiencing climate change and its impacts on the environment and natural resources. Continued climate change is expected to bring greater variability, and extreme weather events which will degrade the country's ecosystems. The impact of climate change in Ethiopia is already apparent in the increasing temperature and declining rainfall, particularly in the north. Agriculture is the source of livelihood to an overwhelming majority of the Ethiopian population and is the basis of the national economy. A decrease in seasonal rainfall has devastating implications on agricultural production leading to food insecurity, malnutrition and famine. The frequency and intensity of drought is likely to increase over the coming decades, which will present a serious threat to biodiversity, ecosystems, water, agricultural and human health.⁴³

In order to protect the country from climate change, the Ethiopian government drafted the Climate-Resilient Green Economy (CRGE) strategy in 2011. Four initiatives were selected to be prioritized. The fast-tracked initiatives are developing the vast hydropower potential, large-scale promotion of advanced rural cooking technologies, improving efficiency in the livestock value chain, and reducing emissions from deforestation and forest degradation. These initiatives were selected as they have the best chances of promoting immediate growth, securing large abatement potentials, and attracting finance for their execution.⁴⁴

³⁶ International Telecommunications Union. (2016). ICT Development Index. Retrieved March 10, 2017 from <http://www.itu.int/net4/ITU-D/idi/2016/>

³⁷ World Economic Forum. (2016). Global Networked Readiness Index - Ethiopia. Retrieved March 10, 2017 from <http://reports.weforum.org/global-information-technology-report-2016/economies/#economy=ETH>

³⁸ The World Bank. (2015). Population ages 15-64 (% of total). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SP.POP.1564.TO.ZS?locations=ET>

³⁹ The World Bank. (2015). Fertility rate, total (births per woman). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SP.DYN.TFRT.IN?locations=ET>

⁴⁰ The World Bank. (2014). Unemployment, total (% of total labor force) (modeled ILO estimate). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SL.UEM.TOTL.ZS?locations=ET>

⁴¹ The World Bank. (2014). Unemployment, youth male (% of male labor force ages 15-24) (modeled ILO estimate). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SL.UEM.1524.MA.ZS?locations=ET>

⁴² The World Bank. (2014). Unemployment, youth female (% of female labor force ages 15-24) (modeled ILO estimate). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/SL.UEM.1524.FE.ZS?locations=ET>

⁴³ Sida's Helpdesk for Environment and Climate Change. (2013). Ethiopia Environmental and Climate Change policy brief. Retrieved March 12, 2017 from <http://sidaenvironmenthelpdesk.se/wordpress3/wp-content/uploads/2013/05/Ethiopia-Environmental-and-Climate-Change-policy-20130527.pdf>

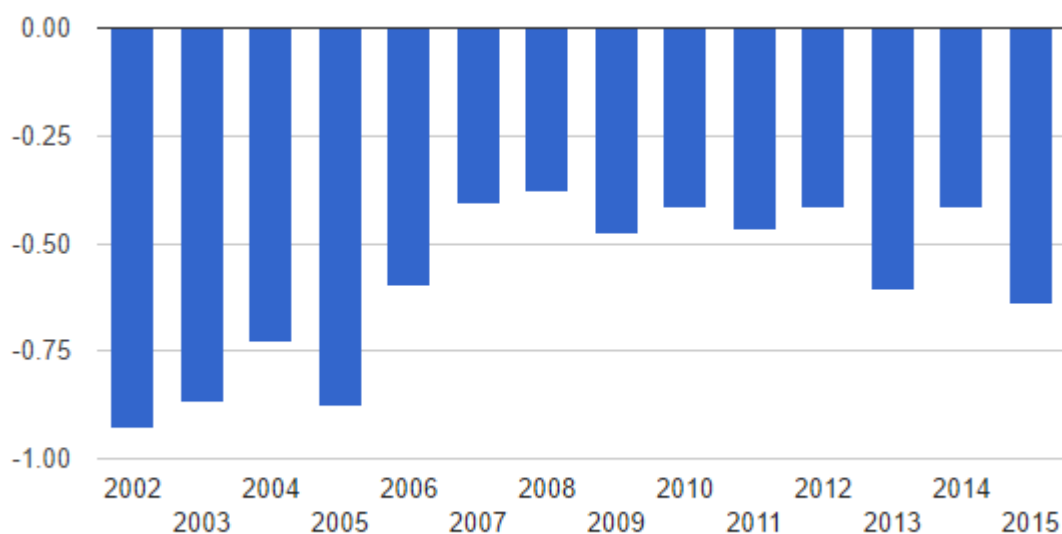
⁴⁴ Federal Democratic Republic of Ethiopia. (2011). Ethiopia's Climate-Resilient Green Economy. Retrieved March 30, 2017 from <http://www.undp.org/content/dam/ethiopia/docs/Ethiopia%20CRGE.pdf>

In 2013, Ethiopia’s CO₂ emissions stood at 0.112 metric tons per capita, up from 0.069 metric tons per capita a decade earlier,⁴⁵ with total greenhouse emissions in 2012 at 185,292.⁴⁶

However, according to the GTP II, Ethiopia is focused on sustaining the country’s strong economic growth ensuring inclusive growth that will continuously reduce poverty, and supporting the country’s goal to become a carbon-neutral middle-income country by 2025. In 2012, Ethiopia got 88% of its electricity from hydroelectric plants, and a further 3.6% from other renewable sources.⁴⁷ Currently, Ethiopia exports power to Kenya, Sudan and Djibouti, yet has contracted with Tanzania, Rwanda, South Sudan and Yemen to provide power, specifically from hydropower. Ethiopia is to begin exporting renewable energy to neighbouring countries by 2018 as part of a cross-border endeavour to meet regional energy demand and limit increases in climate-changing emissions.⁴⁸

The index of Government Effectiveness in Ethiopia (data gathered from a number of survey institutes, think tanks, non-governmental organizations, international organizations, and private sector firms) shows perceptions of the quality of public services, the quality of the civil service and the degree of the governments independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to these policies. The scale rates countries from 2.5 (strong government effectiveness) to -2.5 (weak government effectiveness). Below is a graph showing the perceived government effectiveness in Ethiopia from 2002 to 2015.⁴⁹

Figure 3 Government effectiveness in Ethiopia⁵⁰



⁴⁵ World Bank. (2013). CO₂ emissions (metric tons per capita). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=ET>

⁴⁶ World Bank. (2013). Total greenhouse gas emissions (kt of CO₂ equivalent). Retrieved March 10, 2017 from <http://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=ET>

⁴⁷ Central Intelligence Agency – The World Factbook. (2016). Op cit

⁴⁸ All Africa. (2015). Ethiopia to Step Up Role as Regional Clean Power Exporter. Retrieved March 9, 2017 from <http://allafrica.com/stories/201505140581.html>

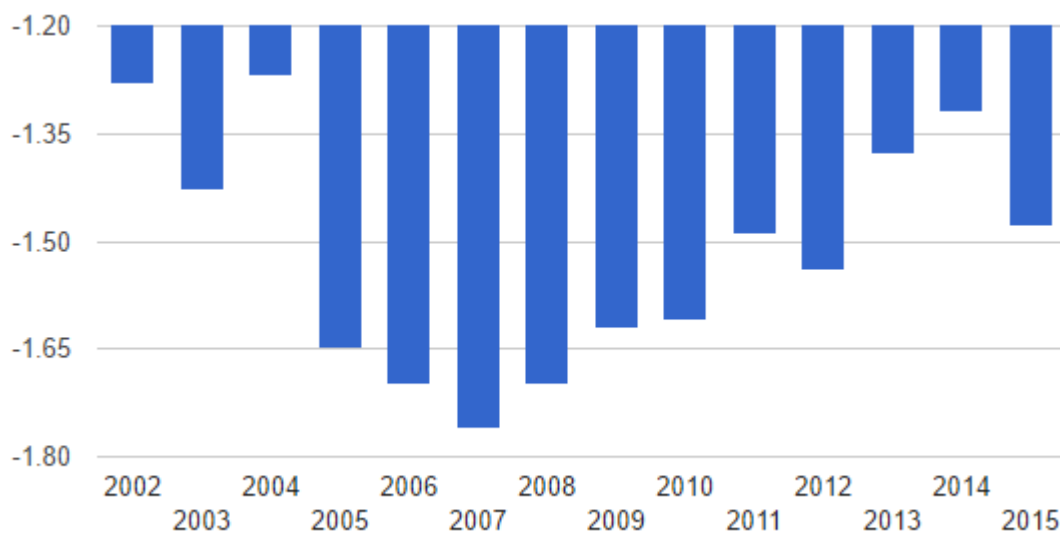
⁴⁹ The Global Economy. (2017). Ethiopia: Government effectiveness. Retrieved March 28, 2017 from http://www.theglobaleconomy.com/Ethiopia/wb_government_effectiveness/

⁵⁰ Ibid

The Legatum Prosperity Index is an index measuring Ethiopia’s 2016 prosperity performance. In the sub-indices, Safety and Security and Governance, Ethiopia has not changed much in its performance over the last decade. Ranked 123rd and 115th out of 149 respectively, the situation has worsened with a declared state of emergency following massive protests in several parts of the country. The current refugee crisis is affecting safety and security, and improvement depends on changing circumstances in Eritrea, Somalia, and South Sudan. It is estimated that Ethiopia is accommodating the largest share of refugees in Africa, becoming a microcosm of civil unrest and conflicts going on in the region.⁵¹

The index of Political Stability and Absence of Violence/Terrorism measures Ethiopians’ perceptions of the possibility that the Ethiopian government will be destabilized or overthrown by unconstitutional or violent means, including politically motivated violence and terrorism. The scale rates countries from 2.5 (strong political stability) to -2.5 (weak political stability). Below is a graph showing the perceived political stability in Ethiopia from 2002 to 2015.⁵²

Figure 4 Political stability in Ethiopia⁵³



Some analysts indicate that the Ethiopian government is looking increasingly unstable, as opposition protests over the past few months have been larger and more frequent than any in Ethiopia since the end of the civil war.⁵⁴ Ethiopian prime minister, Hailemariam Desalegn, claims the reason for some of the regional protests is unemployment and poor governance, and that Ethiopia is an “island of stability in the Horn of Africa” because security and poverty eradication are key concerns of the government.⁵⁵

⁵¹ Legatum Institute. (2016). Ethiopia. Retrieved March 12, 2017 from <http://www.prosperity.com/globe/ethiopia>

⁵² The Global Economy. (2017). Ethiopia: Political stability. Retrieved March 28, 2017 from http://www.theglobaleconomy.com/Ethiopia/wb_political_stability/

⁵³ Ibid

⁵⁴ Risk Advisory. (2016). Ethiopia – Assessment of government stability amid ongoing protests. Retrieved March 28, 2017 from <https://news.riskadvisory.net/2016/27/ethiopia-assessment-of-government-stability-amid-ongoing-protests/>

⁵⁵ The Guardian. (2016). Ethiopian prime minister: 'We are an island of stability in a troubled region'. Retrieved March 31, 2017 from <https://www.theguardian.com/global-development/2016/mar/09/ethiopian-prime-minister-hailemariam-desalegn-island-of-stability-troubled-region>

2. Information and Communication Technology (ICT)

The ICT sector in Ethiopia is shaped by sector regulation that was approved in 1996 to create a single national operator. The reform of the communications sector began by separating the regulatory and the operational functions through the establishment of a regulatory entity, the Ethiopian Telecommunications Agency (ETA), and a commercial entity, the Ethiopian Telecommunications Corporation (ETC) 1996. Before 1996, the ETA had acted both as a provider of communication services and the regulator of the sector.⁵⁶

In 2003, the government established the Ethiopian ICT Development Agency (EICTDA) with a mandate to support information technology (IT) applications and capacity building within the government. The EICTDA was organized around five areas, namely ICT for government, legal and regulatory frameworks including standards, human resources development, ICT applications in various sector, private sector development and promotion of community access. The EICTDA was also charged with the development of a national ICT policy. It was mandated to coordinate the functions of regional ICT agencies that had been established under the former Ministry of Capacity Building.⁵⁷

During its existence, the EICTDA, through funding from the World Bank, was able to launch a series of projects that improved ICT access in the public sector, including the e-Government strategy. The EICTDA was also able to draft laws governing the online environment including e-commerce law, data protection law and digital signature law.⁵⁸

The third organization with an ICT regulatory mandate is the Ethiopian Broadcasting Authority (EBA). The EBA was set up in 1999 under the Ministry of Information, but later transferred to the Government's Communications Office. While the EBA was confined solely to the broadcasting sector, the ETA and EICTDA continued to share responsibilities across regulatory divides until the Federal Government decided to create a new Ministry of Communication and Information Technology (MCIT) that assumed all their functions.⁵⁹

The MCIT was formed in 2010. The ministry leads the ICT development in Ethiopia and is a result of the consolidation of three former agencies: the Ethiopian Information and Communications Technology Development Agency (EICTDA), the Ethiopian Telecommunications Agency (ETA) and the communication department of the former Ministry of Transport and Communications.⁶⁰

The role and responsibilities of MCIT include:

- promoting the expansion of communication services and the development of information technology;
- setting and implementing standards to ensure the provision of quality communication and information technology services;
- regulating the rate of telecommunication service charges;
- licensing and regulating telecommunication and postal service operators;
- facilitating the creation of institutional capacity for the effective implementation of information technology development policy;

