Ushirika wa Maendeleo ya Elimu Barani Afrika
الرابطة لأجل تطوير التربية في إفريقيا
Association for the Development of Education in Africa
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STUDY ON THE USE OF ICT IN EDUCATION AND REMOTE LEARNING DURING CRISES AND
THE REQUIRED INVESTMENT FOR DIGITAL TRANSFORMATION FOR AFRICAN COUNTRIES

COUNTRY PROFILE REPORT
BOTSWANA

This study was commissioned by the African Development Bank Group (AfDB) and the Islamic Development Bank (IsDB)

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BOTSWANA

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ABBREVIATIONS

BDIH	Botswana Digital Innovation Hub
BIDPA	Botswana Institute for Development Policy Analysis
BOCRA	Botswana Communications Regulations Authority
BOU	Botswana Open University
BNS	Broadband National Strategy
BWP	Botswana Pula
CS	Computer Studies
ERTP	Economic Recovery and Transformation Plan
ETSSP	Education and Training Sector Strategic Plan
4IR	Fourth Industrial Revolution
GDN	Government Data Network
GDP	Gross Domestic Product
HCI	Human Capital Index
J-PAL	Abdul Latif Jameel Poverty Action Lab
KC	Kitsong Centre
MELSD	Ministry of Employment, Labour and Skills Development
MIT	Massachusetts Institute of Technology
MoBE	Ministry of Basic Education
MoESD	Ministry of Education and Skills Development
MTR	Mid Term Review
MoTEST	Ministry of Tertiary Education, Science, Research and Technology
MYSC	Ministry of Youth, Sports and Culture Development
NBS	National Broadband Strategy
NDP	National Development Plan
NEET	Not in Employment, Education or Training
NTS	National Transformation Strategy
QMTS	Quarterly Multi-Topic Survey
RISE	Reform for Investment and Sustainable Economies
RNCE	Report of the National Commission on Education
RNPE	Revised National Policy on Education
SmartBots	Botswana Digital Transformation Strategy
TaRL	Teaching at the Right Level
TVET	technical and vocational education and training
VDC	Village Development Committee
VNR	Voluntary National Review

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EXECUTIVE SUMMARY

Botswana is a small, dynamic country that is an education success story and has deployed resourced into implementing its ICT, which is linked to the broader economic vision for the country. A landlocked country, located between Zambia, Zimbabwe, South Africa and Namibia, Botswana has, since its independence in 1966, rapidly became one of the world's development success stories (World Bank). Its mineral wealth, good governance, and judicious economic management with its small population, have enabled Botswana to become an upper middle-income country with a transformation agenda in the hope of becoming a high-income country by 2036.

The current population of Botswana is 2,452,514, which spanned across the total land area of 580 000km^2 makes the country among those with the lowest population density of 4 per km^2. Its large geographic land mass and a highly dispersed population have implications for the country's infrastructure and the country's ICT logistics to ensure full national coverage pose challenges for the country.

In addition to Botswana being one of the world's biggest diamond-producing country, the main economic activity includes mining, cattle farming and tourism. The countries high gross net income per capita gives the country a relatively high standard of living with its GDP per capita of about $18,113 as of 2021, one of the highest in Africa albeit with large income disparities.

The GoB regards ICT as a significant enabler for economic and social development. The 2019 Global Competitiveness Report ranked Botswana 100 out of 141 countries on the ICT Adoption Priority Area with a score of 45.5%, an increase of two places from 98 in 2018 with a score of 42%. Internet penetration had 96% of the adult population using internet (WEF, 2019).

Table 1: Information and Communication Technology

Information & Communication Technology	2021 Q4	2021 Q3	2021 Q2
Fixed Telephone Subscribers	132,457	136,356	134,498
Mobile Cellular Phone Subscribers	4,160,553	4,023,009	3,911,833
Internet Subscribers	2,557,538	2,472,260	2,288,041
Electricity access % of population (2019)	57.3%	n/a	n/a
Fixed Broadband subscription per 100 (2019)	77.6	n/a	n/a
No of internet users % of population (Jan 2019)	47	n/a	n/a

Sources: Botswana Communications Regulatory Authority; World Education Forum 2019.

Between 2016 and March 2021, mobile cellular subscriptions had grown by 18%, and internet subscriptions by 60%, while fixed telephone subscriptions had declined by 2%. Mobile cellular subscriptions stood at 3.9 million in March 2021, from 3.3 million in 2016.

Access to digital skills, affordable and quality internet connectivity remains unevenly distributed in Botswana. Due to a lack of statistical evidence, there seem to be no precise figures measuring the country's digital divide. ("Digital Rights and Inclusion in Botswana - Paradigm Initiative").

Botswana has made great progress in education since independence in 1966 at which time only a small percentage of the population had attended secondary school and there were few graduates,

making the country reliant on expatriates for skilled work. The country attained universal education and Botswana's adult literacy rate increased from 69% in 1991 to 83% in 2008 and to 90% in 2015 (UIS; Statistics Botswana). Moreover, the Government of Botswana has invested a sizeable proportion of its national income in education to future-ready the workforce to be less dependent on diamonds for its economy and to be less reliant on expatriates for skilled work. These aims have found expression in the Botswana's National Development Plan and its national policies for education. With 10 years of free and compulsory education, Botswana spends about 22.2% of the government budget on education but has not created a skilled workforce.

1. THE REVIEW AND SURVEY PROCESS

The development of this country profile is based on a review of secondary literary sources provides an initial profile that offers a baseline and frame of reference for understanding the key issues, for the country's experiences, priorities and challenges regarding ICT and remote learning strategy specifically as has been accelerated by the COVID-19 experience.

This review of literature provides a background to what policy initiatives are in place, budgetary allocations, key challenges, and lessons learnt. It will also show the country's interpretation and response regarding ICT in Education, remote learning, and COVID-19 with implications for the country's resiliency levels and the required investment to attain a standard level of resilience. In addition, the literature review provides initial information about the partners engaged in this area and will inform the detailed partner mapping, for which the primary research activities will enable the identification of further key expert informants and partners to provide ways forward for the study.

Essentially the ICT in education study relies on the use of both primary and secondary data collection for profiling and suggesting proposals for the use of ICT in education in African countries subsequent to the COVID-19 pandemic, across the subsectors of basic education, TVET and higher education specifically focusing on: (1) existence and breadth of ICT policies and strategies; (2) availability and utilization of ICT infrastructure in learning facilities; (3) the level of the workforce's digital competence including learners' abilities; (4) the availability of electronic systems for learning and assessments; (5) the existence of e-education materials; (6) partners engaged in supporting the use of digital technology in education; (7) and challenges related to implementing e-education.

1.1. Limitations of the study

There are obvious limitations of studies using secondary data. Data sources are themselves limited and those available might be incomplete and not current. It is proposed that subsequent primary data collection process using interviews with key informants and partners as well as the administration of surveys or feedback from the country would ensure that the limitations are minimised.

2. POLITICAL, ECONOMIC, SOCIAL AND CONTEXT

2.1. Political Context

Botswana has a stable political environment with a strong multiparty democratic tradition and the country holds general elections held every five years with its last election in October 2019 being the country's 11th general elections.

2.2. Economic Overview

As pointed out by the World Bank, "Botswana's macroeconomic policy framework is anchored on prudent macroeconomic policies and good governance", however, it points out those challenges such as slow economic transformation because of low economic diversification and declining revenue from minerals since the onset of the COVID-19 pandemic. The World Bank contents that the economic dependence on a single commodity – diamonds – makes the country vulnerable to external shocks, pointing out that pre-existing challenges associated with mineral-led growth contribute to furthering inequality with unemployment being at an all-time high of 26% at the end of 2021.

The African Development Bank (AfDB) notes that as the Covid-19 restrictions were lifted, Botswana's GDP expanded from 8.7% in 2020 to 12.5% in 2021 with the recovery of the global diamond market. In addition, it points out that non-mining outputs expanded, particularly from construction, and wholesale and retail. Moreover, the AfDB points out that public debt, at 18.6% of GDP in the 20/21 fiscal year remained sustainable. Moreover, it points out that the Bank of Botswana's monetary policy was accommodative, with its policy rate at 3.75% in 2021. The average inflation in 2021 increased above the upper end of the central bank's range (3–6%), reflecting higher fuel prices, value-added tax, and domestic demand (AfDB).

According to the World Bank, Botswana's GDP growth is projected as moderate at 4.2% in 2022, supported by the continued increase in economic activity and diamond prices. Risks include weaker diamond demand that may result if the global economic loses momentum or because of new Covid-variants, persistent drought, and decreased demand for Botswana's exports. It is also anticipated that unemployment rates may increase post-lockdown, but this could be mitigated by well-targeted social programs (AfDB).

2.3. Social Context

Living conditions have improved for the Botswana people, and poverty has declined with the proportion of the population living on less than $1.90 a day having declined 29.8% to 18.2% between 2002–03 and 2009–10, and to 16.1% in 2015-16. Although still high, inequality is reduced with the Gini index falling from 60.5 to 53.3% during between 2010 and 2015. Notwithstanding this, Botswana remains among one of the world's most unequal countries. Its unemployment rate increased showing an increased by 3.1% from 17.6% to 20.7% with youth unemployment posing a critical challenge which rely on infrastructure (water and electricity), essential basic services (education, health, and social safety nets) for their addressal. In addition, reforms to the business environment and support for entrepreneurship need to be effected. Despite Botswana's education provision of nearly universal free primary education the country has not created a skilled workforce. ("Botswana Overview: Development news, research, World Bank, 7 April 2022).

