

Assessment of Knowledge Society Development in Mozambique

June 2017

African Leadership in ICT (ALICT)

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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.

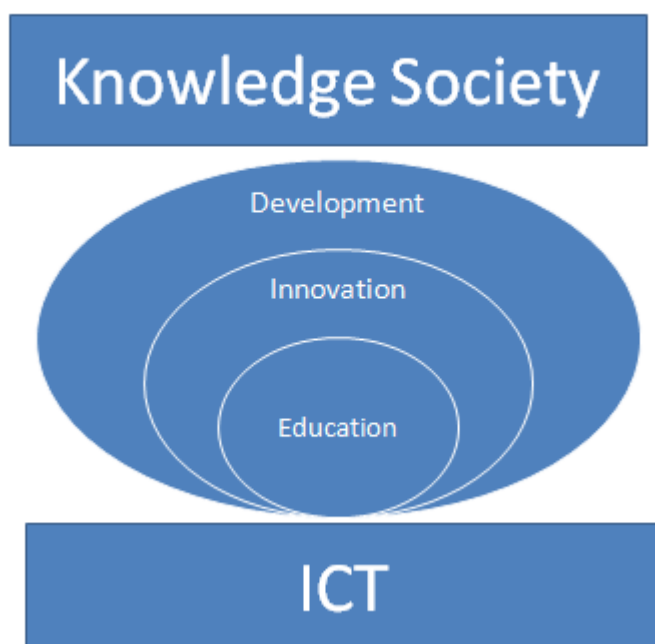
Dahlman (2011) defines a KS as a society that values the creation, dissemination, and effective use of knowledge, and has the institutions, infrastructure, norms, social interactions, and culture that support this.¹ UNESCO (2005) describes a KS as one that is nurtured by its diversity and its capacities. 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 organizational capability through knowledge sharing, collaboration, and exposure to technology. It is

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

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.

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

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

*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

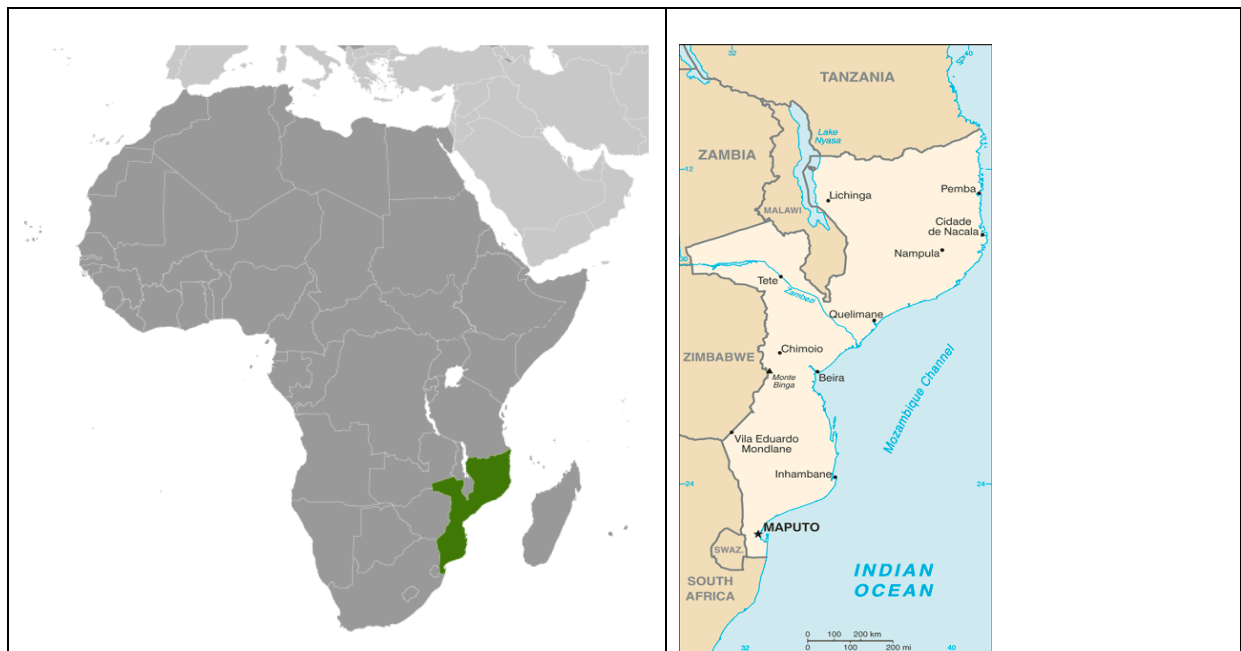
Knowledge Society Development in Mozambique

1 Introduction

Mozambique is located in south-eastern Africa, bordered by the Indian Ocean and the Mozambique Channel to the east, Tanzania to the north, Zimbabwe to the west, Zambia and Malawi to the northwest, and Swaziland and South Africa to the southwest. It has 2,500 km of ocean coastline. The country occupies an area of 799,380 km², with 13,000 km² of this water.¹⁶

Mozambique gained independence in 1975 from Portugal. The Liberation Front of Mozambique (FRELIMO) is the ruling party while the Mozambican National Resistance (RENAMO) is the main opposition party.¹⁷

Figure 2 Map of Mozambique¹⁸



The total population is 25.9 million people with a population growth rate of 2.45%. Ethnic groups residing in Mozambique include African (99.66%, comprised of Makhuwa, Tsonga, Lomwe, Sena, and others), Europeans (0.06%), Euro-Africans (0.2%), and Indians (0.08%). Languages spoken in the country are Emakhuwa (25.3%), Portuguese (10.7%), Xichangana (10.3%), Cisena (7.5%), Elomwe (7%), Echuwabo (5.1%), other Mozambican languages (30.1%) and other (4%). The official language is Portuguese.¹⁹

¹⁶ CIA The World Factbook. (2017). Mozambique. Retrieved February 28, 2017 from <https://www.cia.gov/library/publications/the-world-factbook/geos/mz.html>

¹⁷ BBC. (2017). Mozambique Profile – Timeline. Retrieved June 8, 2017 from <http://www.bbc.com/news/world-africa-13890720>

¹⁸ CIA The World Factbook. (2017). Mozambique. Op cit

¹⁹ Ibid

Unemployment in Mozambique in 2007 was 17%, and is currently 39.4% among youth aged 15 to 24. Life expectancy is 53 years with a growth rate of 2.45%. The adult literacy rate was last measured at 58.8% in 2015, according to the World Bank.²⁰

Mozambique was one of the world's poorest countries at independence. Socialist policies, economic mismanagement, and a civil war from 1977 to 1992 deprived the country further. Macroeconomic reforms, donor assistance and political stability since the multi-party elections in 1994 boosted Mozambique's GDP from \$4 billion in 1993 to about \$34 billion in 2015.²¹

Despite this economic upturn, more than half the population remains below the poverty line, with subsistence farming employing the vast majority of the work force. In 2010, Mozambique experienced riots due to the increasing fuel, water, electricity and bread prices, so the government implemented subsidies, and decreased taxes and tariffs.²²

Aluminium production from the Mozal Aluminium Smelter has significantly boosted export earnings in recent years. The Cahora Bassa Hydroelectricity Company contributes significantly to the Southern African power supply. The government has plans to expand the Cahora Bassa Dam and build additional dams to increase its electricity exports and fulfil the needs of its growing domestic industries.²³

Mozambique grew at an average annual rate of 6% to 8% in the decade up to 2015, one of Africa's strongest performances. Mozambique's ability to attract large investment projects in natural resources may sustain high growth rates, but the weaker global demand for commodities is expected to lower revenues from these vast resources, including natural gas, coal, titanium, and hydroelectric capacity.²⁴

The country has achieved an impressive average of 8.1% growth during the last decade. The continuation of high foreign direct investment (FDI) inflows, mostly in extractive industries, together with strong agricultural growth and infrastructure investment, will drive growth to 7.5% and 7.9% in 2012 and 2013 and 8.1% in 2014. Agriculture constituted 25.3%, industry 19.8% and services 54.9 % of GDP in 2011. Mozambique has successfully made the transition to peace, stability and strong economic growth. Mozambique's status as an essential link between landlocked neighbours and global markets, as well as economic ties to the industrial heartland of South Africa, underscore the fact that the country's socio-economic and political progress is vital to the interests of the region.²⁵

The country's Gini Coefficient Index (which measures inequality in the level of income) was recorded at 45.58 in 2008.²⁶ Mozambique received US\$3.868 billion in foreign direct investment during 2015, down from the 2013 figure of US\$6.697 billion.²⁷

²⁰ The World Bank. (2015). Country Profile – Mozambique. Retrieved June 8, 2017 from http://databank.worldbank.org/data/Views/Reports/ReportWidgetCustom.aspx?Report_Name=CountryProfile&Id=b450fd57&tbar=y&dd=y&inf=n&zm=n&country=MOZ

²¹ CIA The World Factbook. (2017). Mozambique. Op cit

²² BBC. (2017). Mozambique Profile – Timeline. Op cit

²³ CIA The World Factbook. (2017). Mozambique. Op cit

²⁴ Deloitte. (2016). Mozambique's Economic Outlook. Retrieved June 11, 2017 from https://www2.deloitte.com/content/dam/Deloitte/za/Documents/africa/ZA_Mozambique%20country_report_25012017.pdf

²⁵ Ibid

²⁶ The World Bank. (2009). GINI index (World Bank estimate). Op cit

²⁷ The World Bank. (2015). Foreign direct investment, net inflows (BoP, current US\$). Retrieved May 10, 2017 from <http://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=MZ>

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 Mozambique 133 out of 138 countries with a score of 3.1.²⁸ The index points to corruption, political instability and access to financing as primary limiting factors.