⁵⁶ Ministry of Communication and Information Technology. (no date). ICT Policy and Regulatory Environment. Retrieved March 12, 2017 from <http://www.mcit.gov.et/web/english/ict-policy-and-regulatory-environment>

⁵⁷ Ibid

⁵⁸ Ibid

⁵⁹ Ibid

⁶⁰ IST Africa. (no date). Introduction – Ethiopia. Retrieved March 12, 2017 from <http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=8216>

- assigning, monitoring and facilitating correct use of government domain names;
- facilitating the creation of fast and affordable information access;
- providing support for the implementation of a modern information network between and within federal and regional government institutions; and
- ensuring critical systems and services in the public sector are computerized and online services are available to users.⁶¹

2.1 ICT Policy Frameworks

The National ICT Policy and Strategy that governs the Ethiopian ICT sector was drafted in 2005 and approved in 2009, and there is an updated 2016 draft.⁶² The 2009 policy's key vision is to improve the social and economic wellbeing of all Ethiopians by optimizing opportunities created by ICT, for ensuring the establishment of a sustainable democratic system and rapid socio-economic development.⁶³ The 2016 draft shares the same vision but has been updated due to a desire to leverage ICT to play a stronger role in Ethiopia's goal to become a middle-income economy, and to provide a regulatory framework for the implementation of ICT across various ministries while focusing on providing ICT access and broadband to all citizens.⁶⁴

In line with its ambition to become a middle-income country by 2025, Ethiopia views its ICT policy as integral to the country's larger development goals and objectives. The Ethiopian ICT Strategy proposes that the country advances its ICT research and development by building a state-of-the-art broadband network that supports academic and research networking, improving the incentives for academic institutions and the private sector to promote ICT research and development, and addressing cross-cutting challenges such as coordination, collaboration, empowerment of women and financing.⁶⁵

The mission of the policy was to develop "Ethiopia into a socially progressive and prosperous nation with a globally competitive, modern, dynamic and robust economy through the development, deployment and exploitation of ICT within the economy and society."⁶⁶

To achieve their vision and implement the ICT policy, the government developed programmes with the aim of:

- Creating an enabling policy, regulatory and legal environment for the growth and use of ICTs;
- Developing ICT human resources, infrastructure, rural access, ICT standards, and local content;
- Capacitating public institutions to facilitate the mainstreaming of ICTs for socioeconomic development; and
- Facilitating the use of appropriate technologies for development of applications and content for rural development, good governance, and service delivery in priority sectors.⁶⁷

Until recently, the National Information Security Policy of 2011 was the most important document in the issue of cyber security. It was the first cyber specific policy. The policy recognizes that cyber

⁶¹ Ibid

⁶² Ministry of Communication and Information Technology. (no date). Ethiopian ICT Policy and Strategy. Retrieved March 12, 2017 from http://www.mcit.gov.et/web/english/the-national-ict-policy#_48_INSTANCE_a3qjCO1umuLf=http%3A%2F%2Fwww.mcit.gov.et%2Fdocuments%2F1268465%2F13533561%2FFDRE%2B-%2BNational%2BICT%2BPolicy%2BEnglish.pdf%2F1a626364-1ef3-424f-97ce-33356ca4628f%3F

⁶³ Ministry of Communication and Information Technology. (no date). ICT Policy and Regulatory Environment. Op cit

⁶⁴ Ministry of Communication and Information Technology. (no date). Ethiopian ICT Policy and Strategy. Op cit

⁶⁵ IST Africa. (no date). Introduction – Ethiopia. Op cit

⁶⁶ Ministry of Communication and Information Technology. (no date). ICT Policy and Regulatory Environment. Op cit

⁶⁷ Ibid

security is an integral part of national security, organizational security, public peace and security and the protection of basic rights and freedoms of citizens. The policy was designed to achieve the following major goals:

- Build national capability for coordinated prevention, detection, response, deterrence against threats and minimize damage, cost and recovery time from attacks that do occur;
- Enable the country to use information as a means and resource in the implementation of its peace, democratization and social and economic development programs;
- Ensure the confidentiality, integrity, availability and authenticity of national information assets; and
- Transform Ethiopia into an information-secure society which supports the development of a trustworthy and competitive information infrastructure.⁶⁸

Three other pieces of legislations are also in place, including the National Payment System Proclamation No.718/2011, the Registration of Vital Events and National Identity Card Proclamation No. 760/2012 and the Telecom Fraud Proclamation No. 761/2012.⁶⁹

The National Payment System Proclamation was enacted with the objective of regulating and overseeing the national payment system of the country to ensure its safety, security and efficiency. This law was enacted at the time where some banks in Ethiopia started to introduce electronic payment systems. It was the first legislation to recognize electronic fund transfer and electronic signatures in Ethiopia. Despite the recognition of these matters, the law does not address the cyber security issues related to the electronic financial system. Article 35 of the law deals with unlawful acts and criminalizes forgery and fraud related activities specifically related to forgery of and fraud with payment instruments.⁷⁰

The Registration of Vital Events and National Identity Card Proclamation introduces the national electronic Identity Card system. Even though the issuance of the electronic Identity Card has not yet begun, this law has provisions which deal with cyber security issues. Articles 65 and 66 deal with some cyber security issues by stating that “information shall be protected from electronically designed attacks, theft or form other similar criminal abuse” and provide for imprisonment against malicious cyber-related activities.⁷¹

The Telecom Fraud Proclamation criminalizes interception of, access to and interference with telecommunication networks, services or systems without authorization. It outlaws illegal manipulation or duplication of SIM card, credit card, subscriber identification number or data. This law has been severely criticized for incorporating vague terms and being overly punitive.⁷²

In June 2016, Ethiopia passed the Computer Crime Proclamation No.959/2016, intended to safeguard national security and individual rights. The law criminalizes defamatory speech, spam and pornography, among other offences, with jail sentences of up to ten years. While the law aims to facilitate and accelerate the way in which the country penalizes computer crimes, it criminalizes

⁶⁸ Hailu, H. (no date). The State of Cybercrime Governance in Ethiopia. Retrieved March 21, 2017 from: <http://www.abysinnialaw.com/blog-posts/item/1545-the-state-of-cybercrime-governance-in-ethiopia>

⁶⁹ Ibid

⁷⁰ Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia. (2011). Proclamation No. 718/2011. Retrieved March 28, 2017 from <http://www.nbe.gov.et/pdf/Proclamation/nationalpaymentsystem.pdf>

⁷¹ Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia. (2012). Proclamation No.760/2012. Retrieved March 28, 2017 from <https://chilot.files.wordpress.com/2013/04/proclamation-no-760-2012-registration-of-vital-events-and-national-identity-card-proclamation.pdf>

⁷² Federal Negarit Gazeta of the Federal Democratic Republic of Ethiopia. (2012). Proclamation No.761/2012. Retrieved March 28, 2017 from <http://www.abysinnialaw.com/uploads/761.pdf>

legitimate forms of online speech. This joins many other laws that already threaten internet freedom in Ethiopia.⁷³

2.2 ICT Infrastructure

In terms of ICT infrastructure, Ethio Telecom provides telecommunication services to Ethiopia. There is an open-wire, microwave radio relay, radio communication in the HF, VHF and UHF frequencies. Two domestic satellites provide the national trunk service. There is 12,000 km optic fibre cable infrastructure starting from central Ethiopia to all directions of the country and connected all cities with a capacity to transmit 40 Gbps along with the national backbone.⁷⁴

In 2015, according to Ethio Telecom, there were 836,543 fixed telephone lines in use, 43 million mobile phone users and 13 million internet users with 87% wireless coverage across Ethiopia. MCIT has established 230 Community Information Centres and eleven community radio stations in remote areas of the country to provide information on new ICT technology transfer and implementations, healthcare, agricultural information and education issues.⁷⁵

Ethiopia is one of the last countries in Africa allowing its national telecommunications agency, Ethio Telecom, a monopoly on all telecom services including fixed, mobile, internet and data communications. A management contract with Orange Group was considered a first step towards privatization and the introduction of competition, and in 2013 the government rejected calls to privatize the incumbent and allow market competition.⁷⁶

While some \$3.1 billion has been invested in telecom infrastructure and service expansion projects over the last decade, the sector is heavily regulated and the government has complete control over networks, with virtually unlimited access to the call records of all phone users and to logs of internet traffic. ZTE and Huawei have provided most of the technologies used, and have often been favoured for offering vendor financing.⁷⁷

Ethiopia's mobile penetration remains among the lowest in the world, at 48,3%, but growth is strong and considerable growth potential remains. Under the auspices of GTP II, the country could have some 103 million mobile subscribers by 2020, as well as 56 million internet subscribers.⁷⁸

Ethiopia has experienced massive increases in international bandwidth, improvements in national fibre backbone infrastructure and the growing availability of mobile broadband services via 3G and LTE networks, developing the broadband network. Prohibitive prices have meant that uptake of broadband services was low, but recently retail prices have been comparable to other more developed markets in the region.⁷⁹ Figure 2 below shows the current rate of internet penetration in Ethiopia.

⁷³ Electronic Freedom Frontier. (2016). Ethiopia's New Cybercrime Law Allows for More Efficient and Systematic Prosecution of Online Speech. Retrieved March 13, 2017 from <https://www.eff.org/deeplinks/2016/06/ethiopias-new-cybercrime-law-allows-more-efficient-and-systematic-prosecution-online>

⁷⁴ IST Africa. (no date). Introduction – Ethiopia. Op cit

⁷⁵ Ibid

⁷⁶ BusseComm. (2017). Ethiopia - Telecoms, Mobile and Broadband - Statistics and Analyses. Retrieved March 19, 2017 from <https://www.budde.com.au/Research/Ethiopia-Telecoms-Mobile-and-Broadband-Statistics-and-Analyses>

⁷⁷ Ibid

⁷⁸ Ibid

⁷⁹ Ibid

Figure 5 Internet usage in Ethiopia⁸⁰

Year	Internet Users**	Penetration (% of Pop)	Total Population	Non-Users (Internetless)	1Y User Change	1Y User Change	Population Change
2016*	4,288,023	4.2 %	101,853,268	97,565,245	13.4 %	506,738	2.48 %
2015*	3,781,284	3.8 %	99,390,750	95,609,466	34.5 %	969,481	2.51 %
2014	2,811,803	2.9 %	96,958,732	94,146,929	56.5 %	1,015,194	2.54 %
2013	1,796,609	1.9 %	94,558,374	92,761,765	31.4 %	429,588	2.57 %
2012	1,367,021	1.5 %	92,191,211	90,824,190	38.3 %	378,575	2.6 %
2011	988,446	1.1 %	89,858,696	88,870,250	50.5 %	331,732	2.62 %
2010	656,714	0.8 %	87,561,814	86,905,100	42.6 %	196,082	2.65 %
2009	460,631	0.5 %	85,302,099	84,841,468	23.2 %	86,773	2.68 %
2008	373,858	0.5 %	83,079,608	82,705,750	24.9 %	74,558	2.7 %
2007	299,300	0.4 %	80,891,968	80,592,668	22.4 %	54,753	2.74 %
2006	244,547	0.3 %	78,735,675	78,491,128	45.3 %	76,269	2.78 %
2005	168,278	0.2 %	76,608,431	76,440,153	45.4 %	52,543	2.82 %
2004	115,735	0.2 %	74,506,974	74,391,239	51 %	39,093	2.86 %
2003	76,642	0.1 %	72,432,290	72,355,648	50.4 %	25,677	2.9 %
2002	50,965	0.1 %	70,391,170	70,340,205	100.5 %	25,548	2.92 %
2001	25,417	0 %	68,393,128	68,367,711	150.6 %	15,275	2.93 %
2000	10,142	0 %	66,443,603	66,433,461	25.3 %	2,046	2.93 %

The telecom network and service expansion activities are a major component of the second Growth and Transformation Plan (GTP II). According to the plan, by 2020, mobile service subscription will reach 103.7 million, and that of internet and fixed line will be 56 million, and 10 million, respectively. The mobile and internet penetration will be 100% and 54%. Out of the 56 million internet subscribers, 39 million will be broadband internet subscribers. The international internet gateway capacity will also increase, reaching 1,485 Gbps.⁸¹

2.3 ICT4D Initiatives

Although outdated, the ICT4D policy (2006–2010) is currently the only national policy regarding ICT4D in Ethiopia. The policy promotes the need for the development of ICT infrastructure to ensure

⁸⁰ Internet Life Stats. (2016). Ethiopia Internet Users. Retrieved March 20, 2017 from <http://www.internetlivestats.com/internet-users/ethiopia/>

⁸¹ International Telecommunications Union. (2015). Presentation on National ICT strategy and the Indicators needed to track its progress. Retrieved March 16, 2017 from https://www.itu.int/en/ITU-D/Statistics/Documents/events/ethiopia2015/3-Ethiopia_presentation_ICT_strategy.pdf

access to knowledge and information by all citizens. The policy is mainly aimed at development, deployment and the exploitation of ICTs to facilitate the growth of all key sectors of the economy. The policy also focuses on the use of ICTs for promoting democratic values, good governance, transparency and accountability. The objectives of the policy are to:

- facilitate public administration and service delivery, including the introduction of electronic government (e-government) and governance;
- promote ICT development at all levels of the educational system;
- use ICT for the development of sectors such as agriculture, health, industry and trade;
- develop telecommunications and physical infrastructure;
- facilitate private sector development including electronic commerce (e-commerce), electronic trade (e-trade) and foreign direct investment;
- promote research and development in ICT; and
- establish enabling legal and regulatory frameworks for smooth development of the ICT sector.⁸²

ICT initiatives in Ethiopia are primarily focused on e-Government and Public Key Infrastructure (PKI), e-Infrastructure, entrepreneurship and e-Education. National initiatives focused on stimulating the use of ICT include the National Data Set, National Enterprise Service Bus (NESB), Public Key Infrastructure (PKI), Ethio ICT Village, WoredaNet, and Integrated Financial Management Information System.⁸³

The e-Government initiatives are discussed below.