Moreover, while living conditions have improved for the Botswana people, and poverty has fallen significantly, Botswana remains one of the world's most unequal countries. According to the Human Development Index 2021, the country has progressed from an HDI of 0.578 in 2000 to 0.735 in 2019 – an increase of almost 30 per cent. Globally, Botswana is placed 100 out of 189 countries. However, the HDI rates Botswana in a lower quintile compared to its economic counterparts, while the Gini coefficient is high at 54.9, it has come down over the past few years[1]. Progress in reducing poverty has been accompanied by improvements in shared prosperity. Factors associated with Botswana's declining income inequality include fast growth in rural areas and demographic changes.

Unemployment is a major concern especially amongst the youth in Botswana. About 40 per cent of the economically active young population (15-24 years) are unemployed. Botswana's unemployment levels grew in 2021, as reported by the Quarterly Multi-Topic Survey (QMTS) of Statistics Botswana (Statistics Botswana (2021). The youth labour force decreased by 4.4 percent between quarter four 2020 and quarter four of 2021, from 509,195 to 486,706. Youth unemployment rate went up by 2.0 percentage point over the same period, from 32.4 to 34.4 percent. Unemployment rate (persons aged 15 years and above) went up by 1.5 percentage points, from 24.5 percent in fourth of 2020, to 26.0 percent in fourth quarter of 2021. The Youth not in Education, not in Employment or Training (NEET) Rate went up from 37.5 to 39.4 percent between the two periods, an increase of 1.9 percentage points (QMTS, 2021). Substantial gender inequality persists. Poverty and inequality have worsened following the COVID-19 pandemic (IMF, 2022). Addressing the multiple challenges including poverty, inequality and unemployment, aggravated by the persistence of the HIV/AIDS pandemic and the emergence of the COVID-19 pandemic will require improving access to electricity and internet, provision of quality education and skills development, as well as accelerating reforms to the business environment and providing opportunities for entrepreneurship (Statistics Botswana, 2021).

The World Bank's Human Capital Index (HCI) scores Botswana at 0.42[2]. The purpose of the HCI is to promote attention and action to improving the level and quality of government investments in child health, nutrition, and education given their strong links to labour productivity and economic competitiveness. Botswana's HCI score suggests that a Motswana child born today will only be 42% as productive when she grows up as she could have been if she had enjoyed complete education and health.

2.4.   Climate change issues and policy options

According to the 2021 SDG Index, Botswana has achieved 61.9% of the 17 SDGs, and is ranked 115 out of 165 countries. However, the country has stagnated on SDG 13 on climate action. Partly to overcome these challenges, the 2020 – 2040 Integrated Resource Plan for electricity generation covers solar and wind technologies. The 2021 National Climate Change Response Policy focuses on climate change governance, technological change, and related investment (AfDB).

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[1] UNDP. 2021. Global Human Development Report 2021: The 2021 Global Multidimensional Poverty Index (MPI), New York, United Nations Development Programme.

[2] https://databank.worldbank.org/data/download/hci/HCI_2pager_BWA.pdf?cid=GGH_e_hcpexternal_en_ext

3. LEGISLATIVE LANDSCAPE

The 2019 Global Competitiveness Report ranked Botswana 100 out of 141 countries on the ICT Adoption Priority Area with a score of 45.5%, an increase of 2 places from 98 in 2018 with a score of 42%. Internet penetration had 96% of the adult population using internet (WEF, 2019). To increase digital capacity, the Government is expanding access to broadband internet services by rolling out fibre across the country. It is enhancing service delivery through adopting digital ways of work. To partly tackle accessibility of ICTs in rural areas, Botswana government initiated the Nteletsa II which is a Rural Telecommunications Development Programme aimed at providing communities with access to telecommunications services. These include voice, data and internet services (UNESCO, 2016).

3.1. Education Sector ICT Policies and Implementation Plan

The National Policy for ICT Development of 2007, widely known as 'Maitlamo', informed the regulatory and legislative framework and provides a roadmap for communication networks to ensure they drive social, economic, political, and cultural transformation for national development.

Launched in 2007, Botswana's first blueprint, the Maitlamo National Strategy for ICT Development, directs the country to use ICTs while driving national development efforts. It is expected that this policy will transform Botswana from a manufacturing economy to an innovation-driven and accelerated digital economy. Although digital literacy and data protection were key concerns regarding internet use in Botswana that lacked a policy response, both were recognised in the ICT Policy (2007) and in the Broadband National Strategy (BNS) launched in 2018 as crucial issues needing policy guidance. Section 5 of the BNS, for example, discussed the effect of these policies on digital rights and addressed concerns related to data privacy and internet security (Ministry of Transport and Communications, 2018). Striving to reach its development agenda to become one of the leading regional ICT hubs in the Southern Africa region, Botswana has invested in its futuristic innovation centre (Botswana Innovation Hub). Such advances in ICT and internet technology have driven the government to implement policies for e-governance and lead citizens in the digital transition of public service delivery.

'Botswana Vision 2036'[3] is the government's vision for achieving prosperity for all and migrate from an upper middle to a high-income country status, based on four pillars:

- Sustainable Economic Development
- Human and Social Development
- Sustainable Environment
- Governance, Peace and Security

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[3] www.vision2036.org.bw

Figure 1: Vision 2036 Pillar 2

Vision 2036 recognises education and skills as the basis for human resource development. Its focus on education and skills development emphasises the need for relevant high quality education. However, Vision 2036 makes no mention of ICT-enabled education nor of an ICT Pillar. The 2021 Budget Proposal for 2021/2022 Financial Year, on the other hand, makes provision for School Digitization initiatives: the Ministry of Basic Education (MoBE) is expected to procure devices for ICT based learning for all learners and teachers from Standard 5 to Form level, connectivity to all schools. The MoBE is also expected to develop e-learning material, train teachers and school managers on basic ICT skills and outsource educational broadcasting programmes (Republic of Botswana, 2021). For Botswana to achieve Vision 2036 (launched in 2016), policymakers need to redress digital inequality that plagues the country and develop a critical mass of digital skills, provide the population with internet connection, especially the marginalised rural communities. According to the World Bank, 64% of Batswana use the internet. Most internet users are found in urban areas[4].

During the Covid-19 pandemic, education was able to proceed in the relatively brief period during which education institutions were closed. While the Policies for ICT in Education had been in place and the education sector was prepared with school connectivity and the training of teachers, however, its success was hampered by the lack of internet connectivity and electricity. While Botswana ranks

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[4] https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS?locations=BW

highly in Africa regarding its ICT platforms, this did not translate into providing cheaper internet access internet penetration is still relatively low.

Historically, the National Development[5] Plan (2007) provided a framework for the integration of ICT in Education focusing specifically on system management development including that of the Teacher Management System, the Student Selection System (which processes the applications and placements of students in tertiary institutions), and an Education Management Information System. This Plan also envisaged that all secondary schools were equipped with computers and ensured the promotion of Basic Computer Awareness courses. In the tertiary sector, the technical colleges and university campus networks were established to enable internet for teaching and learning.

By way of the Maitlamo National ICT Policy (2007), Botswana undertook to ensure that all secondary schools were equipped with computer infrastructure and internet connectivity with a view to ensuring that ICT was used both as a teaching tool and as a learning tool by students. Botswana's Revised National Policy on Education (2004) had previously outlined a policy framework for the education system. IST Africa[6] describes the national ICT framework as follows:

> The development of a national ICT framework is perceived as a shift from a factor endowments economy to an efficiency driven economy that will pave way to an innovative driven economy. In this context Botswana's first National Information and Communications Technology Policy was approved by Parliament in 2007 [Maitlamo National Policy for ICT Development 2007]. In terms of ICT infrastructure, there are two diversified fibre links to South Africa. There are also radio links to Zimbabwe, Zambia and Namibia as well as direct Satellite links to UK, US, Canada with connectivity to London through SAT3 undersea cable (Gesci.org). Botswana invested in both local and international fibre-optic networks to strengthen communication infrastructure. These include NEPAD Undersea Cable, East African Submarine System, the West African Festoon System and West Africa Coast Cable System (gesci.org) The National Backbone (TransKalahari Fibre Optic Ring) was installed in 2008. These cross-border fibre optic cable connections line Botswana to other countries in SADC including Namibia, South Africa, Zambia, and Zimbabwe and substantially enhanced national connectivity.

The Education and Training Sector Strategic Plan (ETSSP) remains the guiding policy document for ICT in education. As part of its implementation, most public education facilities have been connected to the internet and provided with ICT equipment. The first half of NDP 11 largely focussed on provision of ICT infrastructure, such as computers, to primary schools. However, there was only sporadic provision of accompanying curriculum or teaching materials. Amongst the key achievements: 304 out of 755 public primary schools (40%) and 114 out of 241 (47%) secondary schools have been provided with educational tablets and/or laptops; 348 primary and 165 secondary (51%) schools have a Wi-Fi connection; 3,613 teachers have been trained and equipped with ICT literacy skills, ICT integration skills, basic coding skills and 21st Century learning design skills: and An e-learning platform has been developed for upper primary school learners, to host content and facilitate interactivity between institutions to enable full scale e-learning in schools. This platform is yet to be rolled out to all schools

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[5] Botswana National Development Plan. CHAPTER 15 Education and Training Government Paper No 3 of 2007. Republic of Botswana. Ministry of Communications, Science.