In 2015, Mozambique ranked 21 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.²⁹

According to the International Telecommunication Union (ITU), Mozambique's (IDI) score for 2016 was 1.75, placing it 163 out of 175 countries and 28th in the region.³⁰ The World Economic Forum's Networked Readiness Index for 2016 ranked Mozambique 123 out of 139 countries, with a score of 3.³¹

In terms of Economic Freedom, the Heritage Foundation report ranks Mozambique 158 out of 180 countries globally, with a score of 49.9, and a status of repressed. Concerns are around the rule of law, fiscal health and investment freedom. Undisclosed debts of \$1.4 billion accumulated by the former government were discovered in 2016, causing donors to suspend fiscal aid.³²

In terms of ease of doing business, a World Bank report shows that Mozambique is positioned at 137 out of 190 in 2017, down from 134 in 2016. This can be attributed to the difficulty in starting a business and harsh reforms in Mozambique whereby getting electricity was made more difficult by requiring authorization of a connection project and by adding an inspection of the completed external networks.³³

Agenda 2025 is Mozambique's national development plan to propel Mozambique to middle-income status by 2025, and was launched in 2003 to guide medium- and long-term actions in the public and private sectors. The plan emphasizes rapid agricultural development, SME growth, good governance and property rights.³⁴

Current environmental issues facing Mozambique include the increased migration of the population to urban and coastal areas with adverse environmental consequences; desertification; pollution of surface and coastal waters; and elephant poaching for ivory.³⁵

Mozambique's geographical location means that it is exposed to a number of climate hazards, including droughts, floods, cyclones and incremental climate change. Temperature increases and an increase in average rainfall is expected, although water availability is likely to decrease. Droughts currently affect Mozambique every three to four years. Areas that are classified as semi-arid and arid experience critical water shortages and limited agriculture productivity, even when they receive above-average rainfall. The sea level is projected to rise by between 30 and 500 cm by 2100. Trends

²⁸ World Economic Forum. (2016). Global Competitiveness Index - Mozambique. Retrieved May 10, 2017 from <http://reports.weforum.org/global-competitiveness-index/country-profiles/#economy=MOZ>

²⁹ Mo Ibrahim Foundation. (2016). Ibrahim Index of African Governance. Retrieved May 10, 2017 from <http://iiag.online/>

³⁰ International Telecommunications Union. (2016). ICT Development Index. Retrieved May 10, 2017 from <http://www.itu.int/net4/ITU-D/idi/2016/>

³¹ World Economic Forum. (2016). Global Networked Readiness Index - Mozambique. Op cit

³² The Heritage Foundation. (2017). Mozambique. Retrieved May 19, 2017 from <http://www.heritage.org/index/pdf/2017/countries/mozambique.pdf>

³³ The World Bank. (2017). Doing Business. Retrieved May 19, 2017 from <http://www.doingbusiness.org/rankings>

³⁴ Committee of Counsellors. (2003). Agenda 2025: The Nation's Vision and Strategies. Retrieved May 22, 2017 from <http://www.foresightfordevelopment.org/sobipro/55/130-agenda-2025-the-nations-vision-and-strategies>

³⁵ CIA The World Factbook. (2017). Mozambique. Op cit

over the past 30 years show that cyclones have expanded their geographical range southwards, becoming more intense, and have had increasingly adverse impacts in terms of deaths and damage to infrastructure. Mozambique experiences regular flooding as a result of being the most downstream country in a number of major river basins, including the Limpopo and Zambezi. Climate change adds an additional stress to the development context in Mozambique, and threatens to undermine achievements made to date.³⁶

Mozambique launched its National Climate Change Strategy (ENAMMC) in 2012, covering 2013 to 2025. The strategy recognizes the risks that climate change poses to development targets and states Mozambique's commitment to adaptation and mitigation, through low-carbon development and the green economy. The specific objectives are:

- to make Mozambique resilient to the impacts of climate change, while minimizing climate risks to people and property, restoring and ensuring the rational use and protection of natural and built capital;
- to identify and implement opportunities for the reduction of greenhouse gas emissions that contribute to the sustainable use of natural resources and access to financial resources, affordable technology, and reduce pollution and environmental degradation by promoting low-carbon development; and
- to create the institutional and human capacity, as well as exploring opportunities for access to technology and financial resources to implement the ENAMMC.³⁷

Political tensions between the ruling Frelimo party and the opposition party, former rebel movement Renamo, is a major concern in Mozambique. After the last presidential results were announced, a low-level insurgency broke out, and Renamo claimed the results were fraudulent. The two parties have agreed to establish working groups on the key issues of decentralization and military affairs, and have made recommendations for the creation of a ceasefire.³⁸

According to USAID, many Mozambicans feel left behind in the country's development, with poor governance causing frustration amongst citizens. Additionally, civil service capacity is low and perception of official corruption is high.³⁹

The 2018 municipal election may present a test for the party popularity due to social and economic hardships, and the perception of corruption within the country. Despite these challenges, President Nyusi seems likely to gain support for his attempt for another term in office in the 2019 presidential election.⁴⁰

In 2016, due to rising tension and armed clashes between the government and the former rebel group, now political party, Renamo, human rights violations in Mozambique increased. Security forces were implicated in abuses in operations against Renamo, including executions and sexual violence, forcing tens of thousands of people to flee the country. Renamo also committed abuses in 2016, including raids on health clinics. Mozambique underwent an economic crisis due to the fall in

³⁶ Kulima Integrated Development Solutions, CSIR and University Eduardo Mondlane. (2012). Climate change health, agriculture and disasters analysis in Mozambique. Retrieved May 22, 2017 from <https://cdkn.org/wp-content/uploads/2012/06/Climate-Change-Health-Agriculture-and-Disaster-Analysis-for-Mozambique-FINAL-REPORT.pdf>

³⁷ Ibid

³⁸ The World Bank. (2017) Mozambique – Country Overview. Op cit

³⁹ USAID. (2017). Mozambique – Democracy, Human Rights, and Governance. Retrieved June 8, 2017 from <https://www.usaid.gov/mozambique/democracy-human-rights-and-governance>

⁴⁰ The World Bank. (2017) Mozambique – Country Overview. Op cit

commodity prices and disclosure of the government's debt to state-owned companies. The economic crisis impacted basic economic and social rights.⁴¹

⁴¹ Human Rights Watch. (2016) Mozambique: Events of 2016. Retrieved May 23, 2017 from <https://www.hrw.org/world-report/2017/country-chapters/mozambique>

2 Information and Communication Technology (ICT)

The telecommunications regulatory authority in Mozambique is the Instituto Nacional das Comunicações de Moçambique (INCM) (National Institute of Communications of Mozambique). Established in 1992, its mandate includes licensing, spectrum management, numbering, and regulation of tariffs and quality. The INCM is an autonomous entity under the administrative supervision of the Ministry of Transportation and Communications.⁴²

2.1 ICT Policy Frameworks

In 1998, the Mozambique government established an ICT Policy Commission with the mandate to draw up a national ICT Policy. After a two-year nationwide debate involving public and private sectors, civil society, academic and research institutions, and donor agencies; the national ICT Policy was approved by the Council of Ministers in 2000. In 2002, the ICT Policy Implementation Strategy (Estratégia de Implementação da Política de Informática) was adopted, and provided concrete benchmarks and targets to be achieved and indicators to assess progress. Human capacity, infrastructure, legal and regulatory framework, e-Government, content, applications and business development were selected as key areas of intervention to ensure ICT as an enabler and a cross-cutting issue in all sectors and development programmes.⁴³

The national ICT Policy has the following objectives relevant to KS development:

- To raise the national level of knowledge of absolute poverty and improve the conditions of life of Mozambicans;
- To provide universal access to information to all citizens in order to improve their level and performance in education, science and technology, health, culture, entertainment and their activities in general;
- To expand and develop the teaching of informatics in the National System of Education;
- To encourage and support informatics training for directors, community leaders, women, young people and children;
- To contribute to the increases in efficiency and efficacy of the public and private sectors;
- To contribute to the efforts to make the country a producer and not only a consumer of ICTs; and favourable climate for industry, business and investment in the area of ICTs;
- To ensure that plans and development projects in all sectors have an ICT component;
- To create a favourable environment for cooperation and partnership in ICTs between the public and private sectors and between all stakeholders at national, regional and international level; and
- To empower and facilitate the integration of the country in the world economy and in the Global Information Society.⁴⁴

The ICT Policy Implementation Strategy and e-Government Interoperability Framework for Mozambique (eGIF4M) were approved 2002 and 2010 respectively to fast-track development of ICT use in national development. The eGIF4M main objective was to have private sector leveraged on government ICT infrastructure without the need for infrastructure duplication. The eGIF4M also defines a framework that enables interoperability across the Mozambique Public Administration. A

⁴² Eaglestone Securities. (2014). The Telecoms Sector in Mozambique. Retrieved May 23, from http://www.eaglestone.eu/xms/files/Telecoms_Research_Mozambique_Eaglestone_Securities_November_2014.pdf

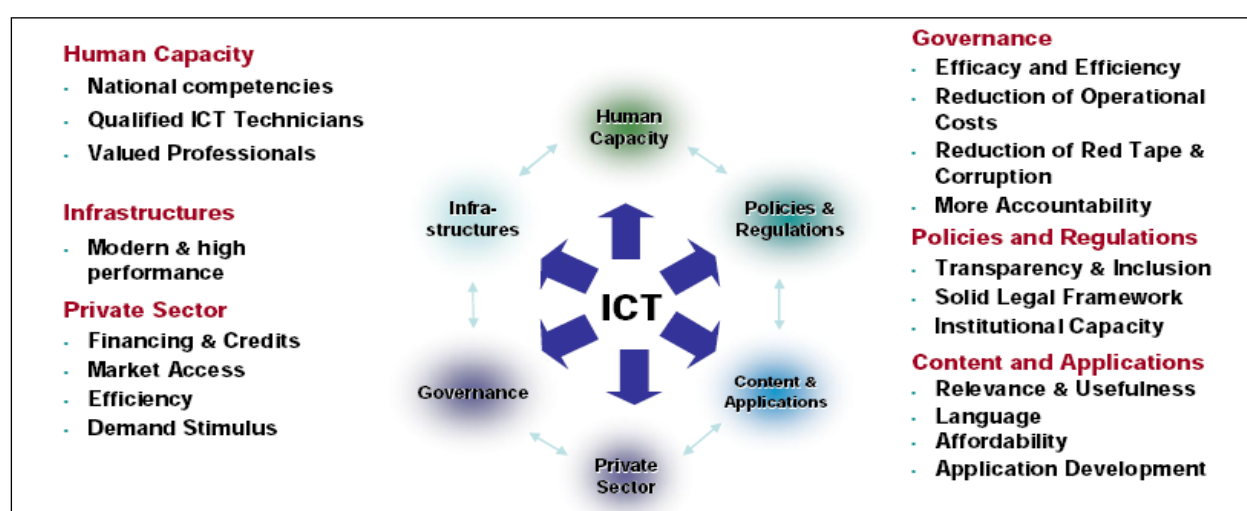
⁴³ IST Africa. (no date). Introduction – Republic of Mozambique. Retrieved May 19, 2017 from <http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=5564>

⁴⁴ Republic of Mozambique. (2000). Information and Communication Technology Policy. Retrieved May 16, 2017 from http://www.ist-africa.org/home/files/Mozambique_ICTPolicy_2000.pdf

number of benefits are expected once an eGIF4M has been implemented including; citizen-centric, one-stop delivery of services through a variety of channels, better decision making, better coordination of government agency programmes and services. Other benefits include better accountability, better coordination of ICT initiatives, cost savings and promotion of international cooperation.⁴⁵

The country endeavours, through the national policy, strategy and planning, to make ICT accessible to promote the use of technological innovations and scientific research findings that will have a positive impact to Mozambican development. With regard to ICT policy implementation, six priority areas were identified in the ICT policy, including education, human resources, health, universal access, infrastructure and governance. The figure below illustrates these thematic areas in relation to ICT4D in Mozambique.⁴⁶

Figure 3 ICT Implementation Strategy – Thematic areas⁴⁷



Other relevant legislations include the Telecommunication Act of 1999 and the establishment of Universal Access Service Funds Regulations (2007) to aid telecommunications services in rural areas. During 2013, the government initiated a revision of the 2004 Telecommunications Act to support the development of infrastructure and greater competition.⁴⁸ Agenda 2025 recognizes that Mozambique is part of globalized world of communications. In addition, the emphasis on ICTs also appears in other development plans. The Poverty Reduction Action Plans aim to make ICT a strategic tool for all Mozambicans in the exercise of democracy and citizenship, good governance and entrepreneurship.⁴⁹ One of the key objectives of MOSTIS is to promote the use of ICT for good governance, service delivery and for diffusion of knowledge and to promote the transfer of technology.⁵⁰