National Data Set project aims to provide a national level data set of commonly used data elements across ministries for delivering eServices.⁸⁴

National Enterprise Service Bus (NESB) is a platform for integration of ministry/agency applications and database at the back end; integrating all front-end channels to deliver eServices. The NESB master plan preparation is in progress.⁸⁵

Public Key Infrastructure (PKI) is aimed at providing PKI based identification, integrity and non-repudiation for online transactions related to the eGovernment projects in Ethiopia.⁸⁶ The framework for the PKI framework is complete and has moved into the implementation phase identification.⁸⁷

Open Data Implementation aims to implement open data at national level.⁸⁸

Ethio ICT Village is built on 200 hectares in Addis Ababa, and aims to establish Ethiopia as the premier IT hub of Africa. It will provide a world-class business environment along with a conducive policy and regulatory framework, and state-of-the-art infrastructure, incorporating an ICT business zone, assembly and warehouse zone, and a Knowledge Park zone.⁸⁹ In 2017 the Ethio ICT Village

⁸² Ministry of Capacity Building. (2006). The National ICT for Development (ICT4D) Five Years Action Plan for Ethiopia [2006-2010]. Op cit

⁸³ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Retrieved March 10, 2017 from <http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=8217>

⁸⁴ PricewaterhouseCoopers. (2010). e-Government Strategy and Implementation Plan – Report January 2011. Retrieved March 10, 2017 from <http://www.mcit.gov.et/documents/1268465/0/Final+e-Government+strategy+Implementation+Report+v1.12-26th+Feb.pdf/f8e5a322-ad0c-4d3e-b040-8352147b1835>

⁸⁵ Ibid

⁸⁶ Ibid

⁸⁷ IST Africa. (no date). Introduction – Ethiopia. Op cit

⁸⁸ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

⁸⁹ Ministry of Communications and Information Technology. (no date). Ethio ICT Village. Retrieved March 28, 2017 from http://www.ictet.org/downloads/Eth_HV9trK_ZZ2N.pdf

announced that it was planning to have more than 70 companies operating in the park by the end of the 2016/2017 fiscal year. The village currently has 20 local companies and six foreign companies taking up office space in the village, with the MCIT and Ethio Telecom building their offices in the village. The second phase of construction is underway and is expected to be completed within three years.⁹⁰

WoredaNET is an eGovernment network connecting more than 600 local, regional and federal government offices across the country. It is a terrestrial and satellite based network designed with the primary objective to provide ICT services including video conferencing, directory, messaging and voice over IP, and internet connectivity to the federal, regional and woreda (district) level government entities. The WoredaNet implementation project is part of the broader eGovernment Strategy. The goal of WoredaNet is to establish a multi-service IP-based service by the use of terrestrial broadband and VSAT infrastructure for the delivery of services to government and the citizens, towards the improvisation of federal and regional government administrative efficiency, effectiveness and productivity, and information provision and service delivery to the public at large.

The main objectives of the project are:

- to bridge the digital divide between urban and rural communities;
- to provide information to citizens;
- to build organizational capacity at all levels of government; and
- to provide the lowest level of government with accurate and timely information.⁹¹

Integrated Financial Management Information System (IFMIS) enables public institutions to use one system with extensive facilities from one source. This enables the Ministry of Finance and Economic Development (MoFED) to improve the quality of financial decision-making by generating timely financial information. The system is a custom-built solution using industry standard products and open source frameworks.⁹²

ICT Business Incubation Centre (MICT-BIC) was initiated in 2008 under the Information and Communication Technology Assisted Development (ICTAD) Project of EICTDA in cooperation with the World Bank and the German Development Service. The project aims to provide solutions to difficulties that graduates of higher education institutions are facing such as finding employment in governmental and private organisations. The main objective of MICT-BIC is to serve as a vehicle for development of competitive ICT based businesses and foster technology innovation.⁹³

MICT-BIC provides a standardized training programme on entrepreneurship, business plan development and incubation services. Currently there are two incubation centres in Jigjiga and Diredawa, which have started activities.⁹⁴

2.4 Key Actors and Players

Actor/Player	Role and Area of Development
Ministry of Communication	Leads the ICT development in Ethiopia; responsible for development of ICT policies and infrastructure, and eGovernment strategy

⁹⁰ EZega. (2017). Ethiopian ICT Park to Admit 70 New Companies. Retrieved March 28, 2018 from <https://www.ezega.com/News/NewsDetails/3903/Ethiopian-ICT-Park-to-Admit-70-New-Companies>

⁹¹ UNPAN. (no date). WoredaNet – Ethiopian Government Network. Retrieved March 28, 2017 from <http://unpan1.un.org/intradoc/groups/public/documents/un-dpadm/unpan034887.pdf>

⁹² PricewaterhouseCoopers. (2010). e-Government Strategy and Implementation Plan – Report January 2011. Op cit

⁹³ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

⁹⁴ Ibid

and ICT (MCIT)	
Ethio Telecom	Previously known as the Ethiopian Telecommunications Corporation; the sole telecommunications services provider in Ethiopia, providing internet and telephone services.

2.5 Challenges in ICT Development

According to the draft 2016 National ICT Policy, the ICT sector in Ethiopia still faces substantial challenges, that are addressed in the draft policy framework, including amongst others:

- *Differences in the extent of usage of broadband services and availability of the latest broadband technologies;*
- *Cost of broadband connectivity impeding its widespread diffusion;*
- *Incomplete connectivity of all institutions in government, education and health networks;*
- *Need for ICT legislation and regulation to adjust to the rapidly evolving ICT sector;*
- *Insufficient locally relevant ICT services and applications for economic and social development and poverty reduction;*
- *Need for ICT to provide a valuable contribution to monitoring, mitigating and adapting to climate change and for ICT to play an enhanced role in emergency communications and disaster relief;*
- *Lack of digital literacy and awareness to enable all citizens to access and contribute to sharing of information, ideas and knowledge to create an inclusive information society; and*
- *Constraints to fully unleash the potential of small innovative entrepreneurs for transforming the economy.*⁹⁵

Ethiopia has Africa's last big telecoms monopoly. The absence of competition has seen Ethiopia lag badly behind the rest of the continent in an industry that has generally flourished alongside economic growth. It has been argued that a US\$1.6 billion agreement with China's two leading telecoms-equipment companies, Huawei and ZTE, to upgrade its network will preserve Ethiopia's state dominance and further put off the opening up of one of Africa's largest economies.⁹⁶

The Ethiopian government claims to have made the development of ICT one of its strategic plan priorities. Despite the challenges in ICT development, the government has a commitment to accelerate the development of ICT in order to strengthen the on-going process of sustainable development and poverty reduction, as well as good governance.⁹⁷

Along with the Computer Crime Proclamation of 2016, which criminalizes legitimate forms of online speech, many other laws threaten internet freedom in Ethiopia. The Proclamation on Telecom Fraud Offences prohibits certain services, such as Call Back services and Fax over the Internet, while extending the provisions of the Criminal Code of 2004 and Anti-Terrorism Proclamation of 2009 to electronic communications.⁹⁸

⁹⁵ Ministry of Communication and ICT. (2016). National ICT Policy. Retrieved March 13, 2017 from http://www.mcit.gov.et/web/english/the-national-ict-policy#_48_INSTANCE_a3qjCO1umuLf=http%3A%2F%2Fwww.mcit.gov.et%2Fdocuments%2F1268465%2F13533561%2FFDRE%2B-%2BNational%2BICT%2BPolicy%2BEnglish.pdf%2F1a626364-1ef3-424f-97ce-33356ca4628f%3F

⁹⁶ The Economist. (2013). Out of reach. Retrieved March 20, 2017 from <http://www.economist.com/news/middle-east-and-africa/21584037-government-expands-mobile-phone-network-tightens-its-grip-out-reach>

⁹⁷ Ministry of Communication and Information Technology. (2016). National ICT Policy. Op cit

⁹⁸ Electronic Freedom Frontier. (2016). Ethiopia's New Cybercrime Law Allows for More Efficient and Systematic Prosecution of Online Speech. Op cit

The Ethiopian government has control over all forms of communication in the country. This is a huge challenge for the development of ICT in the country, particularly deterring further foreign investment.

3. Education

The Ethiopian Ministry of Education (MoE) coordinates general, higher, and technical and vocational education and training (TVET) education in the country.

Pre-primary education is delivered through three modalities in Ethiopia. Kindergarten is predominantly operated by non-governmental organisations (NGOs), communities, private institutions, and faith-based organisations. Non-formal pre-school service is being delivered mainly through the child-to-child initiatives. The third modality is the most widespread response of local governments and that has been the setting up of 'O' class.⁹⁹

Ethiopian primary education lasts eight years (age 6 to 14) and is divided into two four-year cycles (Grade 1 through Grade 4, and Grade 5 through 8). At the end of Grade 4, pupils take a national exam and must achieve a score of at least 50% to continue to Grade 5. At the end of Grade 8, pupils take the national Primary School Leaving Certificate Examination. Primary education is followed by two years of secondary education. At the end of Grade 10, pupils take the Ethiopian General Secondary Education Certificate Examination. This exam is administered by the Ministry of Education's National Organization for Examinations. After having successfully completed this exam, pupils can opt to attend the two general upper grades or follow vocational training. The second phase of preparatory secondary education also consists of a two-year period (Grades 11, 12) and is regarded as preparation for higher education. Until 2003, pupils could obtain the Ethiopian School Leaving Certificate (ESLC) at the end of Grade 12. This certificate has been replaced by the Ethiopian Higher Education Entrance Examination.¹⁰⁰

After having completed Grade 10 of their primary education, pupils can choose to attend TVET. There are one-year and two-year programmes resulting in a Level I and Level II Certificate, and three-year programmes resulting in a diploma.¹⁰¹

Admission to higher education is based on the Ethiopian Higher Education Entrance Examination. Students must obtain a grade point average (GPA) of at least 2.0 to be admitted to bachelor's courses. In practice, however, admission is restricted to pupils with the highest grades due to the limited capacity of the higher education system. Students that have achieved a C grade or higher in at least five subjects including English, mathematics and Amharic are generally admitted. Admission to the diploma programmes requires a GPA of 1.4, yet in practice the required GPA is determined on the basis of the number of available seats. To increase access to higher education for women, they are allowed admission with a GPA that is 0.2 points lower than the required GPA.¹⁰²

Diploma institutes, colleges and technical universities offer mainly professional-oriented diploma programmes. These programmes have a nominal duration of one or two years. Although these diploma programmes are mainly designed to prepare students for the labour market, they also provide access to bachelor degree programmes. In addition to diploma programmes, universities offer bachelor degree programmes. All bachelor programmes are at least three to four years in duration. Master's programmes have a duration of one or two years. In order to be admitted to the master's programmes, students must obtain a bachelor's degree.¹⁰³

⁹⁹ Ministry of Education. (2016). Educational Statistical Annual Abstract 2007 E.C. Retrieved March 10, 2017 from <http://www.moe.gov.et/statistics>