[6] IST Africa http://www.ist-africa.org/home/default.asp?page=doc-by-id&docid=5195#:~:text=In%20this%20context%20Botswana's%20first,Policy%20for%20ICT%20Development%202007%5D

(Republic of Botswana, 2021). The policies for the most part seem to emphasise providing access to technology, with little mention of learning with technology. Botswana's polices and plans are well aligned to the development of a knowledge society and its goals are outlined in its Vision 2036 document.

The aim of the ETSSP create an enabling environment for the growth of an ICT-industry with a view to Botswana becoming a regional ICT hub. The ETSSP identifies policy actions that need to be considered, including the following programmes.

3.2. Connecting Communities Programme

This programme is aimed to provide access centres for citizens who do not have computers and/or internet access at home, providing an "on-ramp to the Information Superhighway". These sites were conceptualised to be more than a simple internet café – to offer a range of services and to provide ICT training. The strategy for the Connecting Communities Programmes undertook to provide connectivity to high-speed networks to all communities with more than 2000 citizens, to link all public libraries and book rooms to high-speed networks, to establish 5 mobile high-speed satellites and ensuring coverage of the country national radio and public TV broadcasters.

3.3. ThutoNet

This programme is pivotal to the Maitlamo initiative and critical for schools. The programme focuses on the provision of literacy, skills and knowledge needed for the networked work with a specific focus on learners in formal and non-formal learning. Through this programme all schools were provided with computers, access to the internet and training all teachers on how to use ICTs as a classroom tool and introduced a curriculum for formal ICT education. The ThutoNet also commits to the development of educational software to assist with e-Learning, ensuring the development of local and relevant content.

The National targets for ThutoNet are to ensure:

- All schools and libraries to receive computers and internet connectivity.
- All teachers to receive ICT training.
- ICT content and curriculum development for all levels of the education system.
- A recommended 1:7 computer to student ratio be introduced into all schools.
- Capacity Building to enhance the knowledge, skills, and attitudes of future leaders in a knowledge-based society.
- That data and information is used in planning, resource mobilization, implementation, and evaluation processes.
- There is a need for improved policy coherence between the three pillars (ICT, Education, and STI) to leverage a knowledge society (Gesci.org).

The 2007 Policy also made provision for generating new and additional ICT skills in the adult population as a vital component of the Thuto Net programme. It planned a range of initiatives aimed at training and job creation for those outside of the formal educational system – with a focus on the development of skills in adults. The Government also planned to collaborate with major employers and providers of distance learning to examine the financial and ICT architecture needed for the development of a national life-long-learning model for Botswana. The focus of the ICT Policy for

Development, Maitlamo, was not necessarily learning with technology but rather to ensure that students who emerge have ICT skills.

The mid-term review of the NDP 11 conducted in 2021, reported that broadband access is still limited and expensive, and download speeds are relatively slow in most areas.

3.4. Kitsong Centres

The Government launched an initiative to have communities connected through the use of Kitsong Centres (KCs). These are community access points that have been installed by various operators and Botswana Post. These centres mostly provide only basic services (airtime resale, telephony, photocopy services, etc.). The most advanced of these though offer broadband together with related services such as training. The NBS (2018) reports that unfortunately, the current model being implemented for Kitsong Centres does not work properly since the bulk of them are operated by Village Development Committees (VDCs), whose members do not have computer and business skills. As per the contracts between the 13 Government and the operators, the operators train personnel to run the Kitsong Centres, but some trainees have left the KCs to look for better paying jobs thus rendering the KCs dysfunctional.

The NBS (2018) made a series of education related recommendations. These include responding to the demand for a Digital Literacy Programme, pointing out that building a state-of-the-art broadband infrastructure while the majority of the people in the country lack the basic skills to access broadband services is of no benefit to the country. A structured mass Digital Literacy programme should be developed and launched as an integral part of the roll out of broadband. The delivery of the programme should be through a public private partnership model to be spearheaded by the Ministry of Basic Education (MoBE) and Ministry of Tertiary Education, Research, Science and Technology (MoTEST) in consultation with the Ministry of Employment, Labour and Skills Development (MELSD) and other ministries including the Ministry of Youth, Sports and Culture Development (MYSC).

The Digital Literacy campaign could take various forms and target distinct categories of people and users such as learning the basic use of computers, mobile devices in rural areas (access to the web, CV writing, etc.). It could also include advanced ICT training (for example establishment of ICT Clubs in schools could be used to facilitate the teaching of ICT services); as well as provide basic computer training in public libraries; funding for Kitsong Centres to provide basic computer training; and training of teachers in order to facilitate delivery of curriculum using ICT.

The Strategy points out that consideration should be given to training a group of "Trainer for Trainers". This should comprise all centres where Government have funded Internet access such as schools, libraries, health centres, post offices and Kitsong Centres. These establishments must be on the front lines of digital literacy and digital inclusion, and these efforts must be conducted nationwide. Moreover, the Kitsong Centres are strategically located to enable access to technology and support digital literacy development. The trainers-of-trainers need to be trained in delivering basic digital literacy curriculum.

3.5. The National Broadband Strategy (NBS)

The NBS is anchored within broader national and international policies and goals. It was developed with reference to the National ICT Policy of 2007 (Maitlamo), the country's Vision 2016 and the UNESCO and ITU Broadband Commission aspirations. These national and international policies advocate access to high-speed ICTs infrastructure; provision of online services and applications; and promoting a knowledgeable and informed society. The Strategy calls for the establishment of a National Broadband Structure made of different key stakeholders, who will spearhead the implementation of the Broadband plan (Ministry of Transport and Communications, 2018). The recommendations cover broadly the following areas:

- Deployment of Mobile Broadband Access Networks (3G/4G/LTE) covering urban centres, major villages, rural areas and agricultural areas.
- Roll out of Fixed broadband and ultra-fast broadband access network (xDSL, FTTx, Fixed Wireless) to cities, towns and some major villages.
- Internet connectivity and access to schools, libraries, health centres and Community Access Points.
- Public Awareness and Education Campaigns.
- ICT research, innovation and development.
- Local Content Development.
- Digital Literacy Education Programme; and
- Funding mechanisms to implement the proposed initiatives.

Botswana Digital & Innovation Hub is a networked organisation whose aim it is to promote technology, entrepreneurship and commercialisation. The organisation falls under the Ministry of Tertiary Education Research Science and Technology[7] and has the mandate to develop and manage the Science and Technology Park to attract commercially viable and technology related investments. The company focuses its activities and output on the following strategic areas; develop & manage Science & Technology Park, attract innovative companies and institutions, foster commercialization of innovations and technology transfer and contribute towards competitiveness & national priorities, supporting start-ups and existing local companies to develop and grow competitive technology driven and knowledge-based businesses.

3.6. Connecting Botswana

This programme was intended to assist in the development and deployment of an enabling technical infrastructure for Maitlamo with a view to providing adequate, affordable, dependable, and sustainable ICT infrastructure solutions and to provide connectivity to homes and communities country wide. The initiative identified the technical requirements needed to support the rollout of Maitlamo and develop a plan for continuous renewal of the ICT infrastructure. Providing electricity and internet access for remote and rural communities has been identified as critical to ensure equity and universal access.

The various ICT strategies and frameworks align with the vision of Botswana moving from a minerals-led to a knowledge-based economy with the ICT-sector anticipated to leverage this. Immense growth

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[7] https://www.bih.co.bw/bdih-profile/

has already been recorded in cellular phone subscriptions. Statistics Botswana[8] indicates that while mobile broadband subscription was at 3 per 100 of inhabitants in 2000, this had grown to 67 per 100 of inhabitants by 2017. Despite the noteworthy expansion of mobile cellular subscriptions, the high costs of airtime and mobile data are prohibitive for lower income users impacting on learning and thus impacting on the transition to online learning during the Covid-19 pandemic. BOCRA further reports on the high numbers of complaints with regard to incorrect billing, vanishing airtime and data, faulty telephone lines, slow internet speeds and price inflation. While ICT is regarded as essential for the creation of new jobs and development opportunities, especially for youth the costs of accessing it are prohibiting and thwart the Minister of Youth Empowerment, Minister, Tumiso Rakgare vision for Botswana moving with "new trends and best practices in the content creation industry" specifically focused on in new occupational areas such as digital design, online content production, and data analytics.

Much progress has been made over the last decade, Botswana invested extensively in infrastructure to support its vision of digital-enabled development, with the Trans-Kalahari Fibre Network aimed to install 2,000 kilometres of optical fibre across the southern regions (BizTech, 2020) with another fibre-optic loop linking Gaborone (in the south), to the northern population hub of Francistown. The country is also linked to the rest of Africa through the Eastern Africa Submarine Cable Netwro and that of the West African Cable System (BizTech, 2020).