⁴⁵ UTICT. (2010). e-Government Interoperability Framework for Mozambique. Retrieved May 17, 2017 from http://www.ist-africa.org/home/files/Mozambique_eGIF_Oct2010.pdf

⁴⁶ Ibid

⁴⁷ Ibid

⁴⁸ IST Africa. (2016). Report on ICT Initiatives and Research Capacity in IST-Africa Partner Countries. Retrieved March 10, 2017 from http://www.ist-africa.org/home/files/IST-Africa ICTInitiatives ResearchCapacity_v2_310116.pdf

⁴⁹ International Monetary Fund. (2011). Republic of Mozambique: Poverty Reduction Strategy Paper. Retrieved June 7, 2017 from <https://www.imf.org/external/pubs/ft/scr/2011/cr11132.pdf>

⁵⁰ Republic of Mozambique. (2005). Mozambique Science, Technology and Innovation Strategy. Retrieved May 22, 2017 from http://chet.org.za/manual/media/files/chet_hernana_docs/Mozambique/National/MOSTIS.pdf

2.2 ICT Infrastructure

Much of Mozambique's electrical infrastructure was destroyed during the civil war, so with the assistance of foreign aid, the country's electrical infrastructure is slowly being rebuilt. The electrical authority, Electricidade de Moçambique (EDM) is owned by the state, and although it owns Africa's second-largest hydroelectric dam, Cahora Bassa, the country still faces the challenge of having to meet the growing electricity needs for most of its population. Cahora Bassa produces nearly four times the usage of Mozambique, so Mozambique's electricity challenges lie not in the amount of power being generated but rather in issues of transmission and distribution. In 2011, only 30% of the Mozambican population had access to electricity, and this was concentrated in major cities, with only 1% of the rural population having access to electricity.⁵¹

In the mobile and fixed telephony sector, Mozambique is said to be one of the clear cases where telecommunications leapfrogging has found a fertile ground, leading to exponential growth and achievement in the ICT sector. Mozambique embarked in the telecommunication sector reform since 2000 through continuous liberalization and establishment of an open and competitive market. The introduction of competition in the mobile sector in 2003 has brought benefits in terms of competitive cost of service provision, but growth has slowed due to ineffective cost structures and insufficient infrastructure.⁵²

The mobile segment in Mozambique has shown strong growth since the introduction of competition in 2003 between Vodacom Mozambique and mCel, the mobile subsidiary of the national telco Telecomunicações de Moçambique (TdM). Mobile penetration is far below the average for the region, and the country has relatively low fixed-line penetration, enabling growth in the sector. This has been stimulated by the launch of commercial services from the third operator Movitel, backed by Vietnam's Viettel.⁵³

Currently, there is only one fixed-line operator, TdM, and there are three mobile operators, namely mCel, Vodacom Mozambique, and Movitel. In 2015, fixed-line telephone subscriptions in Mozambique only amounted to 89,292, that is less than 1 per 100 customers. Mobile cellular subscriptions totalled 20.135 million, which is 80 subscriptions per 100 inhabitants. In 2016, it was estimated that the country had 1.8 million internet users, equalling 6.4% of the population.⁵⁴

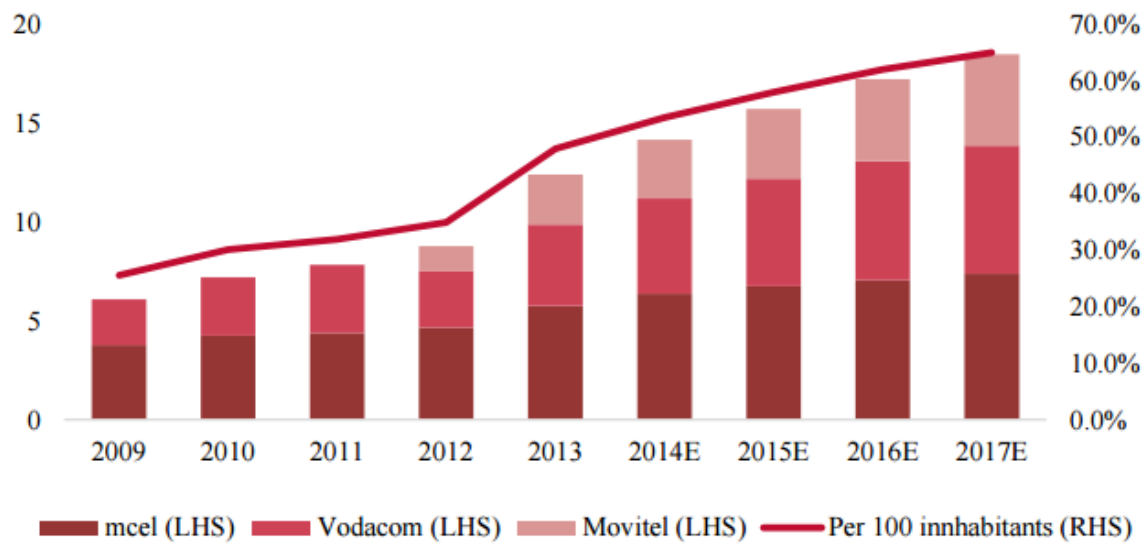
⁵¹ Open Society Initiative for Southern Africa. (no date). Political economy of new media technologies in Mozambique. Retrieved May 22, 2017 from <http://www.mediastudies.co.za/images/OSISA/MozambiqueICTReport.pdf>

⁵² IST Africa. (2016). Report on ICT Initiatives and Research Capacity in IST-Africa Partner Countries. Op cit

⁵³ BuddeCom. (2017) Mozambique - Telecoms, Mobile, Broadband and Digital Media - Statistics and Analyses. Retrieved May 22, 2017 from <https://www.budde.com.au/Research/Mozambique-Telecoms-Mobile-Broadband-and-Digital-Media-Statistics-and-Analyses#sthash.InGWDpuw.dpuf>

⁵⁴ Internet Life Stats. (2016). Mozambique Internet Users. Retrieved May 20, 2017 from <http://www.internetlivestats.com/internet-users/mozambique/>

Figure 4 Mozambican mobile subscribers (million)⁵⁵



⁵⁵ Eaglestone Securities. (2014). The Telecoms Sector in Mozambique. Op cit

Table 1 Internet users in Mozambique⁵⁶

Year	Internet Users**	Penetration (% of Pop)	Total Population	Non-Users (Internetless)	1Y User Change	1Y User Change	Population Change
2016*	1,834,337	6.4 %	28,751,362	26,917,025	5 %	87,863	2.76 %
2015*	1,746,474	6.2 %	27,977,863	26,231,389	8 %	129,827	2.8 %
2014	1,616,647	5.9 %	27,216,276	25,599,629	13.1 %	187,419	2.83 %
2013	1,429,228	5.4 %	26,467,180	25,037,952	14.5 %	181,412	2.85 %
2012	1,247,815	4.8 %	25,732,928	24,485,113	16 %	172,088	2.86 %
2011	1,075,728	4.3 %	25,016,921	23,941,193	6.1 %	61,523	2.86 %
2010	1,014,205	4.2 %	24,321,457	23,307,252	60 %	380,443	2.85 %
2009	633,761	2.7 %	23,647,815	23,014,054	76.7 %	275,042	2.84 %
2008	358,720	1.6 %	22,994,867	22,636,147	76.3 %	155,247	2.84 %
2007	203,473	0.9 %	22,359,637	22,156,164	11 %	20,232	2.86 %
2006	183,240	0.8 %	21,737,860	21,554,620	1.5 %	2,743	2.89 %
2005	180,497	0.9 %	21,126,676	20,946,179	29.4 %	41,053	2.94 %
2004	139,444	0.7 %	20,523,159	20,383,715	66.8 %	55,836	2.98 %
2003	83,608	0.4 %	19,928,496	19,844,888	66.4 %	33,376	3 %
2002	50,232	0.3 %	19,348,715	19,298,483	67 %	20,158	2.96 %
2001	30,074	0.2 %	18,792,357	18,762,283	50.2 %	10,057	2.89 %
2000	20,017	0.1 %	18,264,536	18,244,519	100.2 %	10,019	2.76 %

According to the INCM, in 2014 there were 27 data service and internet service providers (ISPs) licensed in Mozambique. Not all licensed operators are currently active and it is unclear how many of them are currently active. Most ISPs are based in Maputo and focused on the corporate segment.⁵⁷

The poor fixed-line infrastructure has held back the market for fixed-line internet services, and as a result, mobile internet accounts for most connections. International bandwidth is costly and has hindered internet use, given the relatively high cost of access. The landing of two international submarine cables (SEACOM and Eastern African Submarine Cable System) has reduced the cost of bandwidth and led to drastic reductions in broadband retail prices, with Liquid Sea and Africa-1 submarine cable systems set to improve bandwidth into 2018. There is some competition, with DSL, cable broadband, WiMAX, 3G and limited fibre broadband available. Improvements can be expected from the ongoing rollout of a national fibre backbone network by TdM and the mobile operators. The expectation is that policy makers and regulators will continue attracting the private sectors to

⁵⁶ Internet Life Stats. (2016). Mozambique Internet Users. Op cit

⁵⁷ Eaglestone Securities. (2014). The Telecoms Sector in Mozambique. Op cit

the business, by licensing more operators and drafting new policies for the expansion of communication to rural areas.⁵⁸

Figure 5 TdM's backbone in 2013⁵⁹



The ICT Policy Implementation Strategy of 2002 stresses the need for establishing a robust and modern nationwide network infrastructure as a pre-condition for boosting the development of an information society in Mozambique. Key priorities for fixed-line incumbent TdM, include expanding

⁵⁸ BuddeCom. (2017). Mozambique - Telecoms, Mobile, Broadband and Digital Media - Statistics and Analyses. Op cit

⁵⁹ Eaglestone Securities. (2014). The Telecoms Sector in Mozambique. Op cit

network coverage and replacing old technologies. The transmission network and all telephone switches are 100% digitalised, and all ten provincial capitals are linked to the network via submarine or terrestrial optical fibre. The next challenges include expanding fibre to district level, expanding 3G services to provincial capitals and districts, and reducing the price for accessing backbone services, and will be addressed through government-funded initiatives (such as the Universal Access Service Fund) and private investments.⁶⁰

2.3 ICT4D Initiatives

Several projects and initiatives are in place for promotion of ICT use in broad socio-economic sectors to fast track the achievement of the Knowledge Economy and Society development in Mozambique.