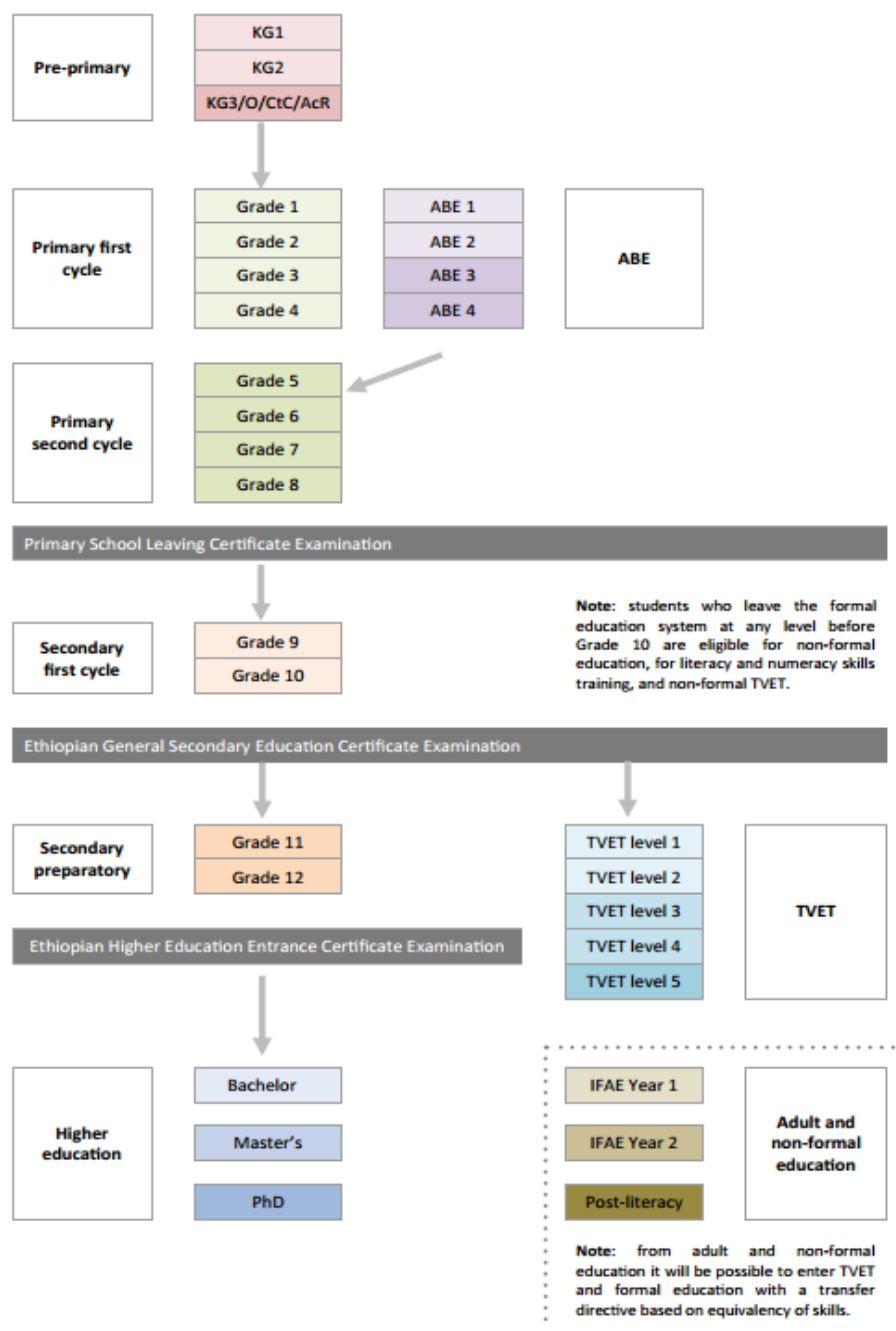
¹⁰⁰ Ministry of Education. (2011). About the Ethiopian Education System. Retrieved March 28, 2017 from <http://info.moe.gov.et/ates.shtml>

¹⁰¹ Ibid

¹⁰² EP-Nuffic. (2012). The Ethiopian education system described and compared with the Dutch system. Retrieved March 12, 2017 from <https://www.epnuffic.nl/en/publications/find-a-publication/education-system-ethiopia.pdf>

¹⁰³ EP-Nuffic. (2012). The Ethiopian education system described and compared with the Dutch system. Op cit

Figure 6 The Ethiopian education and training system^{104 105},



The Education and Training Policy of 1994 has inspired five medium-term Education Sector Development Programmes (ESDP). ESDP V is the fifth medium-term plan which serves as the central strategy document for educational development in Ethiopia from 2015/16 to 2019/20. ESDP V focuses on a few select important policy priorities (for example, improving teacher quality, developing core foundation skills, reducing high drop-out and repetition rates and ensuring

¹⁰⁴ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Retrieved March 10, 2017 from <http://www.globalpartnership.org/content/education-sector-plan-2016-2020-ethiopia>

¹⁰⁵ Kindergarten (KG); Alternative Basic Education (ABE); Technical and Vocational Education and Training (TVET), Integrated Functional Adult Education (IFAE)

relevance of middle- and higher-level training) rather than trying to spread limited resources across too many priorities. These align with the priorities established in the second Growth and Transformation Plan which emphasize economic growth and industrialization. This national policy document makes clear the expected changes in the structure of the economy over the next five years and the implications for education and training as a main source of supply of human capital to the emerging economic and productive sectors.¹⁰⁶

ESDP V outlines the following main goals, addressing the main challenges in the Ethiopian education system:

- 1) Improve management of the education sector through:
 - Improving human resource capacity and sufficient resources at all levels.
 - Effectively using results-oriented planning and activity management system to implement ESDP V.
 - Improving communication and coordination for more efficient use of resources and activities implementation.
 - Providing systems for promoting a culture of evidence-based policy development across all levels.
- 2) Improve the quality of general education through:
 - Investing in teachers' and leaders' development.
 - Improving the school curriculum and producing good quality teaching and learning materials to support the curriculum.
 - Developing and fostering school improvement programs and improving quality assurance and system performance.
 - Supporting information and communications technology as a tool for improving learning.
- 3) Improve access and equity in general education through:
 - Providing access to education and schooling for all children across all levels with a focus on the most disadvantaged.
 - Reducing drop-out and repetition rates in primary schooling.
 - Improving completion rates at all levels of primary schooling.
 - Increasing participation in secondary schooling.
 - Addressing gender issues in education.
 - Providing support for young people with special education needs.
- 4) Increase the adult literacy rate through improving the skill levels of facilitators and adult education tutors, and improving the coordination and quality of adult education in communities.
- 5) Develop a skilled and competent workforce through increasing access to good quality TVET, ensuring that training is employment-led, and transferring technologies to priority sectors to increase competitiveness and productivity.
- 6) Focus on higher education through:
 - Increasing enrolment in higher education.
 - Improving access to higher education in disadvantaged groups.
 - Improving the quality of teaching and research.
 - Improving the relevance of higher education instruction and research community.¹⁰⁷

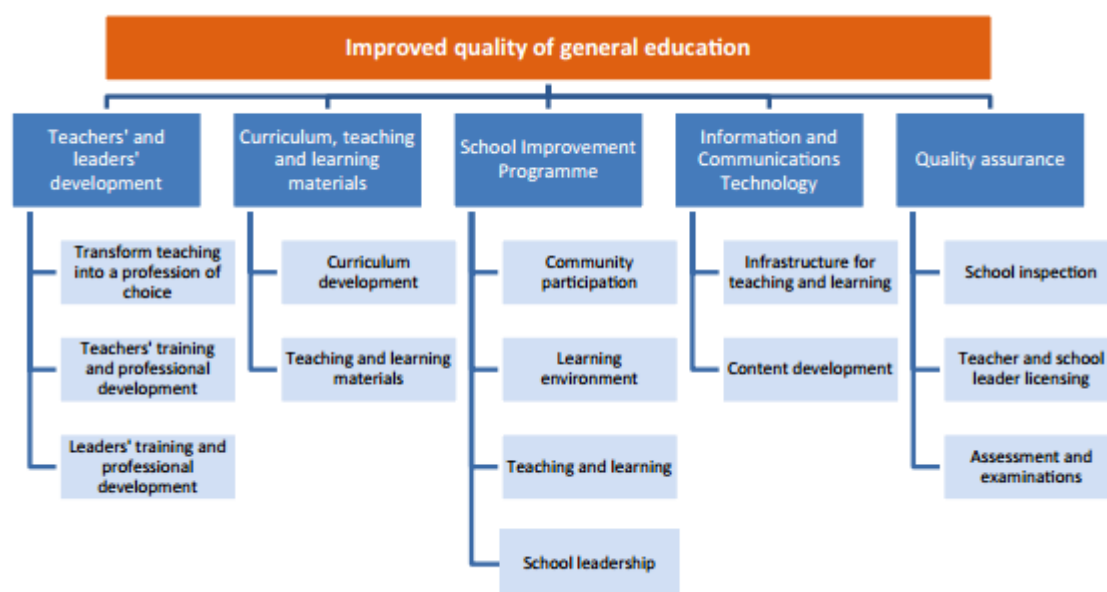
The ESDP V also focuses on crosscutting issues that affect all education sub-sectors. These issues are gender, special needs and inclusive education, HIV/AIDs, education in emergencies, school health and nutrition, drug and substance abuse prevention, and water, sanitation and hygiene.¹⁰⁸

¹⁰⁶ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Op cit

¹⁰⁷ Ibid

¹⁰⁸ Ibid

Figure 7 Structure of components that contribute to improving the quality of general education¹⁰⁹



Enrolment in the education sector in 2014/2015 is summarized below.

Table 1 Summary of enrolment information for 2014/2015¹¹⁰

Section	Total Enrolment	Gross enrolment ratio	% of female students	Total Teachers
Pre-Primary	2,958,803	39%	50%	19,706
Primary	18,691,217	102.7%	47%	396,099
Secondary	2,108,115	25.61%	48%	81,932
TVET	352,144	N/A	52%	21,830
Undergraduate	729,028	N/A	34.7%	N/A

Equity

Ethiopian women have one of the world's lowest literacy rates, with 41% in 2014. This statistic means fewer than half of women are able to read and write. Over the last decade, the country has made strides in educating women between the ages of 15 and 19, achieving a 70% literacy rate by 2014. Among 45 and 49 year old women, however, the literacy rate is 18%. Ethiopian women's literacy rate also varies by income level and depending on whether women live in urban or rural areas. In 2013, the literacy rates for women in the wealthiest households was 72%, compared to 17% for women in the poorest households. Women in urban areas also fare much better, as 71% are literate compared to 32% of rural women.¹¹¹

The Ministry of Education collects data on the repetition rate, a measurement of how many students remain in the same grade for two or more consecutive years. In 2012/2013, boys' repetition rate was higher than girls'. The data underscores the fact that if provided the opportunity, girls stay and

¹⁰⁹ ibid

¹¹⁰ Ministry of Education. (2016). Educational Statistical Annual Abstract 2007 E.C. Op cit

¹¹¹ Beyene, H. (2015). National Assessment: Ethiopia – Gender equality and the Knowledge Society. Retrieved March 20, 2017 from <http://owsd.ictp.it/sites/default/files/National%20Assessment%20on%20Gender%20and%20STI%20-%20Ethiopia.pdf>

do well in school, and thus that there needs to be sustained and systematic effort to support the education of Ethiopian girls.¹¹²

In terms of the SDG of achieving gender equality and empower all women and girls, the Ethiopian government has implemented policies aimed at equality and ensuring that women benefit from the economy. The gender parity index in primary education reached 0.91 in 2015/16.¹¹³

Despite the continuing improvement of the gender gap in enrolment, differences in the education of urban and rural women persist at the secondary or higher levels. Only 7% of rural women, compared with 38% of urban women, have secondary or higher education. Given the fact that most students are rural residents, it means that girls still lag behind nationally.¹¹⁴

Female enrolment in TVETs remains almost equal to men's. In 2012/13, at 51.2%, and 52% in 2014/2015 female enrolment is slightly more than men's. Unlike primary and secondary schools, higher education institutions have not made great strides in closing the gender gap. The percentage of female students hovered around 30% in 2012/2013. Furthermore, non-government schools had a higher enrolment rate of female students at 42.6%, far ahead of the 27.9% of women enrolled in state-owned institutions.¹¹⁵

3.1 ICT in Education

The government introduced the ICTs in Education Implementation Strategy and Action Plan in 2010 as one of the pillars of the ICT4D policy to address the rural-urban divide in Ethiopia in terms of access to computer in education.¹¹⁶

ESDP IV planned to equip all secondary schools with the equipment necessary to access satellite television education and e-learning programmes in computer laboratories. By 2015, 69% of secondary schools had benefited from the educational satellite television broadcast programme. To overcome shortages of power supply in schools and interruption of satellite transmission, newly developed educational television programmes were digitised and dispatched on DVDs. Only 28% of secondary schools have access to an internet service and, of these, only 6% have high capacity content servers. English language interactive radio instruction programmes have been developed by the Centre for Educational Information and Communication Technology (CEICT) of the MoE for use in primary schools. These programmes and educational audio programmes in other subjects were aired in primary schools.¹¹⁷

¹¹² Ibid

¹¹³ United Nations. (2017). Ethiopia. Retrieved June 28, 2017 from <https://sustainabledevelopment.un.org/memberstates/ethiopia>