Against the background of these major investments, Botswana's ICT policy and regulatory arrangements were to be repurposed to help translate this elaborate infrastructure into advanced levels of corporate communication, citizen access and high-speed connectivity for national development. Vision 2036 aims to realise these goals to leverage Botswana's transformation from an upper middle- to a high-income knowledge-based society by 2036 (Vision 2036).

3.7. Challenges

The NDP 11 MTR raised several challenges, which also impact the education sector, regarding the development of ICT including the following:

- Limited skills within the ICT sub-sector;
- The National ICT Policy of 2007 recommended the establishment of an Information Age Council to provide strategic guidance and oversight of ICT development in Botswana. To date, this has not been established;
- The frequent change of leadership responsible for the ICT sector development in Government has contributed to poor and uncoordinated delivery;
- Inadequate funding for maintenance and implementation of ICT projects, especially in Ministries' and Departments' local area networks and the data centres;
- High data transit costs (across neighbouring countries) are a major contributor to the high tariffs experienced in Botswana.
- Land shortage for expansion of mobile telephony sites, affecting coverage and quality. Prevalence of grey phones in the market which tend to have a negative effect quality of service. Grey phones are illicit mobile or cellular phones not from original vendors that come into the market through illegal means.

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[8] Information and Communication Technology Statistics Report 2017.pdf (statsbots.org.bw)

The Mid-Term Review therefore noted that Maitlamo (2007) is due for revision to reflect current trends and developments. Botswana now has more employable tertiary education and training graduates, and technology has advanced, resulting in availability of new applications, that were not conceived in 2005, when the Policy was first formulated.

4. ICT IN EDUCATION DURING COVID-19

The Covid pandemic spurred on the need for the availability ICT for learning, including systems for authenticating examinations, e-education materials, and data analytics to monitor teaching and learning. Botswana's early strategies for ICT in Education, more significantly the Maitlamo ICT strategy and implementation placed the country in an advantageous position. At the onset of the pandemic, the education system had both curricula for teaching computer skills and educators with the pedagogical skills to use ICT in teaching other subject areas. Already in 2002, Botswana ensured that all secondary schools were equipped with computer infrastructure and internet connectivity, to learn basic computer skills.

The Maitlamo strategy ensured the early integration of ICT into primary and secondary curricula advancing the development of digital literacy skills among learners across the education spectrum and beyond. UNESCO commends Botswana for its early integration of ICT in education, pointing out that the development of computer skills in primary and secondary education plays a critical role in national development particularly for learners who come from homes and communities which lack ICT infrastructure (UNESCO Institute for Statistics, 2015). The following figure reflects Botswana's dominant position in the early acquisition of computing or basic computer skills.
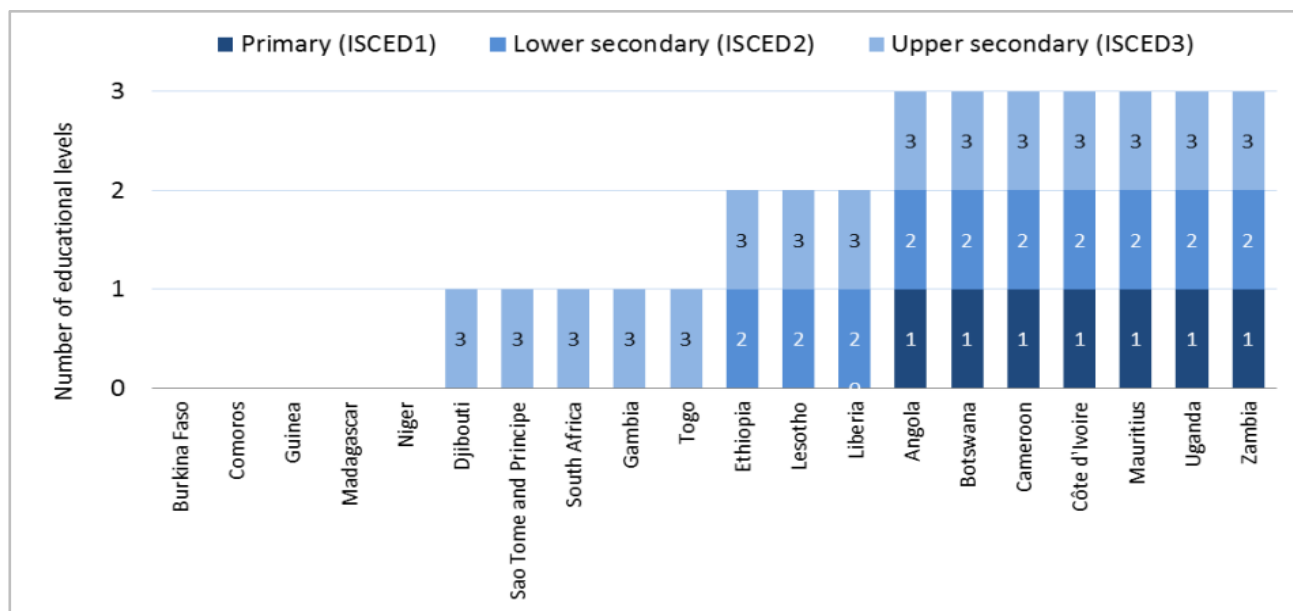

Figure 2: Education levels with basic computer skills, 2013. Data for Botswana 2012.

Source: UIS statistical database, 2015.

Notwithstanding Botswana's advanced stature, the country like many developing countries faced challenges with learning losses despite their high-level skills and school connectivity.

In responding to the COVID-19 pandemic the country's education policy and practice was found to be beneficial as was its introduction of new online and offline learning tools and platforms. However, despite the early adoption of ICT, only small number of learners of its school-going population benefitted from country's remote learning plans which in this case needed to rely on households for its implementation.

There were large disparities among households, particularly across Botswana's vast geographic area, with many challenged when the pandemic required the transition to online teaching, learning and assessment. Moreover, the inequalities in access to education technology meant that even radio and TV presented lessons were difficult to deliver and monitor due to the lack of infrastructure particularly among households located in the regions away from Gaborone.

Botswana has traditionally shown high level trends in ICT as indicated in the following figure. However, the implementation of digital teaching during the pandemic was limited by access to connectivity and to the state of readiness for the rapid transition to remote learning.
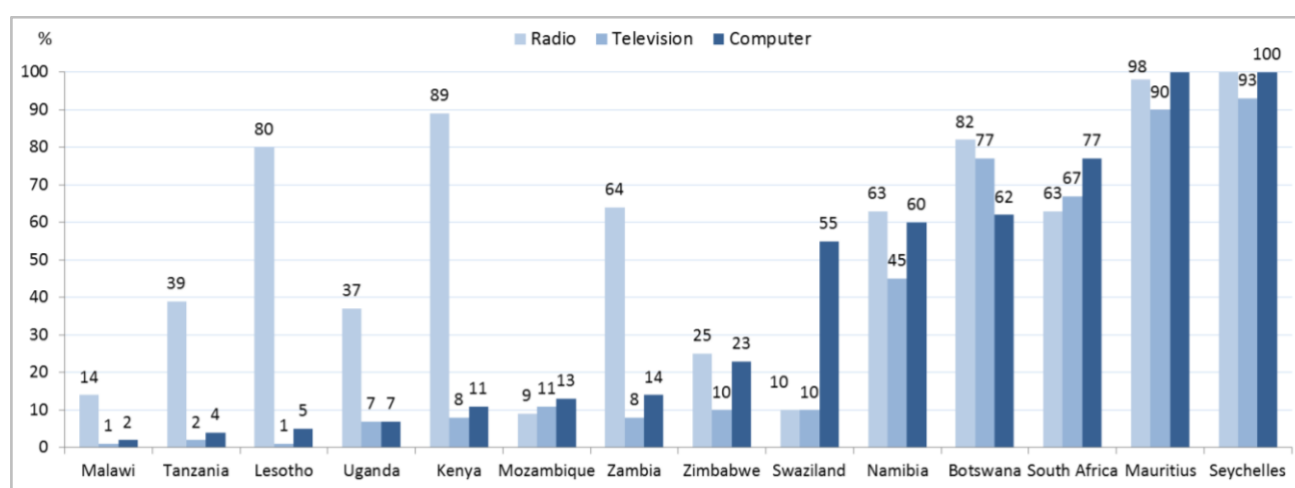
Figure 3: Proportion of Grade 6 pupils with radio, television and computers, by country, 2007

Source: Hungi et al., 2011.

5. THE EDUCATION SECTOR

Botswana's educational development has made great strides since the country attained independence in 1966. At this time only a small percentage of the population attended secondary school and there were very few graduates in the country making the country reliant on expatriates for its skills work. There has been a steady increase in Botswana's adult literacy rate from 69% in 1991 to 83% in 2008 to 90% in 2015 (UIS; Statistics Botswana). Moreover, the Government of Botswana has invested a substantial proportion of its national income in education to future-ready the economy to be less dependent on diamonds for its economic survival, and less reliant expatriates for skilled workers. These aims have found expression in the Botswana's National Development Plan and its national policies for education. With schooling compulsory from Standard 1 up to the end of Junior Secondary/Form 3, Botswana's education system compares favourably with other developing countries but still shows disparities between rural and urban schooling as well as between learners from the poorest (quintile 1) and those in the richest (quintile 5) socio-economic groups. The country

has made great strides in ensuring gender parity with female students more likely to enter tertiary education than males. This 'female advantage' is unusual for a developing country and reflects the country's efforts made towards educating the girl-child.