Electronic Government Network (GovNet) connects all ministries and all other government institutions across Mozambique. The World Bank, the Italian government and the Government of Mozambique fund the network. It provides connectivity, internet access, a host for government web pages and applications, as well as providing a secure environment and the quality services for running sectoral applications. The National ICT Institute (INTIC) implements the network.⁶¹

Mozambique eGovernment Communication Infrastructure Project (MEGCIP) 2010–2014: This initiative is funded by the World Bank and hosted at the Ministry of Science and Technology (MCT). Its main aim is to lower communication costs and improve efficiency and transparency through e-Government applications. The Ministry of Science and Technology (MCT), the National ICT Institute (INTIC), the Ministry of Transport and Communication and the Mozambican National Institute of Communications (INCM) coordinate and implement the project.⁶²

The e-State Financial and Administration System (eSISTAFE): This project is implemented by the Ministry of Finance, through the Development Centre of Financial Information Systems (CEDSIF) and funded by the World Bank. The project aims to take advantage of the capabilities offered by ICTs and it is proposed to provide financial administration services through the internet using a single bank account for all government institutional expenditures. Through this system, the Ministry of Finance is able to present the annual State Financial Report on time. This project also demonstrates that e-government transactions that have been developing since the 1990s, such as G2G (government-to-government), G2B (government-to-business) and G2C (government-to-citizen), can be done more effectively and efficiently when done electronically, provided all the security mechanisms are in place.⁶³

Government Portal: The Government Portal initiative was launched in 2006 and aimed at providing a single-entry point to government information and services, which are organized according to the interests and needs of its consumers, and available at any time.⁶⁴

⁶⁰ Mabila, F. (2013). Understanding what is happening in ICT in Mozambique. Retrieved May 17 from https://www.researchictafrica.net/publications/Evidence_for_ICT_Policy_Action/Policy_Paper_10_-_Understanding_what_is_happening_in_ICT_in_Mozambique.pdf

⁶¹ Republic of Mozambique. (2003). E-Government for Development Programme. Retrieved June 8, 2017 from <http://unpan1.un.org/intradoc/groups/public/documents/other/unpan022093.pdf>

⁶² The World Bank. (2014). Africa - Regional Communications Infrastructure Program Third Adaptable Program Loan: Mozambique eGovernment and Communications Infrastructure Project. Retrieved June 8, 2017 from <http://documents.banquemondiale.org/curated/fr/96690146828777768/Africa-Regional-Communications-Infrastructure-Program-Third-Adaptable-Program-Loan-Mozambique-eGovernment-and-Communications-Infrastructure-Project>

⁶³ International Monetary Fund. (2007). IMF Survey: Budget Reform Holds Promise in Mozambique. Retrieved June 8, 2017 from <https://www.imf.org/en/News/Articles/2015/09/28/04/53/socar1126c>

⁶⁴ Republic of Mozambique. (2003). E-Government for Development Programme. Op cit

Multimedia Community Centres (MCC) Programme: The World Bank, the UNDP and UNESCO fund this programme. The programme aims at providing a means by which the community has access to information using a wide range of ICTs at a single point, reducing the digital divide, reducing poverty by enabling people to solve development problems that the community faces, and strengthening the community capacity.⁶⁵

Human Capacity Building: This project has a national geographic scope, funded by Italian Government through the GovNet Project, World Bank through MEGCIP project, and UNPD. The objective is to address the problem of lack of qualified human resources to lead ICT development and maintain the system, equipment and infrastructure that could be put in place. This gap was identified during the process of drafting the ICT Policy. Programmes in the course aim to provide “necessary skills to use designed applications, administrative networks, manage and design data bases and web pages as well as produce word documents, worksheets, presentations, send and receive electronic messages, search for information on the Internet and produce and content and applications”. This is being implemented in government institutions at all levels.⁶⁶

ICT Legal and Regulatory Framework: This is implemented at national level with financial support from the World Bank through MEGCIP project. This aims at creating a legal, regulatory framework for protecting ICT against electronic abuse and crime. This led to the establishment of Electronic Transaction Law.⁶⁷

Mobile ICT Unit: This initiative is implemented in the districts, with funding from UNDP and the Italian Government. This unit provides training courses in districts isolated from ICT facilities to address the lack of ICT-skilled human resources across the country. The training is provided in a mobile unit set up as a classroom, equipped with ten computers. This mobile ICT technology provides relevant programmes for public servants and other community members. Within the Mobile Unit, these groups can also access a variety of information via the internet and email.⁶⁸

Provincial Digital Resource Centres (CPRDs): These centres are implemented at national level with funds from UNDP, Italian Government, Microsoft Corporation, Mozambican Government and Finnish Government. These centres concentrate ICT infrastructure, skills and investment by providing a single-entry point for ICT deployment and activity in the provinces, stimulate local demand and use of ICT by all sectors of development, and support capacity building and development of local content. The first CPRDs were established in 2004 by the ICT Policy Implementation Unit (UTICT).⁶⁹

National System of Civil Registration (SINAREC): Partners in this programme include the Ministry of Science and Technology, the Ministry of Justice, the Mozambican International Bank and the Swedish Tax Agency. This project is one of the key initiatives in Mozambique's national eGovernance strategy. This initiative aims at creating a central registration system from birth, and intends to promote democracy through the availability of efficient and correct registers for voting, to promote an efficient, effective and fair government.⁷⁰

⁶⁵ UNESCO. (no date). Community Multimedia Centres in Africa. Retrieved June 8, 2017 from <http://www.unesco.org/new/en/dakar/communication-information/community-multimedia-centres-cmcs/>

⁶⁶ Republic of Mozambique. (2003). E-Government for Development Programme. Op cit

⁶⁷ The World Bank. (2014). Africa - Regional Communications Infrastructure Program Third Adaptable Program Loan: Mozambique eGovernment and Communications Infrastructure Project. Op cit

⁶⁸ IST Africa. (no date). Current ICT Initiatives and projects – Republic of Mozambique. Retrieved May 17, 2017 from <http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=5563>

⁶⁹ Gaster, P. et al. (2009). Digital Inclusion in Mozambique. A Challenge for All. Retrieved June 8, 2017 from <http://www.ngopulse.org/sites/default/files/FinalMozambiqueReport10July2009-English.pdf>

⁷⁰ United Nations Statistics Division. (2016). Status of Civil Registration and Vital Statistics. Retrieved June 7, 2017 from <https://unstats.un.org/Unsd/demographic/CRVs/Technical-report-CRVs-in-English-speaking-African-countries3.pdf>

Biometric Driving Licence and Motor Vehicle Registration Systems: This initiative is implemented at national level, with funds from the World Bank. The system produces driving license cards with visible and invisible security features. The motor vehicle registration system is used to register motor vehicles, issue registration plates and motor vehicle permits, deregistration of motor vehicles, change of vehicle particulars, change of ownership of a motor vehicle, financial information and accountability, transaction auditing and management information reports.⁷¹

Biometric ID Card and Passport: This system has significantly reduced the waiting period for these documents. The biometric identifiers used in this card are the fingerprint and the facial image, making it a secure identification document that is difficult to forge.⁷²

Criminal Registration System: Implemented at national level, aiming at facilitating the exchange of records between the provincial delegations and central institutions about the criminal status of the citizens, it is then used to issue criminal certifications faster. This certification is often required for new employments, bank loans, and other systems that require background checks.⁷³

2.4 Key Actors and Players

Actor/Player	Role and Area of Development
Instituto Nacional das Comunicações de Moçambique (INCM)	The INCM is the telecommunications regulatory authority in Mozambique. Its mandate includes licensing, spectrum management, numbering, regulation of tariffs and quality. It is an autonomous entity under the administrative supervision of the Ministry of Transportation and Communications.
Electricidade de Moçambique (EDM)	The EDM is the state-owned electricity provider and owns Africa's second-largest hydroelectric dam, Cahora Bassa.
Telecomunicações de Moçambique (TdM)	TdM is the state-owned fixed-line operator, and is the only fixed-line operator in Mozambique.
Vodacom Mozambique	Vodacom is a mobile service provider in Mozambique.
mCel	mCel is a mobile service provider, and a subsidiary of the national telco, TdM.
Movitel	Movitel is a mobile service provider, and subsidiary of Vietnam's Viettel.

2.5 Challenges in ICT Development

Despite the ambitious policies and legislation to integrate ICT in all sectors of the economy, and the benefits thereof, from literature reviewed, the development of the ICT sector is still limited, with only 6.4% of the population with access to the internet. The major issue seems to be the national expansion of network backbone, which is still limited to the capital of Maputo and provincial capitals. As a result, the Mozambican government has embarked on a major infrastructure development for telecommunications. The undersea infrastructure based on submarine optic fibres along the Indian Ocean will bring more access to the internet and data communication at lower costs to boost national connectivity. The principal objective of these projects is to ensure a truly national network. Additionally, the implementation of hotspots and cable televisions with capability of

⁷¹ IST Africa. (no date). Current ICT Initiatives and projects – Republic of Mozambique. Op cit

⁷² Ibid

⁷³ Ibid

offering internet in many public locations has allowed citizens to have access to the internet. The major obstacle to this achievement is low literacy levels that hinder ICT skills and low internet penetration rate in Mozambique. There is need, therefore, for a well-balanced package of projects to provide an effective response to the country's needs, which can enhance knowledge sharing within the populace.

Mozambique is currently investing in several ICT projects because of the gradual realization of the ICT benefits. Public-private initiatives such as the Electronic Government Network (GovNet), Mozambique eGovernment Communication Infrastructure Project (MEGCIP) and Multimedia Community Centres (MCC) aim to reduce the digital divide, reduce poverty by enabling people to solve development problems that the community faces and strengthen the community capacity. Together with the abovementioned low levels of skills in ICT applications, poor coordination mechanisms among the stakeholders challenge the effectiveness of these projects. Thus, there is an increasing need for personnel with technical ICT skills.

The Mozambican government has also made policy efforts to expand ICT services to low-income rural areas through a Universal Access Service Fund Regulation. The expansion of ICT services to rural areas will aid in tackling the low level of literacy in ICTs among the Mozambican population. The challenge remains with installations of electricity in rural areas to achieve equity in provision of ICT services.

Liberalization and establishment of an open and competitive market for telecommunication service providers has resulted in the existence of three mobile operators, as opposed to the earlier monopoly enjoyed by TdM as the sole provider. Additionally, the licensing regime has changed significantly, whereby international telephony and data and international gateway have also been liberalized. The challenge is that Voice over IP (VoIP) is still regulated and the costs of internet access are high and not affordable for most Mozambicans.