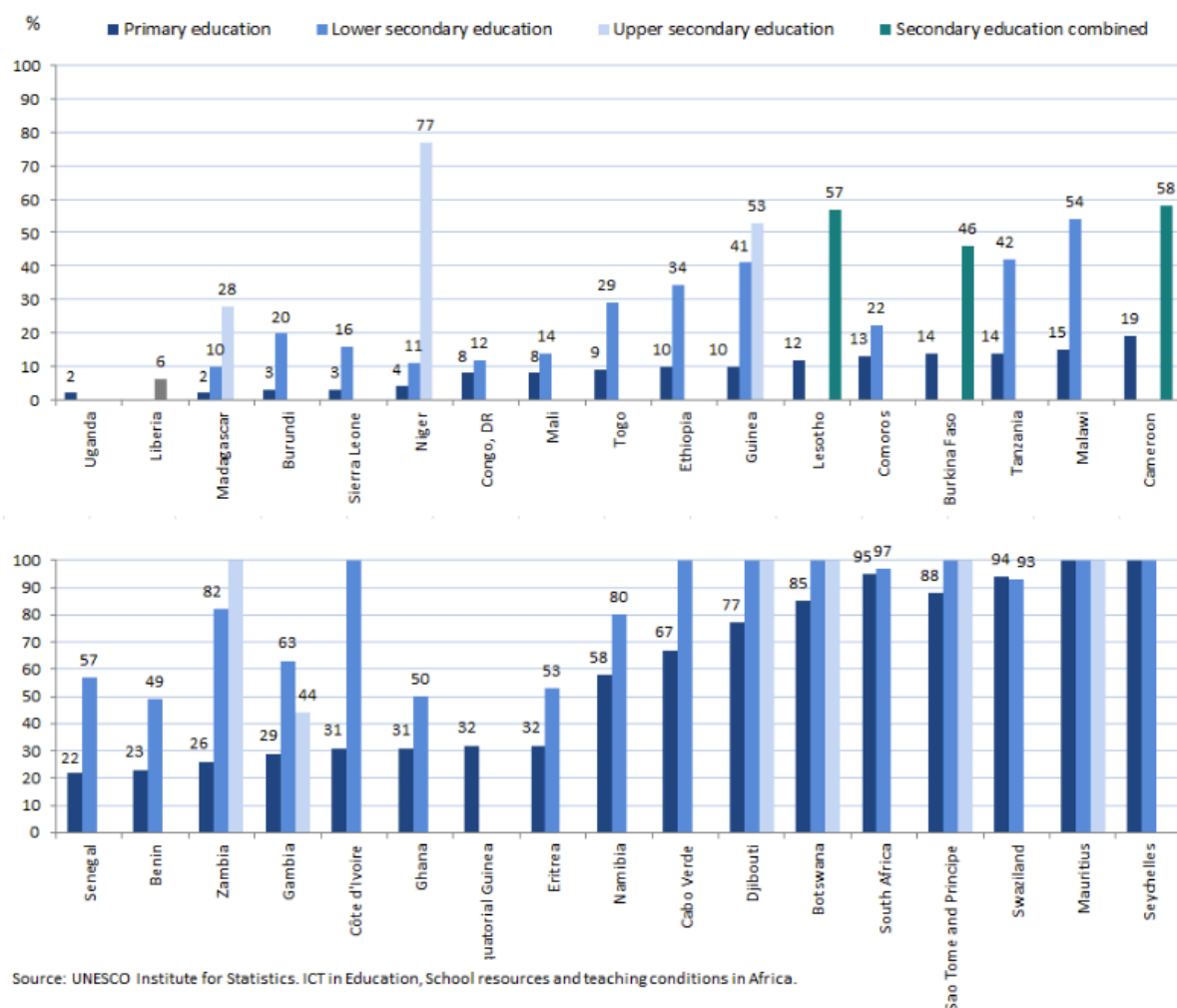
¹¹⁴ Beyene, H. (2015). National Assessment: Ethiopia – Gender equality and the Knowledge Society. Op cit

¹¹⁵ Beyene, H. (2015). National Assessment: Ethiopia – Gender equality and the Knowledge Society. Op cit

¹¹⁶ IST Africa. (no date). Introduction – Ethiopia. Op cit

¹¹⁷ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Op cit

Figure 8 Percentage of schools with regular and reliable access to electricity, 2013¹¹⁸



The Ethiopian Educational and Research Network (EthERNET) was initiated in 2001 as part of the national capacity building programme to provide connectivity and specialized applications for schools and local governments. The project was launched to develop interconnected, high-performance networks for universities and other educational and research institutions in Ethiopia, and by doing this, to enable these institutions to share educational resources and collaborate both within Ethiopia and globally.¹¹⁹

EthERNET has a network with 20 Mbit/s or better bandwidth connecting 22 universities in Ethiopia. Plans have been made to build the next generation network that would provide 10 Gbit/s to each of the public universities. EthERNET's vision is to provide an interconnected and advanced network of Ethiopian Research and Education institutions that enables institutions to actively and effectively participate in the national, regional and global research and education communities. The Ministry of Education is currently working with ICT Centre of Excellence (Ethiopia) to build a strong organisational framework for EthERNET that will enable it to engage with a wide range of

¹¹⁸ UNESCO. (2015). Information and Communication Technology (ICT) in Education in Sub-Saharan Africa. Retrieved March 10, 2017 from <http://unesdoc.unesco.org/images/0023/002342/234279e.pdf>

¹¹⁹ UbuntuNet Alliance. (no date). EthERNET, Ethiopia. Retrieved March 28, 2017 from <https://www.ubuntunet.net/ethernet> <http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=8217U>

stakeholders such as universities, and involve them in helping set the direction and services that EthERNet develops and delivers.¹²⁰

SchoolNet is a satellite-based network that provides internet connectivity as well as TV-broadcast educational content to secondary schools across Ethiopia. SchoolNet aims to provide students in rural schools with access to equal learning opportunities to those in urban schools. The MoE launched the SchoolNet Project in 2003 with support from UNDP. Around 756 schools have been connected through this project. The second phase of the SchoolNet project will connect more schools and provide internet access.¹²¹

In 2016, the MoE and Inspur Group Company Limited signed about US\$ 20 million contract commissioning educational infrastructure and services for 300 secondary schools and ten universities. One of the components of the contract is the provision of text books. The MoE published nearly 65 million text books for secondary schools in seven mother tongue languages. The project has been rolled out to 2,622 secondary schools in the country and Educational Private Cloud Infrastructure and Services have been distributed proportionally. All secondary schools need to address internet access, have power supply and accessibility to the road.¹²²

3.2 Curriculum

In the ESDP III period a full curriculum revision was conducted. This was implemented during ESDP IV in all primary and secondary schools. According to ESDP V, a revision and modernization of the school curriculum will continue with an academic focus on mathematics and sciences in response to economic needs and will be supported through the development of quality learning materials. The use of ICT will help teachers and students develop the skills and technologies that Ethiopia will need in its future workforce. It is envisioned that the curriculum update will pay attention to the incorporation of modern technology and vocational topics and education for entrepreneurship. In line with the priorities of the second Growth and Transformation Plan, a large demand is expected for middle - and higher-level human resources.¹²³

It is the Curriculum Development Institute's responsibility to specify and guide the Centre for Educational Information and Communication Technology (CEICT) in the production of digital learning materials for use by regions and to guide schools in providing adequate equipment in science laboratories.¹²⁴

A sub-component of the priority programme, general education quality, of ESDP V states that the strategy will cover the development of digital content, to be shared across the various platforms and that ICT will be mainstreamed across core subjects at all levels. Rather than a stand-alone ICT course, activities will exist for all core subjects that demand the use of ICT, including radio, television and digital technologies. It is envisioned that as the curriculum is updated, digital content will be adapted for core elements. To boost an e-learning culture among students and teachers and to improve the alignment of digital resources with the curriculum, digital content will be developed for all curriculum subjects. These will be supplemented by additional materials for crosscutting issues, focusing on topics including gender, environmental protection, and HIV/AIDS.¹²⁵

¹²⁰ Ibid

¹²¹ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

¹²² The Ethiopian Herald. (2016). Ethiopia: Equipping Schools With ICT. Retrieved March 12, 2017 from <http://allafrica.com/stories/201602231152.html>

¹²³ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Op cit

¹²⁴ Ibid

¹²⁵ Ibid

3.3 Professional Development

Ethiopia's government adopted an Education and Training Policy in 1994. The Ethiopian Education and Training Policy aimed to achieve four educational goals namely, quality, access, relevance, and equity. The government also established new teachers training colleges and upgraded the existing ones. In Ethiopia, all teacher education activities are organized under the Federal Ministry of Education through the Department of Educational Programmes and Teacher Education. The primary school teacher training programmes and training for TVET teachers is supervised by the Teacher Education Department of the General Education sub-sector, while the secondary teachers training programme is the onus of the Higher Education Department. In addition to the teacher education policy, a teacher education reform called Teacher Development Program (TDP) was also implemented by the Ministry of Education which is jointly funded by six donor countries.¹²⁶

The first Education Sector Development Programme (ESDP I) considered the shortage of trained teachers as one of the major obstacles to providing quality education. ESDP V (2015) states that all teachers will move to the required qualification standard: a three-year diploma for primary school teachers; a first or second degree, respectively, for first and second cycle secondary teachers; a one-year accelerated mixed-mode of training for ABE teachers; and a certificate or multi-year diploma for Early Childhood Care and Education (ECCE) facilitators and teachers.¹²⁷

The plan is for teachers trained specifically for pre-primary education to complete either a one-year certificate or a new multi-year diploma. Given the limited availability of teacher educators with specific skills for ECCE instruction, in order that skilled educators exist in all colleges of teacher education (CTEs), a training programme for ECCE educators will be provided centrally. Once training for ECCE teachers is offered in all CTEs, the system should reach the capacity required to fill the existing gap and future expectations of ECCE staff. Selected universities and CTEs have started teacher education programmes on special needs education. These programmes will be further supported by the development of pre-service training modules.¹²⁸

In-service training for all teachers will be provided through a targeted programme of Continuous Professional Development (CPD). The approach to CPD is conceptualized as a school level, peer-led professional excellence strategy, consisting of reflective activity designed to improve an individual's values, knowledge and skills. It is designed to support teachers' individual needs and to improve professional practice and will be delivered through external expertise, school networks and clusters, and school-based training.¹²⁹

ICT will be fully integrated in teachers' training courses and supported with practice so that teachers are equipped to use technology and to teach and assist their students with technology. The Teacher Education Programme emphasizes enhancing the capacity of teachers in the use of ICTs in teaching and learning processes of various basic subjects especially in secondary schools. ICT helps teachers to use devices such as cell phones and computers, and internet services. ICT facilitates communication between teachers and between student and teacher both on the campus and off the campus. ICT also allows teachers to access information through teacher portals, websites, office software, multimedia programmes, and sharing information within and across schools.¹³⁰

¹²⁶ African Journal of Teacher Education. (2013). Teacher Education in Ethiopia: Growth and Development. Retrieved March 18, 2017 from <https://journal.lib.uoguelph.ca/index.php/ajote/article/view/2850/3254>

¹²⁷ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Op cit

¹²⁸ Ibid

¹²⁹ Ibid

¹³⁰ African Journal of Teacher Education. (2013). Teacher Education in Ethiopia: Growth and Development. Op cit

The Government of Ethiopia is making strides to improve student and teacher access to quality enhancement tools and training. Camara Education Ethiopia is a non-governmental organization (NGO) working in partnership with the MoE to supply ICT equipment, educational content, technical support, and teacher training to primary and secondary schools and teacher training institutions across Ethiopia. At the end of 2015, Camara Education completed a five-year project by delivering over 17,500 refurbished computers to about 600 primary and secondary schools across seven regions. The Camara Ethiopia team has been working to ensure schools have adequately prepared their eLearning Centres, and teachers are trained properly in order to ensure students and teachers make the best use of the resources and training.¹³¹

Introduction of digital television instructional delivery or “plasma teacher” in the Ethiopian classrooms in 2004 has revolutionized the education process. The Educational Satellite Television Programme enables teachers to impart lessons in natural sciences, mathematics, English, and civics through plasma display screens on television in place of traditional teaching classes. The introduction of plasma teachers in Ethiopian schools has been quite successful. An important advantage of this system is that it helps to develop a standard syllabus all over the country as plasma teaching materials are uniformly transmitted to the students via satellite in all parts of the country, irrespective of any contextual differences among them. The teacher candidates who operate the plasma display panel are given training as to how to operate the television to impart the lessons through the media.¹³²

Mathematics and science form the foundation of the education and training programs included in teacher education. The Ethiopian government has initiated a countrywide teacher education and training programme which aims to increase the quantity and quality of mathematics and science teachers at different teaching levels. The Mathematics and Science Teacher Education Programme focuses on increasing the capacity of teachers in the use of ICTs in teaching and learning mathematics and science and increasing the number of qualified and efficient mathematics and science teachers in schools all over Ethiopia.¹³³

In connection with mathematics and science teacher education the African Virtual University (AVU) initiated a teacher education and training programme initiated in 2005 to improve the quality of teacher education across Africa. The programme was launched as a part of AVU’s policy to meet the challenges of the teaching profession in Africa which was jointly funded by the African Development Bank (AfDB) and the United Nations Development Program (UNDP). Since 2005 when the project was launched, a total of 54 modules were developed for Biology, Chemistry, Physics, Mathematics, Basic ICT Skills, and the Pedagogy and Practice of Integrating ICTs into Science and Mathematics. The project fulfils the purpose of teacher capacity building in two ways. The first motive is to improve the competencies of teachers in the use of ICT in imparting mathematics and science education, and the second purpose is to develop the capacity of teachers to deliver ICT education. The working partner of AVU in Ethiopia is Jimma University.¹³⁴

More than 30 English Language Improvement Centres were established in different Teacher Education Institutes (TEIs) of Ethiopia that provide language support to the teacher trainees and

¹³¹ Camara. (2016). Annual Report 2015. Retrieved March 28, 2017 from <http://camara.org/wp-content/uploads/2016/07/Annual-Report-2015.pdf>

¹³² Centre for Educational Information and Communication Technology. (no date). Information and Communication Technology (ICT). Retrieved March 28, 2017 from <http://www.ceict.gov.et/web/guest/msgg>

¹³³ African Journal of Teacher Education. (2013). Teacher Education in Ethiopia: Growth and Development. Op cit

¹³⁴ African Virtual University. (2017). Teacher Education. Retrieved March 28, 2017 from <http://www.avu.org/avuwweb/en/projects/past-projects/teacher-education/>

administrative staff along with providing technical assistance to teacher educators. The English Language Improvement Project became a priority programme of the TPD.¹³⁵