Botswana's education is administered as shown in Table 2.

Table 2: Education administrative system

Level	Responsibilities
Headquarters	Policymaking and the overall strategic coordination of the education sector.
Regional offices	Policy implementation and the coordination of education services including continuing professional development, school inspections, the provision of textbooks and stationery and the supervision of monetary management in secondary schools.
Schools and institutions	Teaching and learning, the provision of school meals
MLGRD	Infrastructure development, school feeding program and learning resources excluding textbooks.
Ministry of Basic Education	Responsible for teaching services, curriculum development and the delivery of teaching and learning, learner assessments, teacher development, and the recruitment and management of educators.

5.1. Expenditure on education

Botswana's social sector expenditures is generous and education expenditure relative to GDP is among the highest in the world, with significant increases in recent years. The expenditure on higher education and bursaries is high relative to expenditure on basic and technical and vocational education especially when considering that 90% of the basic education budget is spent on salaries leaving insufficient funding to be targeted at improving learning outcomes of the most disadvantaged students, including early childhood development.

Table 3: Expenditure on education in US$

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Government expenditure on education										
as % of GDP	...	...	...	...	7.8	8	7.1	6.7	6.9	...
as % of total government expenditure	...	...	...	...	17.5	16.5	22.2	15.6	15.4	...

Source: UIS.

5.2. The structure of the education sector

The following figure shows the structure of the formal education system indicating school standards/forms by age group.

Figure 4: Educational levels by age range.

Source: MOBE.

Table 4: Number of schools

Type of school	Number of schools
Primary	826
Secondary	211
Unified schools offering both junior and senior education	2
Total number of schools	1039

Table 5: Enrolments across the education sector

Level	Enrolments
Pre-primary	24688
Primary	340065
Secondary	175509
Tertiary	56666
Total learners in the system	596928

With close on 600000 learners across the education system, there is a large proportion of those in the school/education and training-age population that are currently not in the system. These are mainly at secondary and tertiary levels, and much can be gained by expanding the capacity of the Botswana Open University and BOCODOL to cater for those who wish to pursue tertiary studies or complete secondary schooling.

Table 6: School age population by level

Pre-primary	164,085
Primary	368,907
Secondary	238,484
Tertiary	206,421

Table 7: Enrolments in education by level

Levels	Indicators	Statistics
Pre-Primary	Total Enrolment	24688
	Gross Enrolment Rate (3-5 years)	20.4
	Net Enrolment Rate (3-5 years)	17.3
	Gender Parity Index	0.96
Primary Education	Total Enrolment	340065
	Gross Enrolment Rate (6-12 years)	110.8
	Net Enrolment Rate (6-12 years)	92.9
	Transition Rate	98.1
	Progression Rate	83.5
	Gender Parity Index	0.95
Secondary Education	Total Enrolment	175509
	Gross Enrolment Rate (13-17 years)	81.1
	Net Enrolment Rate (13-17 years)	64.1
	Transition Rate	67.7
	Gender Parity Index	1.1
Tertiary Education (2013/2014)	Total Enrolment	60439
	Tertiary Education Gross Enrolment Rate (18-24 years) -2013	20.2
	Gender Parity Index	1.32
Literacy Survey - 2014	Literacy Rate (15-65 years) - 2014	90

Source: Statistics Botswana, 2021.

6. THE EDUCATION SUBSECTORS

The official age for starting school in the country is six years. However, Statistics Botswana (2021) indicates that while (only) 72,9% of learners enrol for primary school at the age of 6-years, the enrolment rates for 8 to 9-year-olds is at 100.6% and 100% respectively, showing that almost all children aged 8 and 9 are enrolled in primary schools irrespective of the standard they are in.

Given the Botswana's vast geographic area, the statistical body points out that approximately 34.3% of primary school learners are enrolled in the Central region; 14.3% in the Kweneng region, and 12.3% in the South region. Although the following table shows that in basic education the number of males enrolled are consistently higher than their female counterparts, the ratio is totally reversed in the tertiary sector with a Gender Parity Index of 160 suggesting that there is one male enrolment for every 160 female enrolments.

Regarding the costs of schooling, parents are charged a 'co-payment' for education which is waived for children from low SES families. While there are indirect costs such as scholar travel and the costs of uniforms, all children receive free school meals each day. There are three nationwide examinations: the PSLE at the end of primary school; the JCE at the end of junior secondary school; and the BGCSE at the end of senior secondary school. Learner progression from primary to junior secondary is automatic, unless the parents and teacher agree that the student should repeat the grade and the PSLE no longer acts as a filter.

6.1. Early childhood and pre-primary education

There have been significant increases in the numbers of learners enrolling for pre-primary education which is offered for children aged 5-years of age. Pre-primary education is offered by community-based early childhood development centres, which although registered with government, do not receive any direct public support. There is a perception that these early childhood centres are not adequately capacitated to teach children in ways that might contribute to quality cognitive and socioemotional development (WORLD BANK (2019). This may be attributed to the extremely small numbers of qualified ECCD teachers (ETSSP 2015). According to the household survey data (BMTHS, 2015-16) nearly 3% of children between the ages of three and five are enrolled community-based pre-school centres.

The proportion of five-year-olds enrolled in pre-primary education increased from 20% in 2013 to 39% in 2018. However, despite this increase in pre-primary enrolments, Table 8 shows that when comparing the number of learners in pre-primary learning with those in Standard 1, fewer than half of the target age cohort enrols in pre-primary schooling.

Table 8: Pre-primary enrolments compared to enrolments in Standard 1 (2018)

Region	Pre-primary Girls	Pre-primary Boys	Std 1 Girls	Std 1 Boys	Pre-primary as % of std 1
Chobe	120	122	371	293	36%
Kgalagadi	560	575	838	722	73%
Central	4,670	4,537	10,501	9,397	46%
Ghanzi	305	312	717	772	41%
Kgatleng	812	722	1,310	1,159	62%
Kweneng	1,746	1,797	4 106	3,712	45%
North East	632	593	2,054	1,953	31%
North West	859	898	2,910	2,622	32%
South	982	1,027	3,668	3,231	29%
South East	676	743	2,390	2,315	30%
Total	**11,362**	**11,326**	**28,865**	**26,176**	**41%**

Source: MOBE EMIS cited in UNESCO.

6.2. Primary education

In 2019, there were 826 public and private primary schools. Primary school enrolments constitute two-thirds of the total number of schooling enrolments (primary and secondary), and students, irrespective of performance, are "automatically" admitted to Form1 after completing of Standard 7. Regions which enrolled high proportions of pupils were Central region accounting for 34.3% followed by Kweneng region with 14.3% and South region with 12.3%.

As shown in the following figure the enrolment rates in primary education have been constant over the period 1999 – 2017, increasing from 320,000 learners in 1999; to 350,000 in 2017, representing an annual enrolment increase of 1% per annum. Over the same period, lower secondary enrolments increased from 112,000 to 125,000, while upper secondary enrolments remained constant at about 50,000 students (World Bank, 2019: Statistics Botswana, 2021). These trends are shown in Figure 5.
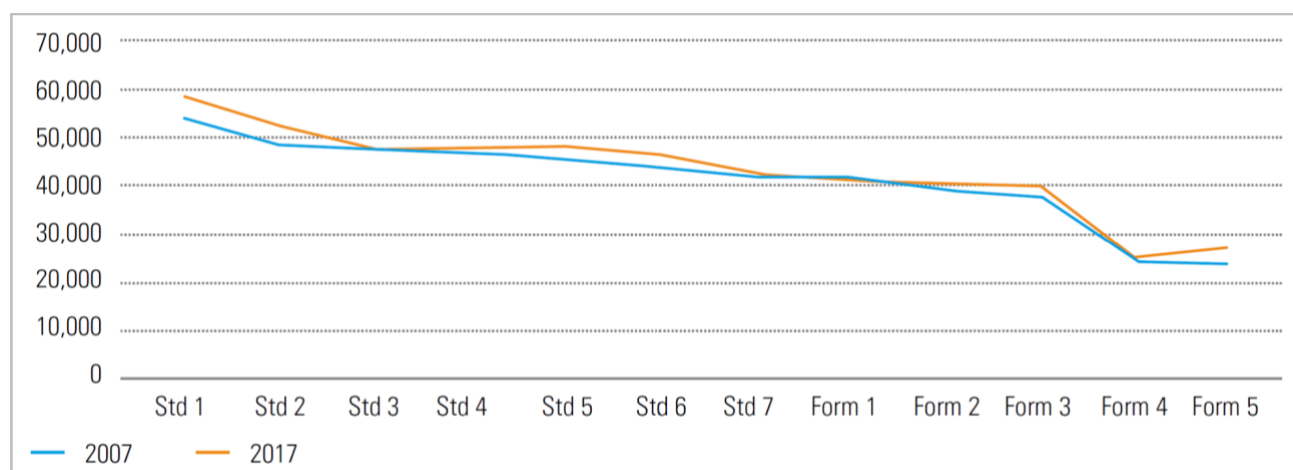