3 Education

Mozambique allocated 6.5% of GDP to education in 2013.⁷⁴ The Ministry of Education and Culture (MEC) is responsible for planning, managing and monitoring the national education system,⁷⁵ with the Ministry of Science and Technology, Higher Education and Technical-Professional (MCTESTP) that directs, plans and coordinates activities in the higher education sector, while promoting access, expansion and quality assurance of teaching at the levels of Technical and Vocational Education and Higher Education in Mozambique.⁷⁶

Education in Mozambique is regulated by the Higher Education Act of 1993 and National System of Education (NSE) of 1983. This law was adjusted in 1992 and is still in force.⁷⁷ In terms of strategic planning, the third Education Sector Strategic Plan (ESSP 2012 to 2016) was endorsed by donors as a sound plan for meeting the Millennium Development Goals (MDGs). The Education Sector Strategic Plan focuses on teacher training, capacity building and motivation; and ICT and Open and Distance Learning. Other strategic plans shaping the education sector include the National Technological Plan for Education 2011 (NTPE 2011), the government's five-year programme (2010–2014) and by the Strategic Plan for Higher Education (2010–2020). The five-year programme and the Strategic Plan for Education define the access increment, the improvement of quality of education and the strengthening of the institutional capacity.⁷⁸

Some of the critical dimensions for educational provision and improvement of the strategic plans are aimed at increasing education access and quality, increasing budget allocations in the education sector, increasing the allocation of free book resources to schools, and policy decision to make primary education free for all Mozambicans. Other than the above mentioned policies, there are some other education provisions in Mozambique such as:

- Decree 48/2010 “which expresses regulation of the licensing and operation of higher education institutions”;
- Decree 27/2011 “approving the regulation of inspection of higher education institutions”;
- Decree 29/2009 “that defines the strategy of training of teachers for higher education”;
- Decree 30/2010 “which approves and ensures the implementation of the regulations of the national framework of qualifications in higher education”;
- Decree 30/2010 of 30 August to govern the system of accumulation and transfer of credits (SNACTCA);
- Decree 64/2007 of December 31, “which creates the National Council of Higher Education quality assessment (CNAQ); and
- International Programme of Technical- Professional education reform (PIREP).⁷⁹

The education structure in Mozambique is in four levels; these are seven years of primary education, three years of secondary education, two years of second level secondary education, and four years of higher education. While pre-primary education is provided in pre-schools and kindergarten, it is

⁷⁴ CIA The World Factbook. (2017). Mozambique. Op cit

⁷⁵ Republic of Mozambique. (2012). Education Strategic Plan 2012-2016. Retrieved May 19, 2017 from <http://www.globalpartnership.org/content/mozambique-education-strategic-plan-2012-2016>

⁷⁶ Ministry of Science and Technology, Higher Education and Technical-Professional. (no date). Attributions and Powers of MCTESTP. Retrieved May 22, 2017 from <http://www.mctestp.gov.mz/?q=content/atribui%C3%A7%C3%B5es-e-compet%C3%Aancias-do-mctestp>

⁷⁷ UNESCO. (2012). World Data on Education – 7th edition Retrieved May 19, 2017 from http://www.ibe.unesco.org/fileadmin/user_upload/Publications/WDE/2010/pdf-versions/Mozambique.pdf

⁷⁸ Republic of Mozambique. (2012). Education Strategic Plan 2012-2016. Op cit

⁷⁹ Republic of Mozambique. (no date). Questionnaire on norms and standards for quality of education by the special rapporteur on the Right to Education. Retrieved May 19, 2017 from <http://www.ohchr.org/Documents/Issues/Education/QuestionnaireEducation/Mozambique.pdf>

not compulsory and is beyond the means of majority of Mozambican citizens. As a result, only a small percentage of the target age participates in formal pre-school education.⁸⁰

At primary education level, in Mozambique, it is free and compulsory. It is divided into two levels; the lower primary (Grade 1 to 5) and upper primary (Grade 6 to 7). The official age of entry into school is six years. In Mozambique, due to a shortage of school places at this level, primary usually operate in shifts. After seven years of primary education, the pupils have a choice of enrolling for general secondary education, lower primary teacher training colleges, basic technical and vocational schools or secondary education for adults. The greater emphasis is in the primary education sector has been on improving the quality of education and retaining students until the seventh class.⁸¹

At secondary level, general secondary education is divided into two stages; junior secondary (comprises of three years, Grade 8 to 10) and senior secondary (comprises of two years – Grade 11 and 12).⁸²

Technical education is responsible for shaping the skills profile demanded in the labour market. It is offered mainly by government schools and training centres, and managed by diverse number of different ministries. Private training providers have joined the market to offer specialized training programmes for their private sector clients.⁸³

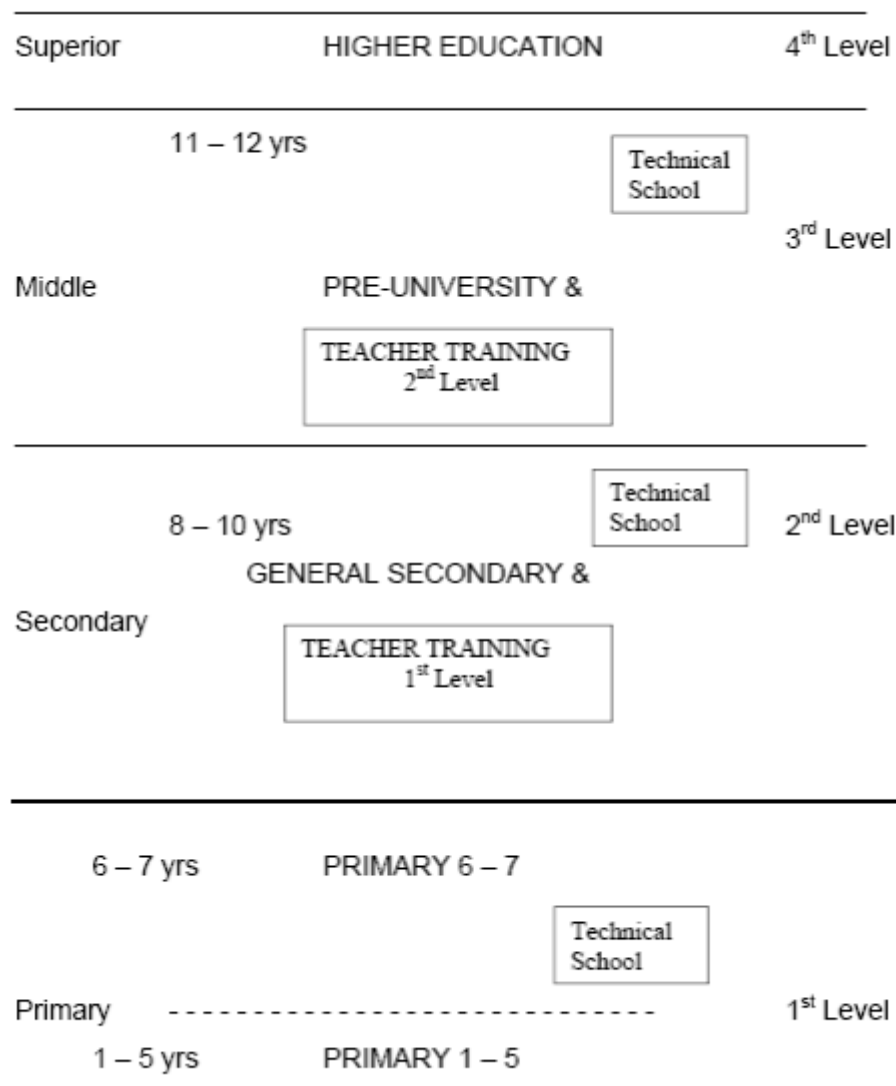
⁸⁰ UNESCO. (2012). World Data on Education – 7th edition. Op cit

⁸¹ Ibid

⁸² Ibid

⁸³ Ibid

Figure 6 The structure of the Mozambican education system⁸⁴



Higher education is offered at public and private universities, higher institutes and schools of higher education to provide education for those who have completed Grade 12. The challenge is that there is stiff competition for limited places at this level.⁸⁵

Technical and Vocational Education and Training (TVET) in Mozambique is primarily offered through government schools and training centres managed by different ministries. Some private training providers have entered the market and offer specialized training programmes, but these programmes only accommodate a minority of students in the TVET system. Unlike other education sub-sectors, which are managed and supervised under a single ministry, the TVET system involves several government ministries and private sector partners. Technical and professional education is taught at technical schools and institutes, offering courses covering industrial, commercial and

⁸⁴ UNESCO. (2012). World Data on Education – 7th edition. Op cit

⁸⁵ The Southern and Eastern Africa Consortium for Monitoring Educational Quality. (no date). Management and Administration of Education. Retrieved May 19, 2017 from <http://www.sacmeq.org/?q=sacmeq-members/mozambique/management-and-administration-education>

agricultural education. There is little appropriate education such as vocational training or lifelong skills learning to cater for youth who have dropped out after some primary or secondary schooling.⁸⁶

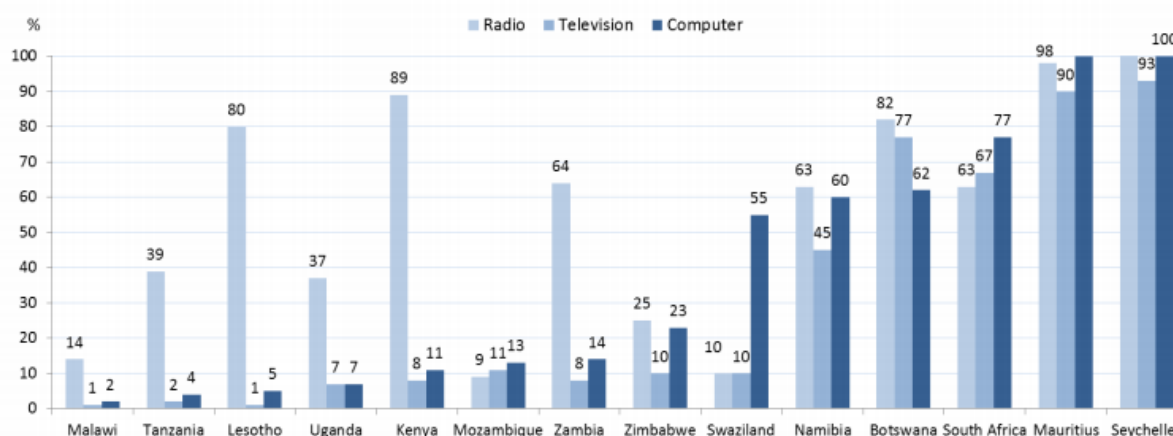
Mozambique has no clearly articulated policy framework on adult education, youth education, technical and vocational training, and skills-training, and this sector is not sufficiently responsive to current labour market needs because both their training methods and equipment are out of date. Further, there is a critical shortage of qualified, competent and up-to-date teachers/trainers, a shortage of teaching aids due to budget constraints, outdated curricula and insufficient career guidance and internship arrangements with industry.⁸⁷

3.1 ICT in Education

The Technological Plan for Education 2011 (TPE) aims to develop education through an integrated political vision for ICT in Education. The governmental priorities regarding the integration of ICTs are outlined in the document as equipment and internet, training and motivating of teachers to use ICTs, content and assessment, and administrative and education management. The plan aims to create a significant improvement of the ratio of students per computer, and greater access to the internet. Through the TPE, Mozambique is also gearing efforts towards enhancing teachers' ICT competencies and in the field of online learning. Challenges faced are teacher capacity, infrastructure, and monitoring and evaluation.⁸⁸

There is not much current information available on the statistics of ICTs in schools, but from the figure below, it is evident that Mozambique is lagging in the use of ICTs in schools.

Figure 7 Proportion of Grade 6 pupils in primary schools with radio, television and computers, by country, 2007⁸⁹



The following section presents an overview of some of the major ICT4E projects and initiatives that have been developed in Mozambique.