3.4 Key Actors and Players

Actor/Player	Role and Area of Development
Ministry of Education	Government ministry responsible for the government and management of Ethiopia's education mandated with providing education at all levels
Curriculum Development Institute	To be established by MoE to guide the MoE in the adaptation of the curriculum
Centre for Educational Information and Communication Technology (CEICT)	An agency of the MoE providing education through electronic technology
Camara Education Ethiopia	Improves education in disadvantaged communities using technology to deliver 21 st century skills
African Virtual University (AVU)	A Pan African intergovernmental organization with a mandate of increasing access to quality higher education and training through the innovative use of information communication technologies
EthERNet	Responsible for building stable, reliable, flexible, modular, and scalable network infrastructure across the country and connect higher education institutions to the global research community
Inspur Group	Total solution and service provider of cloud computing

3.5 Challenges facing the education sector

At primary level, increased primary school enrolment creates opportunity, but accessing quality education remains a significant problem for the most disadvantaged children in Ethiopia. A lack of electricity in schools limits access to ICT initiatives. Poorer children and those in rural areas enrol later and make slower progress in learning. Late and delayed enrolment in school are associated with slow grade progression, drop-out and poor achievement. Absenteeism and drop-out among boys is often higher than for girls and are largely due to their involvement in unpaid domestic/agriculture work, whereas for girls they are mainly the result of a need to look after younger siblings and the direct cost of schooling (such as school uniforms, stationery, and parental contributions towards school improvement activities).¹³⁶

Another challenge across primary and secondary education is the low levels of teacher qualification. Teacher characteristics, particularly their qualifications, subject knowledge and motivation for teaching, impact the nature and quality of pupils' classroom experience.¹³⁷

Some of the major challenges in the field of teacher education in Ethiopia are problems of quality and relevance of program of studies, and research that is inefficient in resource utilization. It is not enough to merely establish reforms and policies, but it should be ensured that the implications of the reform decisions are properly interpreted and addressed by the authorities concerned. The

¹³⁵ British Council. (no date). The English Language Improvement Project (ELIP), Ethiopia. Retrieved March 28, 2017 from <https://englishagenda.britishcouncil.org/global-projects/track-record/english-language-improvement-project-elip-ethiopia>

¹³⁶ Young Lives. (2017). Improving Education Quality, Equity and Access in Ethiopia: Findings from the Young Lives School Component. Retrieved March 20, 2017 from <http://www.younglives-ethiopia.org/files/policy-papers/et-pb1-improving-education-quality-equity-access>

¹³⁷ Ibid

other challenges faced by teacher education are inadequate capacity for professional development within the education system, lack of transparency within its processes, and the need for a participatory approach of the leadership and management of educational institutions.¹³⁸

At 8%, African higher education enrolment is significantly lower than the global average of 32%, and Ethiopia trails even further behind, with fewer than 6% of university-age adults attending university. Ethiopia desperately needs universities to drive development, and higher education infrastructure has burgeoned in the last two decades, but the institutions suffer from curricula being abandoned due to funding cuts, unqualified lecturers, and shoddily built institutions.¹³⁹

¹³⁸ African Journal of Teacher Education. (2013). Teacher Education in Ethiopia: Growth and Development. Op cit

¹³⁹ The Guardian. (2015). Ethiopia's higher-education boom built on shoddy foundations. Retrieved March 22, 2017 from <https://www.theguardian.com/global-development-professionals-network/2015/jun/22/ethiopia-higher-education-universities-development>

4 Science, Technology, and Innovation (STI)

Four years before most of the developing countries were introduced to science and technology policy by the United Nation in the Science and Technology conference 1979, Ethiopia established the Ethiopia Science and Technology Commission in 1975 by proclamation No.62/1975. It was set up with the mission to initiate, organize, direct and promote scientific and technology research and development endeavours, but did little towards this end. The Commission was re-established in 1994 and soon thereafter reinstated as an agency. The government, recognizing the importance of science and technology on economic growth and development, elevated the Agency to a full-fledged ministry, Ministry of Science and Technology (MoST). The Ministry was established in 2008. The office was then restructured in 2010 to fit in with the definitions of powers and duties of the executive organ government by proclamation No.691/2010. Subsequent to the introduction of the Growth and Transformation Plan (GTP), aligning the STI policy was a necessity, and it was revised in 2012 to accommodate the changes in strategy of the country.¹⁴⁰

A few organizations and agencies of MoST are described below.

The Science and Technology Information Centre (STIC) was established to identify, gather, organize, analyze and add value through research, as well as disseminate a science and technology information to accelerate Ethiopia's technology transfer. STIC has been given the mission to ensure the competitiveness of the key science and technology information users, including manufacturing and service providing enterprises, higher education and research institutes.¹⁴¹

The Ethiopian Conformity Assessment Enterprise (ECAE) was established in 2011 as a federally owned public enterprise, governed by MoST. ECAE is the major conformity assessment organization in the country providing testing laboratory, inspection and certification services to the industry and to the public.¹⁴²

The Ethiopian National Accreditation Office (ENAO) is mandated to accredit the competence of Conformity Assessment Bodies (CABs) to perform specific activities, such as test, calibrations, certifications or inspections. The focus of its activities is to ensure that the key sectors of textiles, construction, leather, agro-processing, pharmaceutical/chemical and manufacturing which have been identified for accelerated development will be serviced.¹⁴³

The Ethiopian Standards Agency (ESA) is a governmental agency which is accountable to the MoST, and has a national standardization council which works together with the agency. ESA has three core business areas which mainly focus on the standard formulation, training and technical support, and organizing and disseminating standards, conformity assessment procedures and technical regulation for the customers.¹⁴⁴

¹⁴⁰ Weldegiorgis, KC. (2015). Analysis of Science, Technology and innovation policy and its challenges in Ethiopia; an emphasis on the role of HEIS. Retrieved March 13, 2017 from <http://www.journalcra.com/sites/default/files/7281.pdf>

¹⁴¹ Science and Technology Information Center. (no date). About STIC. Retrieved March 17, 2017 from <http://www.stic.gov.et/about-stic>

¹⁴² Science and Technology Information Center. (no date). About ECAE. Retrieved March 17, 2017 from <http://www.stic.gov.et/web/ecae/about-ecae>

¹⁴³ Ethiopian National Accreditation Office. (no date). About Us. Retrieved March 17, 2017 from <http://www.ena-eth.org/content.php?page=About+Us>

¹⁴⁴ Ethiopian Standards Agency. (2017). About ESA. Retrieved March 12, 2017 from <http://www.ethiostandards.org/ESA/CommonPage.aspx?Id=1>

The Ethiopian Intellectual Property Office (EIPO) provides legal protection for Intellectual Property in the country, and collects, organizes and disseminates technological information contained in patent documents and encourages its use.¹⁴⁵

The National Metrology Institute (NMI) of Ethiopia was established in 2011 and is responsible for the maintenance of Ethiopian National Measurement Standards and Certified Reference Materials (CRM). It also provides calibration, training and consultancy services in the areas of metrology and scientific equipment.¹⁴⁶

The Ethiopian Radiation Protection Agency (ERPA) is a federal government body that controls and regulates the import, export, use, transport, and disposal of any source of radiation. The ERPA works towards the contribution of radiation and nuclear technology towards accelerating sustainable national development, while protecting people and the environment against the risk of damage from radiation by implementing an efficient radiation protection and regulatory infrastructure.¹⁴⁷

The Ethiopian Space Science Society (ESSS) was set up in 2004 to enable Ethiopia to reap the benefits of space science and technology. ESSS focuses on popularizing space science and astronomy to attract and develop young professionals by providing access to basic astronomy and space science education, laying down infrastructure for establishment of research centres and observatories, and collaborating with local and international bodies working in the field.¹⁴⁸

The Entoto Observatory and Research Centre (EORC) was established as the first initiative of the ESSS as a research centre. The mandate of EORC is leading research and training in astronomy and astrophysics, space science, earth observation, satellite science and related science and technology. It is the first and the only institute working on astronomy, space science, satellite technology and earth observation in Ethiopia.¹⁴⁹

4.1 STI Policies and Objectives

The National Science, Technology and Innovation (STI) Policy (2012) was formulated by MoST to support rapid learning, adaptation and utilization of effective technologies by 2022. It aims to create a technology transfer framework that enables the building of national capabilities in technological learning, adaptation and utilization through searching, selecting and importing effective foreign technologies in manufacturing and service providing enterprises.¹⁵⁰

The major objectives of the STI policy are to:

- *Establish and implement a coordinated and integrated general governance framework for building STI capacity;*
- *Establish and implement an appropriate national Technology Accumulation and Transfer (TeCAT) system;*
- *Promote research that is geared towards technology learning and adaptation;*

¹⁴⁵ Ethiopian Intellectual Property Office. (no date). About EIPO. Retrieved March 17, 2017 from <http://www.eipo.gov.et/about-eipo>

¹⁴⁶ National Metrology Institute of Ethiopia. (no date). Home Page. Retrieved March 17, 2017 from <http://www.stic.gov.et/web/nmie>

¹⁴⁷ Ethiopian Radiation Protection Agency. (2016). Home Page. Retrieved March 17, 2017 from <http://www.stic.gov.et/web/erpa/home>

¹⁴⁸ Ethiopian Space Science Society. (2017). About ESSS. Retrieved March 17, 2017 from <http://www.ethioss.org.et/index.php/ethiopia-space-science-society/about-esss>

¹⁴⁹ Entoto Observatory and Research Center. (2014). Background. Retrieved March 17, 2017 from <http://www.eo.org.et/index.php/entoto-observatory-and-research-center/2012-07-30-05-19-40/2012-07-30-05-22-40>

¹⁵⁰ IST Africa. (no date). Introduction – Ethiopia. Op cit

- *Develop, promote and commercialise useful indigenous knowledge and technologies;*
- *Define the national science and technology landscape and strengthen linkages among the different actors in the national innovation system;*
- *Ensure implementation of STI activities in coordination with other economic and social development programs and plans; and*
- *Create conducive environment to strengthen the role of the private sector in technology transfer activities sustainably.*¹⁵¹

The key policy issues include technology transfer, human resource development, manufacturing and service providing enterprises, research, financing and incentive schemes, national quality infrastructure development, universities, research institutes, TVET institutions and industries linkage, intellectual property system, science and technology information, environmental development and protection, and international cooperation.¹⁵²

According to the STI policy of 2012, research is needed to address the resolution of major social and economic problems, contribute to the achievement of national development objectives, and to meet technology demand. However, there is a gap between the research activities and focuses in higher education and research institutions and the national development need. To rectify this, the policy has laid out the following strategies:

- 1) *Support research institutes to develop their capacity to search, learning, adapting and utilizing effective foreign technologies;*
- 2) *Ensure research work in higher education and research institutions is in line with the technological needs of national development programs;*
- 3) *Support joint research activities among universities, research institutes and industries;*
- 4) *Support medium and large industries to establish research centres on technology adaptation.*¹⁵³

Ethiopia's research and development agenda focuses on incremental approaches and areas that are relevant for economic growth such as core computing, internet technologies, social and economic applications, policy and regulation and the content industry.¹⁵⁴

4.2 Research and Innovation

Ethiopia's innovation performance stifles its overall competitiveness. According to the World Economic Forum's Global Competitiveness Index (GCI), Ethiopia ranks 109th out of 138 countries with a score of 3.7 out of 7.0 in the 2015-16 report.¹⁵⁵ While the overall score of innovation indicators increased 0.5 points in the past six years (3.2 in 2015-16 from 2.7 in 2009-10), Ethiopia still lags behind in global benchmarking on key innovation indicators and has room for improvement.

The research allocation of all universities accounted for only 1% of their total budget in 2010-2011. In addition, there are limited numbers of personnel available to conduct high quality research and higher education research is conducted predominantly by postgraduate students. To improve the relevance of research and technology development for societal and national development needs, institutions have identified their thematic research areas considering their staff profile, topics of excellence and local needs. On completion of the National Research Undertaking Framework and sorting National Research Priorities, institutions will be supported through provision of funding for

¹⁵¹ Ibid

¹⁵² Ibid

¹⁵³ The Federal Democratic Republic of Ethiopia. (2012). Science, Technology and Innovation Policy. Retrieved March 10, 2017 from <http://www.lawethiopia.com/images/STI20Policy20English20ver.pdf>

¹⁵⁴ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

¹⁵⁵ World Economic Forum. (2016). Global Competitiveness Index - Ethiopia. Op cit

innovation. A national forum co-chaired by the Ministry of Science and Technology and the MoE has been formed to enable institutions to collaborate with industries and mega-project implementers in their respective development corridors. Efforts to form business incubation centres at the institutes of technology and science and technology universities are progressing well, and may become sources for income generation.¹⁵⁶

Increase in the R&D budget was a result of the increased headcount of R&D personnel and not researchers. From 2010 to 2013, the Ethiopian government's spending on R&D increased from 931.3 million ETB to 5,242.6 million ETB. As such, the share of R&D spending as a share of GDP has increased from 0.24% to 0.61%. However, a large share of this increase is on account of the increased headcount of R&D personnel. The number of R&D personnel in the country increased to 18,435 in 2013 from 13,095 in 2010, which is approximately a 41% increase. The percentage of the number of researchers that increased during the same period was only 13% (from 7,283 to 8,218). This implies that the majority of the increase of R&D personnel was on account of the increase of personnel other than researchers.¹⁵⁷

Business sector spending on R&D has declined sharply. Contrary to higher education and government institutions, the R&D spending by business sector has decreased from 144.6 million Ethiopian Birr (ETB) to 61.5 million ETB during the same period, which accounts for only 1.2% of the total R&D spending in 2013. Given increased global competition, the success of Ethiopia's industrial sector depends on the firms' ability to innovate.¹⁵⁸

Ethiopian research organizations and their fields of research are listed below.