Figure 5: Enrolment by grade, 2007 – 2017

In 2019, the Gross Enrolment Rate (GER) was 48 percent at pre-primary school level; primary school had a GER of 109 percent with a parity index of 0.9 and completion rate of 99.5 percent. Lower secondary was 99.9 percent with completion rate of 99 per centre and parity index of 1.00. Upper

secondary school was 56.7 percent with completion rate of 98.8% and parity index of 1.31; while tertiary was19.5 percent with a parity index of 1.6 (Republic of Botswana, 2022). The Botswana 2022, Voluntary National Review (VNR) report explains that one of the reasons for the low GER at pre-primary and upper secondary school is limited space. At Tertiary Education, the low GER is attributed to the significantly high fees and heavy dependence on government funding. However, through initiatives such as the Affirmative Action Programme (AAP), learners from remote area communities, and economically and socially disadvantaged groups are supported socially, financially and psychologically to access education and training (Republic of Botswana, 2022).
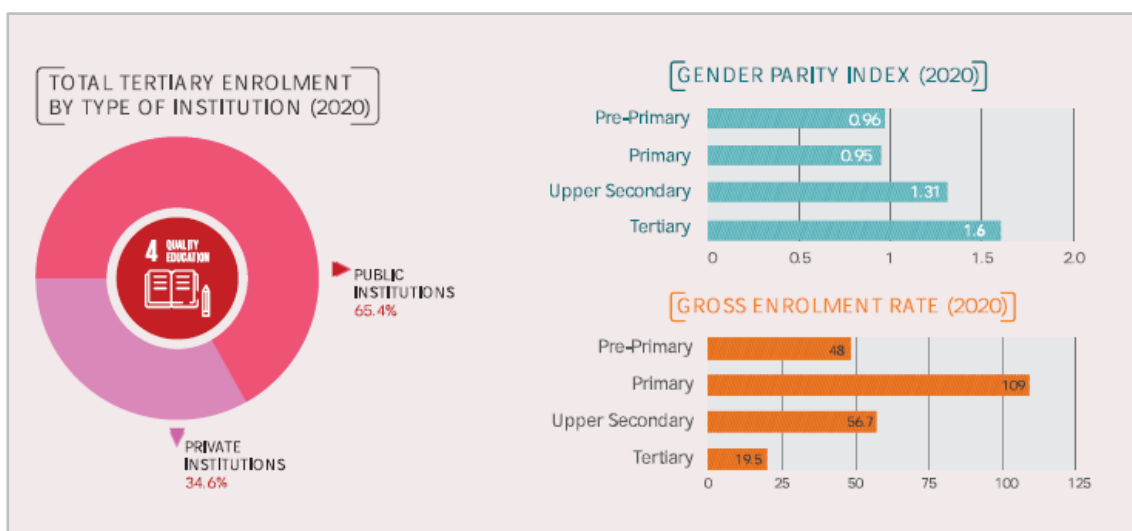
Figure 6: Enrolment rate in education (Republic of Botswana, 2022)

The VNR 2022 report indicates that regarding quality education; Botswana continues to record impressive net enrolment rates, 98.1 and 67 per cent for primary and secondary education, respectively. The country has a 90 per cent literacy rate. However, early childhood and tertiary enrolment lag behind, standing at 30 and 20.2 per cent respectively. Reasons for the low tertiary enrolment, according to the report include the high per capita cost while early childhood rates are attributed to the private sector dominance of the market share. At 7.1 per cent of Gross Domestic Product (GDP), Botswana's public expenditure on education is comparable to the upper middle income country average. However, there is a disproportionate pattern of investment per student at basic and tertiary levels, with spending on the latter estimated to be six times higher. One challenge of note is the under-representation of low socio-economic students within the tertiary education sector, with 63.4 per cent of tertiary students coming from the top two income quintiles. This underscores a need to focus on pre-primary and primary education to strengthen the basic foundations for life-long learning and skills development (Republic of Botswana, 2022).

6.2.1. Learners with Special learning Needs

The Ministry of Basic Education is committed to an inclusive education system and the provision education for learners with special educational needs (LSEN) with the aim of increasing access for all including those children who are orphans and vulnerable children (OVC), children in difficult circumstances and those children with special education needs and disability.

Special education units are established in existing schools and mainstream schools are provided with equipment and infrastructure to support children with disabilities. Currently there is one government

junior secondary school and one senior secondary (SSS) each with special units to cater for children who have visual impairments. A further two Junior Secondary Schools, and one Senior Secondary School have units for learners with hearing impairments. However, because of the long distances to travel, many LSEN secondary learners are compelled to attend boarding schools which may not always have access to assistive devices to accommodate LSEN learners.

The following figure from Statistics Botswana, shows the special needs type and proportions that are to be accommodated.
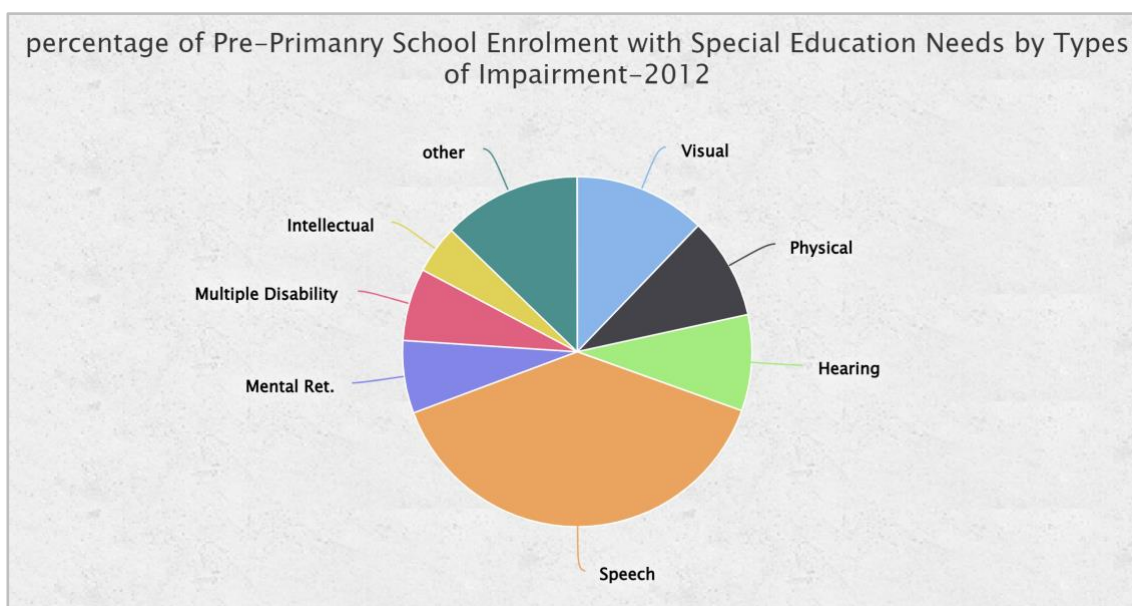
Figure 7: Breakdown of the types of special needs to be accommodated

Statistics Botswana, 2021

6.2.2. The use of ICT in primary schooling

The need for digital content/digital learning resources and content linked to specific curricular using a range of devices and platforms is upon us. The teachers and learners are also expected to use, re-use and re-mix digital teaching and learning resources, in addition to using robotics, simulations, and games in teaching and repositories, and Open Educational Resources (OER) which are essential for fast tracking the development of teaching content.

Primary level learner to computer ratio in Botswana is 55:1 in primary schools. While lower in secondary education this ratio is still considered too high for optimal learning (UIS, 2016) and further data is required from the ministry to determine the needs.

As shown in the Figure 8, Botswana had reached full use of computer assisted education by 2013 suggesting that the country is faring extremely well when compared with all other countries in the region. In addition, as shown in Figure 9, Botswana has already achieved full internet coverage of its primary and secondary schools.
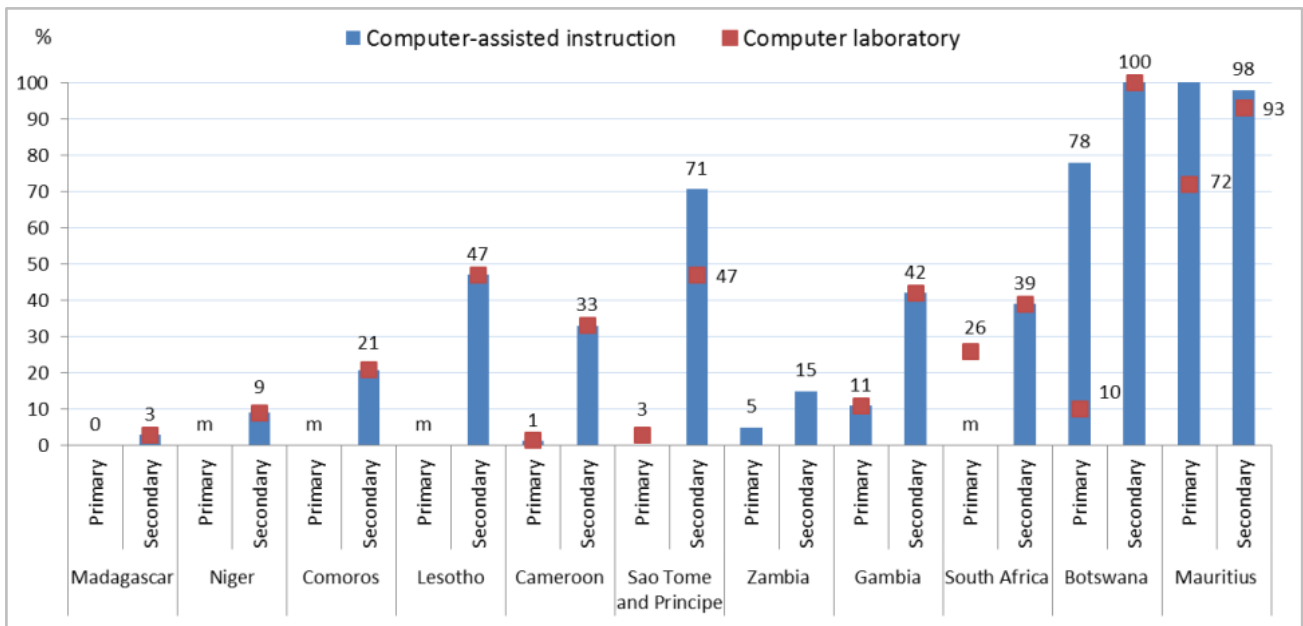
Figure 8: Computer-assisted instruction and laboratories in primary and secondary education, 2013