⁸⁶ Africa-EU Renewable Energy Cooperation Programme. (no date). Country mapping: Mozambique. Retrieved May 23, 2017 from http://www.euei-pdf.org/sites/default/files/field_publication_file/TVET_Country_Mapping_-_Mozambique.pdf

⁸⁷ Ibid

⁸⁸ UNESCO. (2015). Southern Africa Regional Meeting on Integrating ICTs in Teaching and Learning. Retrieved May 17, 2017 from

http://www.unesco.org/new/fileadmin/MULTIMEDIA/FIELD/Harare/images/ICTRegionalMeeting_Reporting_15122015.pdf

⁸⁹ UNESCO. (2015). ICT in Education in Sub-Saharan Africa. Retrieved May 19, 2017 from <http://www.uis.unesco.org/Communication/Documents/ICT-africa.pdf>

SchoolNet Mozambique dates back to 1997 when it was established as a pilot project named Internet para as Escolas (Internet for Schools). It was aimed to introduce computer literacy into ten secondary schools, explore the integration of ICTs in the teaching process, encourage schools to become centres of information sharing and promote the use of e-mail for the exchange of experiences within the southern Africa region. The International Development Research Centre (IDRC) and the World Bank Institute's World Links Programme supported this initiative. In 2002, SchoolNet Mozambique was launched as an in-house project of the Ministry of Education and was envisaged as a flagship of the National ICT Policy Implementation Plan. SchoolNet Mozambique is a nationwide network of professional educators and schools working to make the Mozambique educational system competitive through the use of internet connectivity and technology. The network aims to enhance learning opportunities for students, teachers, and the surrounding community via the internet. SchoolNet is also seen as a way to prepare Mozambican students for work in the Global Information Society.⁹⁰

CEND (Centro de Ensino à Distância) is a department of the Eduardo Mondlane University (EMU). The University provides higher education, research and extension courses. The Centre for Distance Learning (CEND) was created in 2002 to promote and coordinate distance education at EMU. The distance learning programme is part of the distance learning strategy advocated by the government. In partnership with CISCO, the IT Centre at the University provides online vocational courses in IT, including IT Essentials, CCNA Exploration and CCNA Security.⁹¹

EPCI or Evolucao Pela Comunicacao e Informatica (Evolution through ICT) was established initially as a pilot project in 2000, based at Emília Daússe Secondary School, situated in Inhambane City, the capital of Inhambane Province, known at the time to be the second-poorest province. EPCI's principal aim was to provide students, teachers and the local community with access to ICTs. The project also served as a public access point for Internet and e-mail as well as training in ICT use. It was set up as a Research and Information Technology Centre.⁹²

ISCETEM or Instituto Superiour de Ciencias e Tecnologia de Mocambique (Higher Institute of Science and Technology of Mozambique) is a private post-secondary ICT school in Mozambique. The institute aims at training students in response to the needs of the country, and uses an eLearning platform for content delivery.⁹³

Mozambique Research and Education Network (MoRENet) was established and sponsored by the Ministry of Science and Technology in 2005. MoRENet will serve to link 25 education and research institutions in Mozambique and will reportedly have the support of fibre-optic operators in an attempt to improve the speed and quality of internet access to the education and research institutions. MoRENet serves to build collaboration between research institutions within Mozambique and between Mozambican institutions and those based in other countries across the world. The focus is to allow the sharing of resources such as research journals and courseware. The network, which is intended to be a framework for fast and efficient exchange of research data among its members, has as main philosophy to take advantage and make use of the already

⁹⁰ InfoDev. (2017). ICT in Education in Mozambique. Retrieved May 23, 2017 from https://www.infodev.org/infodev-files/resource/InfodevDocuments_419.pdf

⁹¹ Eduardo Mondlane University. (2017). Centro de Ensino à Distância. Retrieved July 14, 2017 from <http://www.cend.uem.mz/>

⁹² International Development Research Centre. (no date). Tools for educational change. Retrieved May 22, 2017 from <https://www.idrc.ca/en/article/tools-educational-change>

⁹³ InfoDev. (2017). ICT in Education in Mozambique. Op cit

deployed fibre infrastructure in the country. The network will accommodate both public and private academic institutions and research centres.⁹⁴

3.2 Curriculum

Curriculum development for general education (primary, secondary and pre-university) and teacher training (basic and intermediate) is carried out by the National Institute for Educational Development (INDE). In 2000, the Ministry of Education initiated the process of decentralising curriculum development and monitoring. This system allows 20% of the national curriculum for basic education to be developed locally.⁹⁵

A new curriculum for primary education was introduced in Mozambique in 2004. The stated objectives of the curriculum include moving from subject-based to interdisciplinary teaching, from teacher-centred to pupil-centred learning combined with an emphasis on culturally relevant and applied learning. Additionally, in 2008, the Ministry of Education and Culture introduced a Secondary School Curriculum aiming to equip students with some notions of professional competences. However, the curriculum has been criticized because it was designed for a globalized context instead of Mozambican context.⁹⁶

The national curricula do not include any courses on basic computer skills, and does not use ICT for instruction in any subject area, at primary or secondary level. The Education Strategic Plan 2012–2016 mentions introducing ICTs to the curriculum during the period but there is no evidence of this having been done.

3.3 Professional Development

The Education Strategic Plan 2012–2016 focuses on teacher training and professional development, and mentions the introduction of ICTs in teacher training. According to the plan, training will have a greater focus on in-service training and monitoring at school and classroom level, in addition to pre-service training. This requires a greater link between a teacher's performance in the classroom and his/her career development. More coordination is needed between teacher trainers (in public and private training institutions at each level of education), managers (human resources directorates in the districts and provinces and school directors, etc.), and those responsible for the school curriculum. Acknowledging the complexity and importance of the matter, a National Directorate for Teacher Training (DNFP) was created with the main mandate of improving the performance of teachers through ensuring a better integration of training with professional development and encouraging cooperation between stakeholders within and outside the government.⁹⁷

With a view to improving the quality of education, the government conducted a reform of teacher training in 2007. Since then, teacher training has been administered by the medium-level Teacher Training Institute (Instituto de Formação de Professores – IFP), which is accessible after completing Grade 10, and provides a fast-tracked one-year course. The reform provided for the creation of an integrated system for initial training and continuing professional development of teachers, a link

⁹⁴ MoReNet. (no date). Welcome to MoReNet. Retrieved May 22, 2017 from <http://www.morenet.ac.mz/index.php/en/>

⁹⁵ The Southern and Eastern Africa Consortium for Monitoring Educational Quality. (no date). Management and Administration of Education. Op cit

⁹⁶ Ibid

⁹⁷ Republic of Mozambique. (2012). Education Strategic Plan 2012-2016. Op cit

between theory and practice and the introduction of a new paradigm in teacher training, preparing them with basic skills.⁹⁸

The Education Sector Technological Plan (PTE) aims to promote ICTs as teaching and learning tool. The Plan emphasises teachers' access to equipment and connectivity, and also building capacity among teachers to use ICTs in the classroom. The long-term strategy aims to move toward a technology-supported interactive education, requiring the updating of existing curricula and materials, and of teacher training in the country.⁹⁹

The Pedagogic University, a teacher training institution for secondary school teachers, offers a bachelor degree course for teacher specializing in ICT. These have filled a number of vacancies in terms of ICT teachers in a considerable number of secondary schools.¹⁰⁰

ICT Policy Technical Implementation Unit (UTICT) adapted a certified ICT for Development curriculum adapted from the European Computer Driving Licence (ECDL), designed to give specific competencies to key target groups including civil servants and teachers. UTICT undertook the training of trainers and their placement in vital institutions, in particular teacher training institutes. The goal is to promote cascaded training, as the IFP graduates will both use and transfer their knowledge in their workplaces after graduation.¹⁰¹

Humana People to People and local NGO, ADPP Mozambique, operate eleven teacher training colleges, and also conduct pedagogical workshops that offer in-service training for teachers currently employed in rural schools. Humana People to People and ADPP operate One World University, which trains instructors for teacher-training colleges, and is the first of its kind in sub-Saharan Africa.¹⁰²

The SchoolNet project was originally planned to install computer laboratories in the country's schools, starting at pre-university level and in teacher training centres, and expanding progressively to general secondary and primary education. The goal was to go beyond basic training for teachers and pupils and promote the use of ICTs for pedagogical purposes, as a tool for improving the quality of education and empowering the users. In 2009, all 22 teacher training institutes (IFPs) were equipped with computer labs. Due to the cost, only a few IFPs and in provincial capitals and big cities had internet access, and even this is thanks to support from the business sector and external partners.¹⁰³

3.4 Key Actors and Players

Actor/Player	Role and Area of Development
Ministry of Education and Culture (MEC)	The Ministry is responsible for planning, managing and monitoring the national education system in Mozambique.
Ministry of Science and Technology, Higher	The ministry directs, plans and coordinates activities in the higher education sector, while promoting access, expansion and quality

⁹⁸ Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (2014). Pro-Education Programme. Retrieved July 14, 2017 from <https://www.giz.de/en/downloads/giz2014-en-pro-educatio-mozambique.pdf>

⁹⁹ Republic of Mozambique. (2012). Education Strategic Plan 2012-2016. Op cit

¹⁰⁰ National Institute for Educational Development. (no date). Mozambique Report. Retrieved July 14, 2017 from http://www.ernwaca.org/panaf/pdf/phase-1/Mozambique-PanAf_Report.pdf

¹⁰¹ Eduardo Mondlane University Informatics Centre (CIUEM). (2009). Digital Inclusion in Mozambique: A Challenge for All. Retrieved July 17, 2017 from <http://www.ngopulse.org/sites/default/files/FinalMozambiqueReport10July2009-English.pdf>

¹⁰² Humana People to People. (no date). Mozambique. Retrieved June 7, 2017 from <http://www.teachertraining-dns.org/countries/mozambique>

¹⁰³ Eduardo Mondlane University Informatics Centre (CIUEM). (2009). Digital Inclusion in Mozambique: A Challenge for All. Op cit

Actor/Player	Role and Area of Development
Education and Technical-Professional (MCTESTP)	assurance of teaching at the levels of Technical and Vocational Education and Higher Education in Mozambique.
National Institute for Educational Development (INDE)	The INDE carries out curriculum development for general education (primary, secondary and pre-university) and teacher training (basic and intermediate).
The Pedagogic University	This is a teacher training institution for secondary school teachers, offering a bachelor degree course for teacher specializing in ICT.
Centro de Ensino à Distância (CEND) at Eduardo Mondlane University (EMU)	The Centre for Distance Learning (CEND) was created to promote and coordinate distance education at EMU. The distance learning programme is part of the distance learning strategy advocated by the government.
Instituto de Formação de Professores (IFP)	Teacher training has been administered by the medium-level teacher training institutes, and is accessible after completing Grade 10, and provides a fast-tracked one-year course.
ADPP Mozambique	ADPP is a Mozambican NGO that runs eleven teacher training colleges in the country.
SchoolNet Mozambique	This nationwide network of educators and schools aims to enhance learning opportunities for students, teachers, and the surrounding community via the internet.
Evolução Pela Comunicação e Informática (EPCI, Evolution through ICT)	EPCI's aim was to provide students, teachers and the local community with access to ICTs. The project also served as a public access point for Internet and e-mail as well as training in ICT use and was set up as a Research and Information Technology Centre.
Mozambique Research and Education Network (MoRENnet)	The network is intended to be a framework for fast and efficient exchange of research data among its members, and aims to take advantage and make use of the already deployed fibre infrastructure in the country. The network will accommodate both public and private academic institutions and research centres.

3.5 Challenges facing the education sector

Education infrastructure in relation to the number of schools and school enrolment rates have been expanding over the years in Mozambique. This is attributable to the implementation of free and compulsory primary education. In addition, there have been large numbers of technical and tertiary institutions that are tasked with skills development to meet the demands of the labour market. However, the major challenges are the shortage of schools, leading to disproportionate teacher student ratio that compromises the quality of education. TVET institutions lack uniformity and coherence in leadership, making them slow to respond to changing labour market demands in the formal sector due to a mismatch between labour supply and the evolving needs of knowledge-economy labour market, which requires workers that have higher order skills. Thus, the expanded enrolment rates call for expansion of infrastructure, equality and human resource developments to address these challenges.