Addis Ababa University (AAU), is the oldest and largest higher education institution in Ethiopia, and has a long record of teaching, research and community service activities. Based on prioritizing research, AAU set up an Office of the Vice President for Research and Technology Transfer, which incorporates the Directorate of Research (three offices focused on Research Capacity Building; Thematic Research, Sponsored Collaborative Grants and Small Grants; and Graduate Research Coordination), the Directorate of University-Industry Linkage and Technology Transfer (two offices focused on Technology Transfer/Parks, Intellectual Property Rights, Adaptive Research and Incubation Centres; and Research Consultancy Services), and the Directorate of Publications and Disseminations.

The IT Doctoral Programme was established in 2008. There are currently 70 PhD candidates and six research tracks. Research tracks in the IT Doctoral Programme include Information retrieval; Language Technologies; Software Engineering; Wireless Communication; IP Networking (low power computing) and Information Systems. Research tracks in the School of Information Sciences for Masters include eHealth and Health Informatics (in cooperation with University of Oslo); Information Sciences and Computational Linguistics. Research areas of interest include eHealth, eGovernment and Technology-enhanced Learning.¹⁵⁹

Arba Minch University (AMU) is a research university located about 500 km south of Addis Ababa. The Department of Computer Science and IT runs a Masters in Computer Science and Masters in

¹⁵⁶ Federal Ministry of Education. (2015). Education Sector Development Programme V (ESDP V). Op cit

¹⁵⁷ Kuriakose, S. et al. (2016). Unlocking firm level productivity and promoting more inclusive growth: the role of innovation in Ethiopia. Retrieved March 18, 2017 from <http://documents.worldbank.org/curated/en/953871467990995068/Unlocking-firm-level-productivity-and-promoting-more-inclusive-growth-the-role-of-innovation-in-Ethiopia>

¹⁵⁸ Ibid

¹⁵⁹ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

Information Technology. Research areas include Future Internet, Cloud Computing; Big Data; Security (penetration testing); Technology-enhanced Learning; Language Technologies.¹⁶⁰

Jimma University (JU) is a public higher educational institution established in 1999 as a merger of Jimma College of Agriculture and Jimma Institute of Health Sciences. The two campuses are located 350 km southwest of Addis Ababa. JU is Ethiopia's first Innovative Community Oriented Education Institution of Higher Learning. Research is currently focused on design and implementation of integrated ubiquitous eTourism services for Ethiopia. Research areas include Internet of Things, Language Technologies, IP and Mobile Networking, Health.¹⁶¹

University of Gondar was originally established as a Public Health College and Training Centre. Research areas include Information Retrieval, Languages architectures (programming), Wireless Networking, Health Sciences, Agriculture (Crop Production), Water, Environment, Sustainable Energy.¹⁶²

Haramaya University is one of the oldest universities in Ethiopia, initially set up as collaboration with the Oklahoma State University in 1952 and then as a College under Addis Ababa University in 1968. In 2004 the Faculty of Technology was added and the Faculty of Computing and Informatics and Faculty of Applied Sciences in 2008. Research areas include Data Mining, Information Retrieval, Technology-enhanced Learning, Cyber Security.¹⁶³

Mekelle University was established in 2000 as a merger of Mekelle Business College and Mekelle University College. Research projects include MU-IUC Projects (The Flemish Inter-University Council (VLIR) Institutional University Cooperation Program); NORAD Project; HP-UNESCO Brain Gain Project; FP7 Projects (Environment - WAHARA 2011 – 2016, Food Agriculture and Biotechnology - EAU4FOOD 2011 – 2015).¹⁶⁴

Higher Learning Centre of Excellence (HiLCoE) is a private college established in 1998 and offers undergraduate and post graduate degrees in Computer Science. Following accreditation from the Ministry of Education in September 2009, HiLCoE launched two Masters programs in Software Engineering and Computer Science. Research areas include Applied research (Tech Transfer); eServices; Information System Security; Environment and Green Technology.¹⁶⁵

ICT Centre of Excellence (ICTCoE) was formed by the former Ethiopian Information and Communication Technology Development Agency (EICTDA), now MCIT, and is hosted by the Addis Ababa University. ICTCoE aims to be a catalyst and an enabler of dramatic progress of ICT in Ethiopia to support socio economic development. The Centre of Excellence aims to utilize innovation based on high quality research and development, training, consulting, and technology transfer, to drive rapid advances of ICT, and its deployment for breakthrough results in national development. ICTCoE will do this by developing networks of partnerships with organizations, both public and private, and local and international. This will allow the CoE to develop into a hub to activate a wide range of resources. The Research and Development department is mandated to conduct use-inspired ICT

¹⁶⁰ Ibid

¹⁶¹ Jimma University. (no date). About Jimma University. Retrieved March 27, 2017 from <http://www.ju.edu.et/about-jimma-university>

¹⁶² University of Gondar. (no date). History. Retrieved March 27, 2017 from <http://www.uog.edu.et/about-university-of-gondar/our-history/>

¹⁶³ Haramaya University. (no date). History. Retrieved March 27, 2017 from <http://www.haramaya.edu.et/about/history-2/>

¹⁶⁴ Mekelle University. (2017). Research Projects. Retrieved March 27, 2017 from <http://www.mu.edu.et/index.php/research/research-projects>

¹⁶⁵ HiLCoE School of Computer Science and Technology. (no date). Welcome. Retrieved March 27, 2017 from <http://www.hilcoe.net/welcome>

research, produce innovative technologies, carry out market oriented training and/or education of ICT professionals, disseminate relevant ICT tools and best practices, and provide consultancy services in relevant areas of ICT that are not addressed by other organizations. Research areas include Localisation, eLearning, Open Sources Software, and Service Management.¹⁶⁶

Ministry of Education – ICT Directorate carries out research in the following areas: Cloud Computing, Big Data, Open Source, Technology enhanced Learning.¹⁶⁷

Ethiopia Telecom – Network Division carries out research in the following areas: eGovernment, eServices, Content Technologies, Future Internet, Advanced Computing.¹⁶⁸

Innovation spaces in Ethiopia include:

- Bahir-Dar ICT Business Incubation Centre was established in November 2009 in Amhara Regional State to support ICT entrepreneurship targeting recent graduates. The Business Incubation Centre provides co-working space with internet access and advisory services focused on marketing, entrepreneurship and financial management. Funding by the regional government, the facilities are used by start-ups as well as final year students doing internships.¹⁶⁹
- iceaddis is the first innovation hub and co-working space in Ethiopia established in Addis Ababa during 2011 to provide pre-incubation and incubation support for technology graduates, final year students, professionals and entrepreneurs, with an emphasis on ICT and green tech. While a social enterprise, most income generated goes to community support. Iceaddis is a member of icehubs and AfricaLabs.¹⁷⁰
- xHUB Innovative Society provides co-working space, training and research collaboration and networking opportunities with potential funders, with a particular interest in rural development.
- Ethiopia Climate Innovation Centre (ECIC) is supported by InfoDev and targets entrepreneurs developing climate mitigation and adaptation solutions.
- Mekelle Information Communication Technology Business Incubation Centre.¹⁷¹

4.3 Human Resource Development

The STI Policy 2012 states:

To search for, select, diffuse, adapt and use technologies from other countries competent local technicians, engineers and scientists are needed. In Ethiopia the level of qualified manpower capable of transferring foreign technology is low, certainly inadequate to facilitate the effective transfer of technology. Hence, the national education and training system will need to place emphasis on producing engineers and natural scientists in manufacturing and service providing enterprises; qualified in understanding and utilizing appropriate technologies.

Strategies

- 1) *Develop science and technology institutions that focus on producing highly qualified technicians, engineers and scientists in line with the demand of the national economy;*
- 2) *Focus on modifying the balance of the enrolment numbers of higher education students in favour of the science and technology human resource development need of the country and conduct practical training in cooperation with industry;*

¹⁶⁶ ICT Centre of Excellence. (no date). Home page. Retrieved March 27, 2017 from www.ictcoe.org.et/

¹⁶⁷ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

¹⁶⁸ Ibid

¹⁶⁹ IST Africa. (2016). Report on Innovation Spaces and Living Labs in IST-Africa Partner countries. Retrieved March 10, 2017 from http://www.ist-africa.org/home/files/IST-Africa_InnovationSpaces_LL_v2_310116.pdf

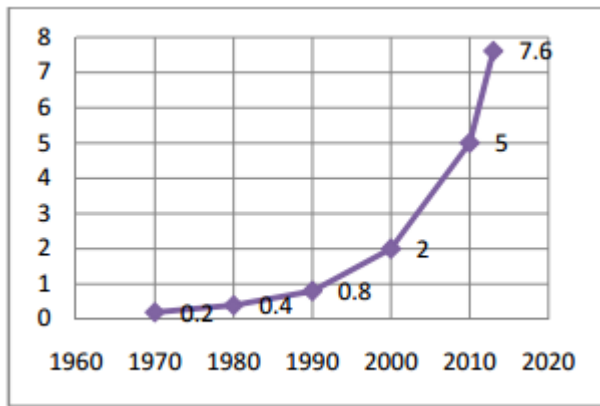
¹⁷⁰ Iceaddis. (2015). About iceaddis. Retrieved March 27, 2017 from <http://www.iceaddis.com/about-iceaddis/>

¹⁷¹ IST Africa. (2016). Report on Innovation Spaces and Living Labs in IST-Africa Partner countries. Op cit

- 3) Increase the number of females enrolling in engineering, science and TVET institutions;
- 4) Enable the establishment of workforce in manufacturing and service providing enterprises with the knowledge and skills necessary to learn, adapt and utilize technology.¹⁷²

The STI policy heavily relies on HEIs and TVETs for human resources development and research and development and technology transfer. The gross enrolment rate at tertiary education institutions in Ethiopia in 2013/14 was low at 7.6%, although this has grown exponentially over the last few years (as is indicated in the graph below).¹⁷³

Figure 9 Higher Education Gross Enrolment Rate¹⁷⁴



An overview of some of the universities and enrolments for ICT/Engineering courses is shown below.¹⁷⁵

¹⁷² The Federal Democratic Republic of Ethiopia. (2012). Science, Technology and Innovation Policy. Op cit

¹⁷³ Weldegiorgis, K.C. (2015). Analysis of Science, Technology and innovation policy and its challenges in Ethiopia; an emphasis on the role of HEIS. Op cit

¹⁷⁴ Ibid

Figure 10 Enrolment in ICT/Engineering courses¹⁷⁶

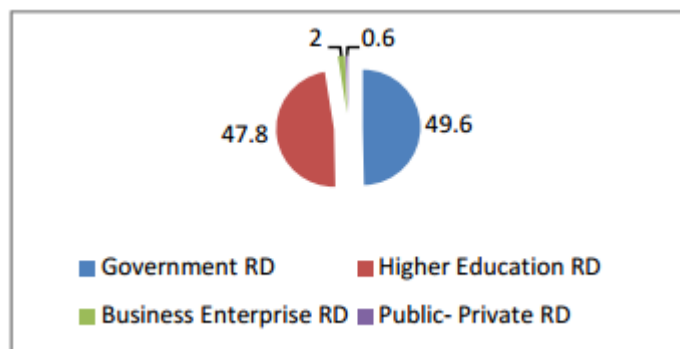
Institution	Location	ICT/Engineering Department(s)	ICT/ Engineering Teaching Staff	Undergraduate Students	Post-Graduate (Masters, PhD)
Addis Ababa University	Addis Ababa	School of Information Science	25	600	260
Ambo University College	Ambo	Department of Computer Science	47	700	0
Hawassa University	Hawassa		30	950	-
Arbaminch University	Arbaminch	Institute of Technology Department of Computer Science	17 lecturers & 20 Assistant Lecturers	885	30
Adama Science and Technology university	Adama	School of Technology; School of Mathematics & Computing Science	61	2000	69
Haramaya University	Haramaya	College of Computing and Informatics (Department of Computer Science, Information Science, Information Systems, Information Technology, Management Information Systems, Software Engineering)	78	1320	0
Jimma University	Jimma	Institute of Technology Department of Computing	49	939	69
Mekelle University	Mekelle	Ethiopian Institute of Technology	15	120	Not Yet Started
Mekelle University		Department of Computer Science, Information Systems and Information Technology	29	1500	20

The number of public universities in Ethiopia has increased from two to over 32 over the past two decades. The number of private tertiary level of institutions has reached 67 from 34 in 2006/07. The government has been fully committed to bridge the gap by producing innovative youth through education and training. However, their strategies lack mechanisms for how universities and TVETs can motivate the youth and make careers in science, research, technology, and innovation as attractive as is possible. As it is indicated in the figure below, 98% of research and development personnel in the country are employed in higher education and government research and development.¹⁷⁷

¹⁷⁶ IST Africa. (no date). Current ICT Initiatives and projects – Ethiopia. Op cit

¹⁷⁷ Weldegiorgis, KC. (2015). Analysis of Science, Technology and innovation policy and its challenges in Ethiopia; an emphasis on the role of HEIS. Op cit

Figure 11 Research and development personnel by sector¹⁷⁸



Data on researchers by background shows that 31% of researchers in the country are Agriculture professionals, 19% are Medical and Health researchers, 17% are researchers from Social Sciences, 15% are researchers from Natural Sciences, 9% are Technology and Engineering, 7% are Humanities, and others accounts for 2%.¹⁷⁹