Source: UIS Statistical database, 2015.
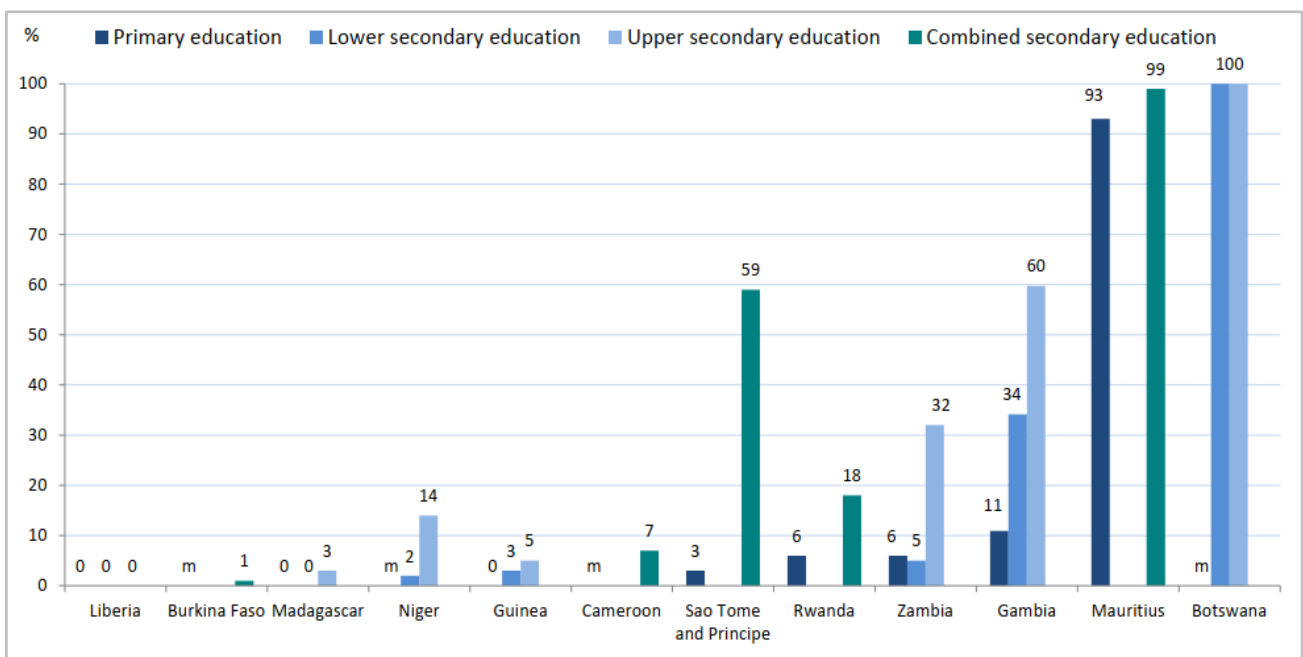
Figure 9: Proportion of educational institutions with Internet, primary and secondary education, 2013

Source: UIS statistical database, 2015.

6.3. Secondary education

In 2019 there were 211 junior secondary schools, 33 senior secondary schools, and 2 unified or combined schools which offer junior and senior secondary education. There are 52 private secondary

schools which accommodate 4% of the total secondary learners in the country (Statistics Botswana, 2021).

Botswana's geographic span with its sparse population makes access to education challenging for many learners. While the country's relatively large network of 826 primary schools across the country make primary schooling geographically accessible – the transition to junior secondary education and the restricted number of senior secondary schools make education less accessible.

Consequently 17% of junior secondary learners (about 21,000) and 35% of senior secondary learners (about 18,700) were accommodated in boarding schools in 2017. (Due to the high number of primary schools, only 1.3% which is fewer than 4,400 primary scholars were enrolled in boarding schools in the same year (World Bank, 2019). As the ETSSP points out, there is a need to "improve and strengthen the management of boarding schools to make them more child-friendly and conducive to learning. (Botswana, Ministry of Education and Skills Development, 2015, p. 49; See World Bank, (2019 p. 42).

The transition from Primary school to Secondary school does not show elevated levels of attrition. The Primary School Leaving Examination (PSLE) at the end of Standard 7 no longer acts as a filter and all learners are admitted to secondary school into Form 1 after completing Standard 7. However, as shown in the next figure, the attrition rates among learners who do not complete Junior Primary is high as large numbers do not proceed to the upper secondary level. At the end of Form 3, students write the JCE examination which determines admission to Form 4. There are consistently lower enrolments in upper secondary, as the World Bank (2019) points out, "while the gross enrolment ratios show universal education, the transition rates to junior and secondary education are low, and the system reflects high levels of repetition and dropping out".
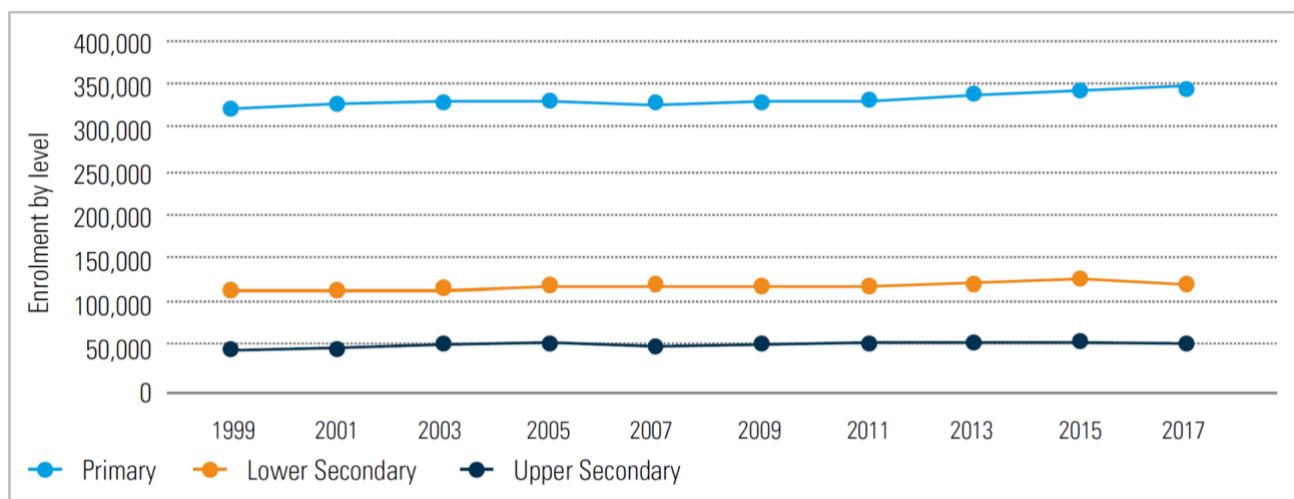

Figure 10: Total enrolment by education level in the period 1999-2017

Source: World Bank (2019)

In 2019 a total of 36,508 candidates sat for the BGCSE examination of which majority 21,130 (58%) were from Government schools, 8,680 (24%) from Botswana Open University, 3,976 (11%) Botswana Examination Council (BEC) Centre and 2,722 (7%) from Private schools.

6.3.1. The integration of ICT in Secondary Education

Although ICT is offered as a subject to enhance students' computer, Siamisan et al's study (2019) in a sample of public junior secondary schools found that teachers' lack of confidence mitigated against their utilising ICT. They indicate that teachers still reverted to using traditional methods. Siamisan et al point out that 98% of the teachers observed sample taught ICT as a subject, however, only 56% opted to use ICT in their teaching of subjects. They argue that the integration of ICT in Junior secondary schools in Botswana is exceptionally low or not yet started and they contend that factors such as a lack of skills, lack of teachers' confidence to use ICT and a lack of ICT equipment in schools attribute to this problem. They recommend that schools need to be equipped ICT-supporting infrastructure, and that teachers should be trained on the pedagogy of ICT in teaching and the curriculum should be designed to include ICT integration across learning areas.