While there are ongoing initiatives to roll out ICTs in education across Mozambique, there are no clear plans for curriculum reform to include ICTs, or for teacher training to include ICTs. There also a need to redesign the higher education system in line with societal educational needs, technology changes and market requirements. A further challenge affecting ICT rollouts in education is the lack of electricity supply in rural areas.

4 Science, Technology, and Innovation (STI)

The Ministry of Science and Technology, Higher Education and Technical-Professional (MCTESTP) is the central organ of the state apparatus, which directs, plans and coordinates activities in the STI sector. The Ministry was created by Presidential Decree No. 1/2015. The MCTESTP aims to promote the provision of scientific and technological solutions to citizens in the strategic areas of development.¹⁰⁴

Agenda 2025 suggests that scientific research and development must give priority to matters that directly meet the need for solutions to the problems facing the country.¹⁰⁵

4.1 STI Policies and Objectives

The Mozambique Science, Technology and Innovation Strategy (MOSTIS), approved in 2006, enlists an enormous task of building a strategic National System of Innovation (NSI). The strategy advocates the use of innovative combinations of modern digital technologies and low-cost conventional technologies to reduce poverty. The vision for STI, according to MOSTIS, is:

*The ubiquitous and equitable availability and use of Science, Technology, Innovation and ICTs as a right of all Mozambicans, in order to accelerate poverty eradication, wealth creation and the improvement of their social wellbeing.*¹⁰⁶

The objectives of MOSTIS are to:

- Promote grassroots innovation and the use of STI-based approaches by poor and disadvantaged communities;
- Promote research and development (R&D) and innovation within the public and private sectors;
- Promote the use of ICT for good governance, service delivery and for diffusion of knowledge and to promote transfer of technology;
- Promote human resource development at all levels of science, technology and innovation;
- Build and improve the policy instruments, institutions and infrastructure of the STI system;
- Establish funding policies and mechanisms for research and innovation;
- Review, evaluate and enhance the performance of the STI system; and
- Promote the mainstreaming of STI within all sectors.¹⁰⁷

MOSTIS also notes that science laboratories in Mozambique are ill equipped, there are too few ICT-trained graduates, there is inadequate access to computers and an insufficient number of science and mathematics teachers in the country. Initiatives need to be undertaken to improve laboratory infrastructure in schools, both for science and for ICT, across all the provinces in Mozambique. There is little mention of lifelong education as a tool for supporting the development and higher-order skills of the evolving STI sector.¹⁰⁸

There is a major opportunity in STI development emanating from the Programme of cooperation in Science, Technology and Innovation between Finland and Mozambique (STIFIMO). This programme has a link with national policy of poverty reduction in that it aims at helping the Mozambicans recognize and resolve their developmental problems by making use of STI in accordance with their

¹⁰⁴ Ministry of Science and Technology, Higher Education and Technical-Professional. (no date). Attributions and Powers of MCTESTP. Op cit

¹⁰⁵ Committee of Counsellors. (2003). Agenda 2025: The Nation's Vision and Strategies. Op cit

¹⁰⁶ Republic of Mozambique. (2005). Mozambique Science, Technology and Innovation Strategy. Op cit

¹⁰⁷ Ibid

¹⁰⁸ Ibid

national Poverty Reduction Strategy Paper (PRSP). STIFIMO contributes to the planning of Mozambique's STI policy and strengthens its management by means of training and cooperation between Finnish and Mozambican institutions. Additionally, at the local level, the programme includes activities that support entrepreneurship, business incubators, and the creation of technologies suitable for the poor, as well as small-scale support for business, which are all the components necessary towards achieving a knowledge society in Mozambique.¹⁰⁹

4.2 Research and Innovation

The main scope of MOSTIS is to develop an integrated system for production and management of knowledge as a way of stimulating sustainable development in Mozambique. It requires the development of an integrated scientific research and professional training system to improve scientific and technological skills. Further, it involves the development of innovation ability in the production sector and, lastly, development of scientific and technological knowledge dissemination.¹¹⁰

The following institutions under the Ministry of Science and Technology, Higher Education and Technical-Professional (MCTESTP) focus on research and innovation in the country:

The Centre for Research and Transfer of Technologies for Community Development (CITT) is dedicated to research, technology transfer and innovation for communities. The CITT is mandated to promote, coordinate, develop and execute scientific and technological research programmes and projects for solving community problems; to research, develop and disseminate the use of natural resources; coordinate and fund research programmes; and disseminate the use of alternative technologies useful to community development in urban and rural environments.¹¹¹

The Centre for Research and Development in Ethnobotany (CIDE) carries out ethnobotanical research studies that promote the use, recovery, preservation, and enhancement of traditional knowledge on plants with medicinal, nutritional, aromatic and ornamental potential.¹¹²

The National Research Fund (FNI) aims to guide scientific research according to the strategic priorities of the government; and finance and encourage the implementation of programmes, projects and actions in the field of scientific research and technological innovation.¹¹³

The Water Research Institute (IIA) performs scientific water research; mobilizes material, human and financial resources for water research; and defines water research priorities, in coordination with relevant entities within the water sector, including research institutes, public and private universities, funding agencies, regulation, and implementation and partners.¹¹⁴

¹⁰⁹ NIRAS.com. (no date). Programme of Cooperation in Science, Technology and Innovation between Finland and Mozambique (STIFIMO). Retrieved June 11, 2017 from <http://www.niras.com/business-areas/development-consulting/references/science-technology-information/stifimo-moz.aspx>

¹¹⁰ Committee of Counsellors. (2003). Agenda 2025: The Nation's Vision and Strategies. Op cit

¹¹¹ Ministry of Science and Technology, Higher Education and Technical-Professional. (2015). Center for Research and Transfer of Technologies for Community Development. Retrieved May 17, 2017 from <http://www.mctestp.gov.mz/?q=content/centro-de-investiga%C3%A7%C3%A3o-e-transfer%C3%A2ncia-de-tecnologias-para-o-desenvolvimento-comunit%C3%A1rio-0>

¹¹² Ibid

¹¹³ Ministry of Science and Technology, Higher Education and Technical-Professional. (2015). National Research Fund. Retrieved May 17, 2017 from <http://www.mctestp.gov.mz/?q=content/fundo-nacional-de-investiga%C3%A7%C3%A3o>

¹¹⁴ Ministry of Science and Technology, Higher Education and Technical-Professional. (2015). Water Research Institute. Retrieved May 17, 2017 from <http://www.mctestp.gov.mz/?q=content/instituto-de-investiga%C3%A7%C3%A3o-em-%C3%A1gua>

The Mozambique Academy of Sciences promotes and stimulates scientific research; enriches scientific thinking in society and participates in the economic and social development of the country, through advice to state institutions, market and civil society.¹¹⁵

The Maluana Science and Technology Park (PCTM) is being established to manage research and enhance the development, transfer and commercialization of technology and innovation. The Park has an area of 950 hectares, and has an anchor building called the Centre for Innovation and Technological Development (CIDT). The CIDT has three main components: the incubation of technology-based companies; the centre of teaching and learning; and hosting companies.¹¹⁶

Mozambique has research capacity and a track record in collaborative research. The level of research maturity is steadily strengthening, supported by the experience of being involved in internationally funded research. There is now a considerable sense of urgency in the government and in the research community to build on recent successes and momentum achieved to date. While the primary focus is still on technology adoption and developing applications, there is an increasing focus on strengthening research capacity within the country, and facilitating the continued development of post-graduate programmes.¹¹⁷

National ICT research priorities in Mozambique include eHealth, food security and sustainable agriculture, energy, future internet, technology-enhanced learning, eGovernment, ICT for rural development, entrepreneurship and socio-economic development.¹¹⁸ The following universities and research centres are undertaking ICT-related initiatives related to the research priorities listed:

Mozambique Research and Education Network (MoRENet) was established and sponsored by the Ministry of Science and Technology in 2005. MoRENet will serve to link 25 education and research institutions in Mozambique and will reportedly have the support of fibre-optic operators in an attempt to improve the speed and quality of internet access to the education and research institutions. MoRENet serves to build collaboration between research institutions within Mozambique and between Mozambican institutions and those based in other countries across the world. The focus is to allow the sharing of resources such as research journals and courseware. The network, which is intended to be a framework for fast and efficient exchange of research data among its members, has as main philosophy to take advantage and make use of the already deployed fibre infrastructure in the country. The network will accommodate both public and private academic institutions and research centres.¹¹⁹

The Centre for Informatics at the Eduardo Mondlane University (CIEUM) played a pioneering role in introducing ICTs for development in Mozambique. It has evolved as a leading agency in promoting the development of national ICT policy and implementation strategy. CIEUM specializes in the computer science, and is dedicated to teaching, and fundamental and applied research into the implementation of ICT solutions and methodologies for the University and the country in general.¹²⁰

¹¹⁵ Ministry of Science and Technology, Higher Education and Technical-Professional. (2015). Mozambique Academy of Sciences. Retrieved May 17, 2017 from <http://www.mctestp.gov.mz/?q=content/academia-de-ci%C3%A2ncias-de-mo%C3%A7ambique>

¹¹⁶ Ministry of Science and Technology, Higher Education and Technical-Professional. (2015). Maluana Science and Technology Park. Retrieved May 17, 2017 from <http://www.mctestp.gov.mz/?q=content/parque-da-ci%C3%A2ncia-e-tecnologia-de-maluana>

¹¹⁷ IST Africa. (2016). Report on ICT Initiatives and Research Capacity in IST-Africa Partner Countries. Op cit

¹¹⁸ Ibid

¹¹⁹ MoRENet. (no date). Welcome to MoRENet. Op cit

¹²⁰ Eduardo Mondlane University Informatics Centre. (no date). Home page. Retrieved May 19, 2017 from <http://www.ciuem.mz/>

Traditionally there has been limited tech entrepreneurship support in Mozambique. Thus, the **Mozambique Information and Communication Technology Institute (MICTI)** was established within the Eduardo Mondlane University to provide an institute for research and learning and a business and technology incubator. Mozambique is a beneficiary through the Southern African Innovation Support (SAIS) Programme and STIFIMO Finnish Programme, both of which aim to strengthen the national innovation ecosystem.¹²¹

4.3 Human Resource Development

Agenda 2025 recognizes the critical role human capital play in socio-economic development as having “a direct influence on human capacity for attaining quality of life, for being healthy, educated and participating actively in community life”. In this regard, Human Resource Development (HRD) concerns the key element of the Knowledge Society and pillars of ICT, Education and STI.¹²²

With regard to the STI, HRD is recognized in MOSTIS as a strategic area for developing the sector. This is particularly in higher education institutions and through lifelong learning. In 2006, a strategic plan was approved by the Council of Ministers for development of human resources for STI to address the need for additional properly trained researchers. Mozambique statistics on research is woefully inadequate when compared to the levels in countries that are showing significant progress in STI. Thus, the policy intends researchers be trained in the areas of “natural sciences, engineering, medical sciences, agronomical sciences, social sciences and humanities.”¹²³

For more than three decades, the Swedish International Development Cooperation Agency (Sida) has supported research capacity building in Mozambique. Sida started to support research education for students at the Eduardo Mondlane University (UEM). The programme was directed at training of individual researchers and providing support for building creative environments and research universities with their own postgraduate training programmes, through grants provided by Sida. There is still only one PhD program offered by UEM, and MSc programmes are only offered at the following four universities: UEM, the Pedagogic University, the Polytechnic University and the Catholic University. The development of researchers has been hampered by the limited possibility to finance research in Mozambique. Sida supported the development of the strategy document, MOSTIS, which included a National Research Fund (FNI) for development of the capacity of research.¹²⁴

A study conducted from 2001 to 2007, involving eight African universities that included UEM, showed that UEM had the lowest annual research publication rate per faculty. In 2008, a partnership between UEM and University of California, San Diego (UCSD) was formed. This partnership expanded under the Medical Education Partnership Initiative (MEPI) and has invigorated research development in Mozambique. The UEM-UCSD MEPI aims to strengthen training of physicians; increase the capacity for locally driven, multidisciplinary research; and recruit and retain qualified medical faculty.