Women’s ability to participate in STI systems depends on their access to the science, engineering and technology sectors of research and industry, their ability to be owners and leaders in the private sector, and their opportunity to utilize and innovate technologies. STI participation can be measured by indicators such as the share of women studying science and engineering at the tertiary level, their share among engineers and scientists, and their presence and productivity in STI-related careers as entrepreneurs and researchers. Other indicators include brain drain of skilled workers, which has an effect in the development of sustainable STI systems.¹⁸⁰

The share of Ethiopian women in higher education in science and technology programmes has been increasing due to government policies. As of 2011-12, the intake ratio of science and technology to social and humanities sciences (S&T to SHS) for all universities was 70:30. In the year 2012-13, the S&T to SHS ratio was 74:26. Women accounted for 27% of the total 218,738 university students enrolled in science and technology. Data from Addis Ababa University, regarding women’s enrolment in various fields within the science, technology, engineering, and math tracks, shows that while some fields had achieved gender parity, some areas fared better than others in educating women in science and technology fields. The Natural and Computational Sciences and Medicine and Health Sciences had relatively high female enrolment, at 34% each, while Agriculture and Life Sciences and Engineering and Technology had less than 20% women.¹⁸¹

There is limited data on the number of women scientists and engineers in Ethiopia. One 2014 study at the 13 new public universities found that women are grossly underrepresented among scientists and engineers in various higher education departments. Among academic staff holding a PhD, masters, or bachelor degree in the scientific and engineering fields, over 80% of the staff were male. Among holders of bachelor degrees, for instance, the Natural and Computational Science schools had the highest percentage of female staff at 17%. Female engineers with bachelor degrees accounted for less than 10% of the staff.¹⁸²

MoST has undertaken a number of projects, such as award programs, that seek out and encourage female innovators. In 2015, its national innovator and researcher award programme, which

¹⁷⁸ Ibid

¹⁷⁹ Ibid

¹⁸⁰ Beyene, H. (2015). National Assessment: Ethiopia – Gender equality and the Knowledge Society. Op cit

¹⁸¹ Ibid

¹⁸² Ibid

acknowledged 278 science and mathematics students and teachers, TVET trainers and trainees, innovators, and researchers, gave awards to 60 female innovators. It has also set up a gender bureau, which supports innovations that increase women’s free time. In 2014, the bureau supported the development of 21 technologies that target one of the most demanding and time-consuming aspects of Ethiopian women’s lives: food preparation. The bureau also runs an innovation award programmes for such projects. By focusing on the area that most consumes women’s time, the bureau hopes to increase the time women can devote to activities such as attending school and caring for their health, opening up more opportunities to partake in the country’s development projects.¹⁸³

4.4 Key Actors and Players

Actor/Player	Role and Area of Development
Ministry of Science and Technology (MoST)	Government institution, main driver of policy and strategic direction
Science and Technology Information Centre (STIC)	Mandated to identify, gather, organize, analyze and add value through research, as well as disseminate a science and technology information to accelerate Ethiopia’s technology transfer
Ethiopian Conformity Assessment Enterprise (ECAE)	Conformity assessment organization in the country providing testing laboratory, inspection and certification services to the industry and to the public
Ethiopian National Accreditation Office (ENAO)	Mandated to accredit the competence of Conformity Assessment Bodies (CABs) to perform specific activities, such as test, calibrations, certifications or inspections
Ethiopian Standards Agency (ESA)	Governmental agency accountable to the MoST, and has a national standardization council which works together with the agency. ESA has three core business areas which mainly focus on the standard formulation, training and technical support, and organizing and disseminating standards, conformity assessment procedures and technical regulation for the customers.
Ethiopian Intellectual Property Office (EIPO)	Provides legal protection for Intellectual Property in the country, and collects, organizes and disseminates technological information contained in patent documents and encourages its use
National Metrology Institute (NMI)	Responsible for the maintenance of Ethiopian National Measurement Standards and Certified Reference Materials (CRM). It also provides calibration, training and consultancy services in the areas of metrology and scientific equipment.
Ethiopian Radiation Protection Agency (ERPA)	Controls and regulates the import, export, use, transport, and disposal of any source of radiation
Ethiopian Space Science Society (ESSS)	Focuses on popularizing space science and astronomy to attract and develop young professionals by providing access to basic astronomy and space science education, laying down infrastructure for establishment of research centres and observatories, and collaborating with local and international bodies working in the field

¹⁸³ Ibid

Entoto Observatory and Research Center (EORC)	First initiative of the ESSS as a research centre, leading research and training in astronomy and astrophysics, space science, earth observation, satellite science and related science and technology. It is the first and the only institute working on astronomy, space science, satellite technology and earth observation in Ethiopia.
ICT Centre of Excellence (ICTCoE)	ICTCoE aims to be a catalyst and an enabler of dramatic progress of ICT in Ethiopia to support socio economic development. The Centre of Excellence aims to utilize innovation based on high quality research and development, training, consulting, and technology transfer, to drive rapid advances of ICT, and its deployment for breakthrough results in national development.
Ethiopian Academy of Sciences	A non-governmental organization established in 2010 to advance the development of all the sciences to promote development, prosperity and improved health services in Ethiopia.

4.5 Challenges facing the STI sector

Despite activities to increase women’s participation in innovation and research, challenges remain. For instance, in 2014 there were only two women recipients of the innovators award given out by the gender bureau for innovations related to women’s excess workload. Sex-disaggregated data on the trends of publication and patents for innovation in Ethiopia remains limited. As the director of the gender bureau at MoST observed, very few Ethiopian women publish or patent innovations, largely due to prevailing beliefs that science is not a suitable field for women and to the time constraints of domestic responsibilities. She further noted that despite the 70:30 policy pushing most students in the STEM fields, more women still gravitate toward the social sciences, severely limiting the pool of women who can be trained as science and technology innovators and researchers.¹⁸⁴

The other important challenge is the shortage of qualified personnel in the national system of innovation in general and the various STI actors in particular. The lack of knowledge, skills and attitude of personnel at all levels of the system has constrained people from discharging their responsibilities in science and technology effectively. The shortage of technical and research personnel, coupled with shortage of financial resources, call for aggressive importation of foreign technology as a catch-up strategy, further hampering development in the sector.¹⁸⁵

The limited understanding of the benefits of STI by the manufacturing sector, which lacks significant growth, has hindered its active involvement in the system. The over reliance on state funding and the poor engagement of the private sector have also greatly challenged STI activities. The absence of different nationally developed guidelines and research evaluation models for the allocation of R&D funding is a barrier that adds up to inefficiencies and resource wastages.¹⁸⁶

STI infrastructure is crucial for searching for, selecting, learning, adapting, and disseminating technology. Outdated laboratory facilities, insufficient equipment and the poor telecommunication networks in Ethiopia contribute to the poor performance. The lack of data warehouses, and poorly designed websites with little or no information about the stakeholders makes it hard to grasp developments in the sector. A poor institutional culture to monitor and evaluate programmes and

¹⁸⁴ Ibid

¹⁸⁵ Weldegiorgis, K.C. (2015). Analysis of Science, Technology and innovation policy and its challenges in Ethiopia; an emphasis on the role of HEIS. Op cit

¹⁸⁶ Ibid

policy implementations has repercussions on the overall effectiveness of the accomplishment of the mission of the STI policy.¹⁸⁷

¹⁸⁷ Ibid

5. Conclusion

The findings from the desk study reveal that the development of the Knowledge Society in Ethiopia is still in the nascent stages. Despite an impressive double digit economic growth in the past decade, Ethiopia is still a low-income country with one of the lowest literacy rates in the world. In 2015, only 49.1% of Ethiopians aged 15 years and above could read and write. As education is one of the key pillars for building a Knowledge Society and contributing to sustainable development, the country's current poor performance in education, particularly the low level of enrolment in higher education institutions, will seriously impede its readiness to transit into the knowledge-based society.¹⁸⁸

Access to resources is one of the key indicators of women's participation in the Knowledge Society. Women's access to resources is also linked to their ability to earn income, which in turn allows them to become entrepreneurs and drivers of the Knowledge Society. Whether or not women can access opportunity and skills at the same rate as men in a society has an impact on their ability to fully benefit from and contribute to a Knowledge Society. This is assessed by factors such as girls and women's access to education, and their ability to access job training so that they can upgrade their skills and continue to become lifelong learners. Poor literacy rates, high rates of school dropout, low rates of enrolment in higher education, and especially in science, technology and engineering fields, low rates of gender parity in science and engineering jobs, and limited access to on-the-job training are all factors that adversely affect their entry into knowledge economies and their ability to become agents of change and innovation.¹⁸⁹ Government policies need to be supported by a multi-dimensional approach which includes access to resources, gender empowerment, along with a strong educational system to allow women to contribute to the building of a Knowledge Society.

Further impeding the status of a Knowledge Society in Ethiopia is the lack of updated policies, particularly in the STI sector and in ICT4D. The National ICT4D Policy is an action plan for 2006 to 2010 and has not been updated. The Science, Technology and Innovation Plan for 2012 is the only existing plan of its kind. The National ICT Policy and Strategy of 2009 does have a 2016 draft waiting to be approved.

To create an environment that is favourable to building a Knowledge Society in Ethiopia, the government would benefit from developing a comprehensive regulatory and institutional framework that allows for the mainstreaming of ICT across sectors and governmental entities. Sustained ICT capacity-building efforts targeting public officials, as well as extensive outreach campaigns for citizens, local businesses, and other key stakeholders will be key to developing the ICT pillar of the Knowledge Society in Ethiopia.

Existing business incubation facilities that have been developed under the ICT4D initiatives could be leveraged to provide sustained and focused support to local businesses and rural entrepreneurs of Ethiopia, furthering the ICT pillar of the Knowledge Society development.¹⁹⁰

The creation of an open innovation ecosystem would allow innovation actors in Ethiopia to have opportunities to conduct R&D and organize the production of goods and distribute services. Digitization efforts for government records would allow the government to simplify record filing processes and improve citizen access to public information. In this way, ICT can be used to empower

¹⁸⁸ Tekeleselassie, F. Y. (2016). The State of Building a Knowledge Society in Ethiopia. Retrieved March 20, 2017 from <https://www.linkedin.com/pulse/state-building-knowledge-society-ethiopia-fasil-yilma-tekeleselassie>

¹⁸⁹ Beyene, H. (2015). National Assessment: Ethiopia – Gender equality and the Knowledge Society. Op cit

¹⁹⁰ The World Bank. (2014). ICT as an Enabler of Transformation in Ethiopia. Retrieved March 28, 2017 from <https://openknowledge.worldbank.org/bitstream/handle/10986/20076/892890WPOP12390IC00FINAL90060ICTWeb.pdf?sequence=1&isAllowed=y>

citizens, such as through geospatial tools and application development, leveraging the existing ICT business incubators established under the ICT4D initiatives. The government can create an enabling environment for innovation and knowledge transfer, through intermediaries, knowledge-transfer forums, networks, and co-creation platforms. Training, capacity building, and strengthening cooperation between research institutions, both locally and globally, are key intermediate outcomes for fostering innovation. This entails training researchers, building a knowledge base, and exploring and evaluating the needs and opportunities for ICT innovations, as well as disseminating results.¹⁹¹

In Ethiopia 40% import tariffs on ICT equipment make it too costly for most citizens. The incumbent public telecom operator has a monopoly over all telecom services. Although the number of mobile phone subscribers is growing, uptake in Ethiopia is among the lowest in Africa. About 60% of telephones and 94% of the internet accounts are concentrated in the capital, Addis Ababa. This is due to the limited telecom infrastructure, low levels of computerization outside the capital and lack of human resources.¹⁹² The low level of internet access is limiting the usefulness of ICT in creating a Knowledge Society.

Radio, one of the most established and least expensive information and communication technologies, and digital TV are frequently used for distance education purposes. Radio and TV are also both effective ways to engage citizens in debates important to their local communities and to facilitate learning from others' experiences, and with the addition of mobile phones, this can provide a feedback mechanism.¹⁹³ This will enable citizens to contribute to and engage in the Knowledge Society.

Therefore, Ethiopia has some way to go in developing a Knowledge Society. Government policies and strategies need to be updated to encourage the development of education, gender parity and efficient access to ICT for all citizens.

¹⁹¹ Ibid

¹⁹² Alemu, B.M. (2017). Transforming educational practices of Ethiopia into development and the knowledge society through information and communication technology. Retrieved March 20, 2017 from <http://www.netjournals.org/pdf/AERJ/2017/1/16-050.pdf>

¹⁹³ The World Bank. (2014). ICT as an Enabler of Transformation in Ethiopia. OP cit

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About GESCI

The Global e-Schools and Communities Initiative (GESCI) is an international non-profit organisation founded on the recommendation of the **United Nations Task Force on Information Communication Technology** (ICT). GESCI was established in 2003 at the first World Summit on the Information Society.

The United Nations ICT Task Force identified **education as an area in critical need of development**, and one where **ICT has the potential to make a positive impact**. Initially GESCI was headquartered in Dublin, Ireland, and in 2011 moved its headquarters to Nairobi, Kenya.

GESCI's mandate is to assist governments in the socio-economic development of their countries through the widespread integration of technology for inclusive and sustainable knowledge society development.

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