¹²¹ IST Africa. (2016). Report on Innovation Spaces and Living Labs in IST-Africa Partner countries. Op cit

¹²² Committee of Counsellors. (2003). Agenda 2025: The Nation's Vision and Strategies. Op cit

¹²³ Republic of Mozambique. (2005). Mozambique Science, Technology and Innovation Strategy. Op cit

¹²⁴ Swedish International Development Cooperation Agency. (2010). The National Research Fund (FNI) as a Tool for Research Capacity Building in Mozambique. Retrieves June 9, 2017 from <http://www.sida.se/contentassets/dd24fe10d7df4811bac24b1e60d0649e/the-national-research-fund-fni-as-a-tool-for-research-capacity-building-in-mozambiquean-in-depth-assessment-of-sida-support-2963.pdf>

When the UEM-UCSD MEPI began, the UEM Faculty of Medicine consisted of 181 faculty members (60 full-time and 121 part-time). Contemporary research methodological skills are lacking within the university-based Mozambican research community, and inexperience in grant writing made it difficult for Mozambican scientists to compete successfully for international funding. This is further hampered by the fact that Mozambique is a Lusophone country and grant writing is largely done in English in the region. This limits both access and contributions to the heavily Anglophone global scientific literature.

To address low productivity due to lack of technical competencies, training programmes in research methods, grant and manuscript writing and human research subject protection were organized by UEM and international partners, and have been integrated into the MEPI-supported postgraduate training programme.¹²⁵

The low levels of researchers in Mozambique can be seen in the tables below from 2011.

Table 2 R&D headcount¹²⁶

SECTORS SURVEYED	COUNTRY	R&D PERSONNEL	RESEARCHERS	RESEARCHERS AS % OF R&D PERSONNEL	POPULATION IN MILLION	R&D PERSONNEL PER MILLION INHABITANTS	RESEARCHERS PER MILLION INHABITANTS
Government, business, higher education, private non-profit	Burkina Faso	2 548	1 144	44.9	16.0	159	72
	Ghana	7 477	2 542	34.0	24.4	307	104
	Kenya	61 964	13 012	21.0	40.5	1 529	321
	Senegal	10 644	8 170	76.8	12.4	856	657
	South Africa	55 531	37 901	68.3	50.1	1 108	756
	Uganda	4 270	2 823	66.1	33.4	128	84
Government, business, higher education	Egypt [†]	139 223	90 990	65.4	82.5	1 688	1 103
	Ethiopia	13 095	7 283	55.6	82.9	158	88
	Mali	1 940	898	46.3	15.4	126	58
	Namibia [‡]	949	748	78.8	2.3	416	328
Government, higher education, private non-profit	Malawi	3 809	1 843	48.4	14.9	256	124
	Mozambique	3 313	1 588	47.9	23.4	142	68
Government, higher education	Angola**	7 603	2 995	39.4	19.7	386.0	152
	Togo	923	568	61.5	6.0	153	94
	Zimbabwe	3 697	2 739	74.1	13.1	282	209
Higher education	Cape Verde	146	128	87.7	0.5	292	256
	Lesotho	53	42	79.2	2.2	24	19

¹²⁵ Noormahomed, EV. et al. (2013). Strengthening research capacity through the medical education partnership initiative: the Mozambique experience. Retrieved June 11, 2017 from <https://human-resources-health.biomedcentral.com/articles/10.1186/1478-4491-11-62>

¹²⁶ NEPAD Planning and Coordinating Agency. (2014). African Innovation Outlook II. Retrieved May 23, 2017 from [file:///C:/Users/Kirstyvongoh/Downloads/AIO_2_Final%20Product\[2\].pdf](file:///C:/Users/Kirstyvongoh/Downloads/AIO_2_Final%20Product[2].pdf)

Table 3 Data for total R&D full-time personnel and researchers

	TOTAL R&D PERSONNEL	FEMALE R&D PERSONNEL	TOTAL RESEARCHERS	FEMALE RESEARCHERS
Angola**	6 408.0	2 223.0	2 245.0	543.0
Burkina Faso	2 049.4	538.0	742.4	160.4
Cape Verde	37.0	9.0	25.0	9.0
Egypt	89 764.4	17 405.1	41 568.4	17 405.1
Ethiopia	8 279.0	-	3 701.0	-
Ghana	3 004.4	636.2	940.6	162.7
Kenya	42 566.0	16 620.0	9 305.0	1 861.0
Lesotho	13.7	4.6	11.9	3.9
Malawi	1 720.6	1 304.9	732.1	135.8
Mali	856.0	139.7	442.5	62.2
Mozambique	2 164.5	728.6	912.4	294.2
Senegal	5 642.3	1 423.5	4 679.0	1 161.6
South Africa	29 486.4	14 777.0	18 719.0	9 642.1
Tanzania	2 928.6	816.1	1 599.6	393.4
Togo	443.7	45.6	220.3	21.2
Uganda	2 006.9	555.0	1 262.7	331.6
Zimbabwe	1 740.8	472.8	1 305.2	332.2
- Data not supplied				
Source: ASTII R&D surveys 2010 or latest year available				
** In the case of Angola "R&D personnel" and "researchers" include university lectures who are not necessarily conducting research				

4.4 Key Actors and Players

Actor/Player	Role and Area of Development
Ministry of Science and Technology, Higher Education and Technical-Professional (MCTESTP)	The ministry directs, plans and coordinates activities in the STI sector in Mozambique.
The Centre for Research and Transfer of Technologies for Community Development (CITT)	The centre is a parastatal mandated to promote, coordinate, develop and execute scientific and technological research programmes and projects for solving community problems.
The Centre for Research and Development in Ethnobotany (CIDE)	The centre is a parastatal and carries out ethnobotanical research studies.
National Research Fund (FNI)	This parastatal guides scientific research according to the strategic priorities of the government; and finances and encourages the implementation of programmes, projects and actions in the field of scientific research and technological innovation.

Actor/Player	Role and Area of Development
Water Research Institute (IIA)	The institute is a parastatal mandated to perform scientific water research; mobilize material, human and financial resources for water research and strengthening of the national research and innovation system; and defines, in coordination with relevant entities of the water sector, research institutes, public and private universities, funding agencies, regulation and implementation and partners, water research priorities.
Mozambique Academy of Sciences	The academy is a parastatal which promotes and stimulates scientific research and publicizes its research; enriches scientific thinking in society and participate in the economic and social development of the country, through advice to state institutions, market and civil society.
Maluana Science and Technology Park (PCTM)	This parastatal is responsible for the incubation of technology-based companies; and is at the centre of teaching and learning.
Eduardo Mondlane University	This is the oldest and largest university in Mozambique, and a key research institute.
Mozambican ICT Institute (MICTI)	The institute aims to build ICT skills and capacity in Mozambique, and is facilitated through a combination of government, academic, domestic and international private sector contribution, as well as development and donor agencies.
Swedish International Development Cooperation Agency (Sida)	Sida is a government agency working on behalf of the Swedish government, with the mission to reduce poverty in the world. Sida funds research in Mozambique.

4.5 Challenges facing the STI sector

While MOSTIS enlists the task of building a strategic National System of Innovation (NSI), the strategy recognizes that STI has crosscutting issues and this cannot be handled in isolation. The challenge facing this strategy from achieving its objectives is the uncoordinated institutional relationships and interactions, as well as the fact that this strategy is out of date, with no evidence of any update.

From the literature reviewed, political will to build STI capacity exists in Mozambique. As a result, research institutes have been established, and legal and regulatory frameworks developed. The government has established the National Research Fund to promote scientific research, technological development and innovation. However, the major challenges are inadequate funding, since the expenditure on R&D is insufficient, and the lack of well-qualified researchers and technology professionals to accelerate research and development in Mozambique.

The Mozambican government acknowledges the role of innovation towards growth and development, and this needs to be done through public and private institutions. However, these institutions lack coordination, leading to inefficiency in the NSI and innovation in the country. Additionally, Mozambique experiences low activity levels and little information relating to innovation, and is heavily reliant on donor funding for research and innovation in the country, which hinders sustainable growth and development towards a Knowledge Society.

In general, Mozambique's ten-year Strategy for Science, Technology and Innovation gives full backing to the need to identify innovative access mechanisms. There is a growing consensus that STI has an important role to play in contributing to poverty reduction and the sustainable ways of

achieving this are still emerging amidst a number of constraints. Mozambique has limited resources related to STI expertise, infrastructure and finances, and to attain a level of substantial use of STI in development strategies for the development of Knowledge Society. A holistic approach is necessary and a commitment at the highest levels of leadership is needed as without effective leadership and political will, the impact is limited.

5 Conclusion

The various policies and plans in place indicate the willingness and commitment from the Mozambican government to transform the country towards a Knowledge Society. The major focus is accelerated national development by integrating ICTs in different sectors of the economy, providing free and compulsory primary education, and development of the STI sector for socio-economic development. However, while there is a commitment by government, many policies and strategies are outdated, impeding the development of the country. Key challenges faced by the development of a Knowledge Society through education in Mozambique include low completion rates in education system, high student-to-teacher ratios, a lack of ICT integration into teacher training and the curriculum, the lack of qualified mathematics and science teachers, and a lack of equipment in schools.

Another obstacle to the achievement of a Knowledge Society is low literacy levels that hinder ICT skills and low internet penetration rate in Mozambique. There is a need for a well-balanced package of projects to provide an effective response to the country's needs, which can enhance knowledge sharing within the populace.

Further, research, innovation and human resource development face challenges including a lack of equipment and funding for research institutions, high unemployment rates particularly among the youth population graduating from basic and secondary education, low ICT skills, lack of connectivity, poor distribution of electricity supplies, low levels of innovation activities, a heavy reliance on donor funding, and uncoordinated cross-ministerial relationships.

National development of Mozambique is also handicapped by natural disasters like floods, which annually have devastating impacts on infrastructure, tourism, education and agriculture. Mozambique has also lived moments of political tension since the last quarter of 2013 to date that affected foreign and local investment initiatives.

The findings from the desk study reveal that the development of the Knowledge Society in Mozambique is still in the nascent stages. This is due to low ranking in various socio-economic indicators as outlined in the country profile as compared to other countries across the world, and Africa in particular, despite its steady growth over the years. The Knowledge Society indices statistics indicate gaps and room for improvement in different sectors of the economy to achieve desired levels of socio-economic prosperity that will ultimately usher in sustained development towards the Knowledge Society in Mozambique.

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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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