Following Mishra et al. (2006) the ability to connect Technology Knowledge (TK), Content Knowledge (CK) and Pedagogy Knowledge (PK) constitutes a challenge for teachers. TK refers to understanding the computer hardware and software with the PK referring to the use of ICT hardware and software in delivering learning. While Siamisan et all contend that it is incumbent on all teachers to have TK-skills, it may be argued that this is another category of expertise needed to enable teachers to reconfigure their lessons into high quality digital material which includes content and quizzes, gaming, artificial intelligence, and learner analytics. In a small country like Botswana, it would be worth considering having this developed centrally and rolled out to schools for teachers to integrate and mediate in their classrooms. It will not be possible for a country like Botswana, with only 256 primary schools, to expect individual teachers to develop digital content.

6.4. Tertiary education

Before transiting from basic education to tertiary education, students must complete the SSS level which is the highest basic education level and then complete the Botswana General Certificate of Secondary Education (BGCSE) or an equivalent assessment. After completing BGCSE (or its equivalent), the expectation is that successful students will proceed to tertiary education in one of the tertiary institutions.

After leaving school, students can enrol at one of the universities, or at one of the technical colleges for vocational training courses or at a nursing or teacher training college Those learners who successfully completed secondary school can register at one of the universities: the University of Botswana, Botswana University of Agriculture and Natural Resources, Botswana International University of Science and Technology and the Botswana Accountancy College in Gaborone. In addition, several school leavers enrol with the one of the private tertiary colleges.

The MELPSD is responsible for all areas concerning TVET and the MTERST for tertiary education and structure of the post-school sector in relation to basic education is shown in the following figure.
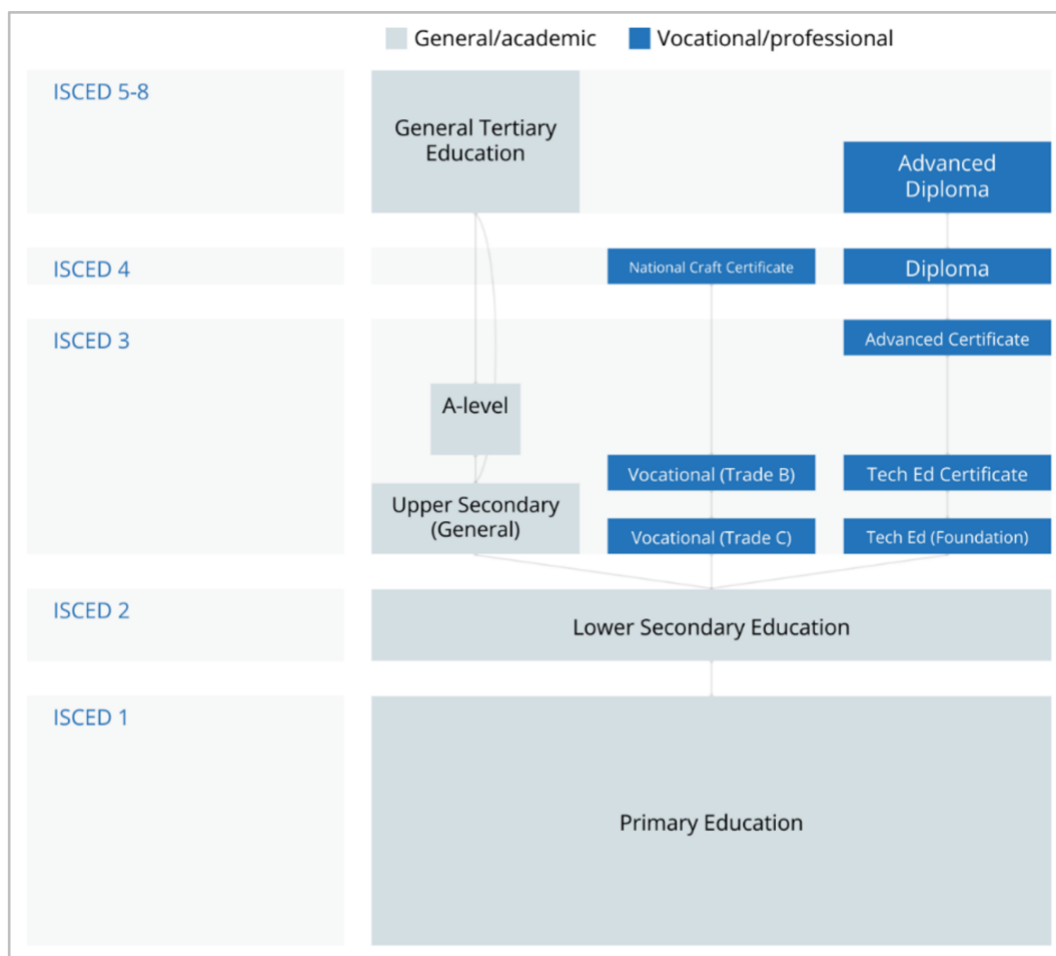
Figure 11: The structure of the education system

Source UNESCO-UNEVOC.

6.4.1. Participation tertiary education

According to Statistics Botswana (2021) in 2020, a total of 56,666 students enrolled for tertiary studies across the various tertiary institutions:

Table 9: Tertiary education by institutional type

Institution type	Number	Percentage
Public tertiary institutions	37061	65%
Private tertiary institutions	19605	35%
Colleges of Education		4%
Institute of Health Sciences		3%

	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Student Enrolment	60439	60583	56447	59091	53450	53930	56666
Private	23571	25808	21707	25272	19761	19166	19605
Public	36868	34775	34740	33819	33689	34764	37061
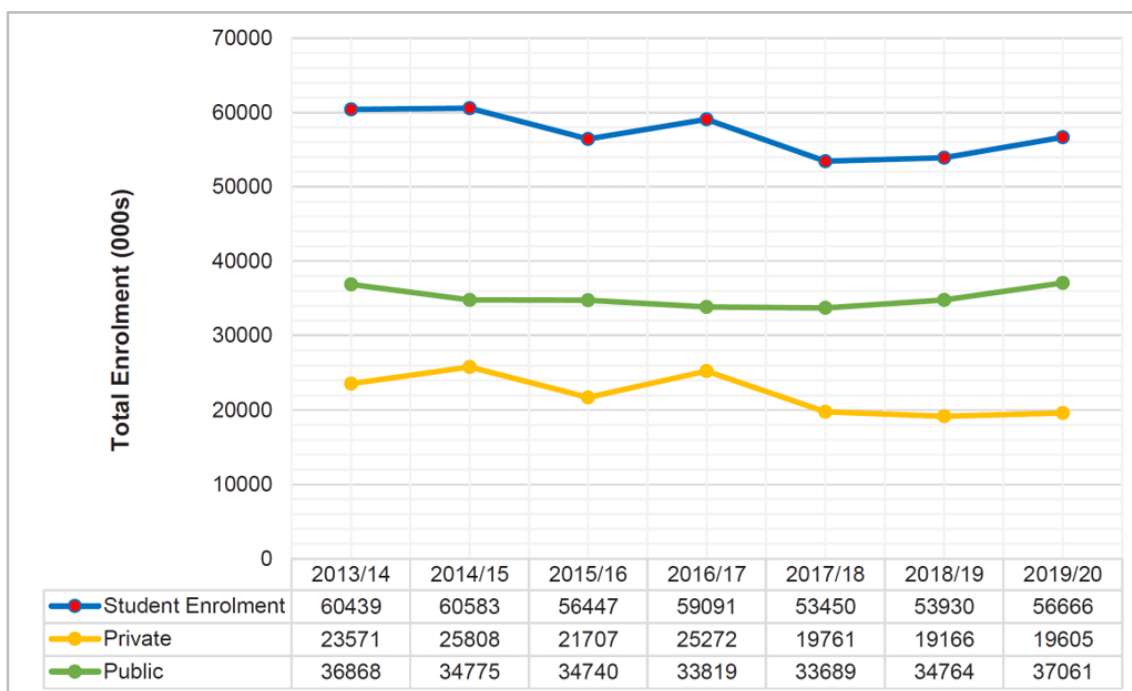
Figure 12: Tertiary Education trends across public and private institutions (2013-2020)

In the period 2013 – 2020, most of the students (22,830) were enrolled in public universities – the Botswana University of Agriculture and Natural Resources (BUAN), Botswana Open University (BOU), Botswana International University of Science and Technology (BIUST) and University of Botswana (UB). The lowest enrolment, (1,229) was recorded from the six public Institutes of Health Sciences.

6.4.2. Gender Parity Index for Tertiary Education

Female enrolments were higher than their male-counterparts, a trend that was observed across all the diverse types of tertiary institutions with female enrolments at 34,505 and accounting for almost 61 % of the total enrolment.

The Gender Parity Index (GPI) shows that of the total student enrolment of 56,666 in 2020, a gender parity index of 1.6 was indicated indicating the higher number of female enrolments (0.6) than for males in tertiary institutions. The trends in GPI for the period 2013 - 2020 show the advantageous position of females showing a total 160 females were enrolled against every100 males. This was partially attributed to the substantial increase of female students enrolled in technical colleges which increased from 657 (42.5%) in 2019 to 1,002 (50.4%) in 2020. Figure 13 shows the increasing high gender parity index since 2013.
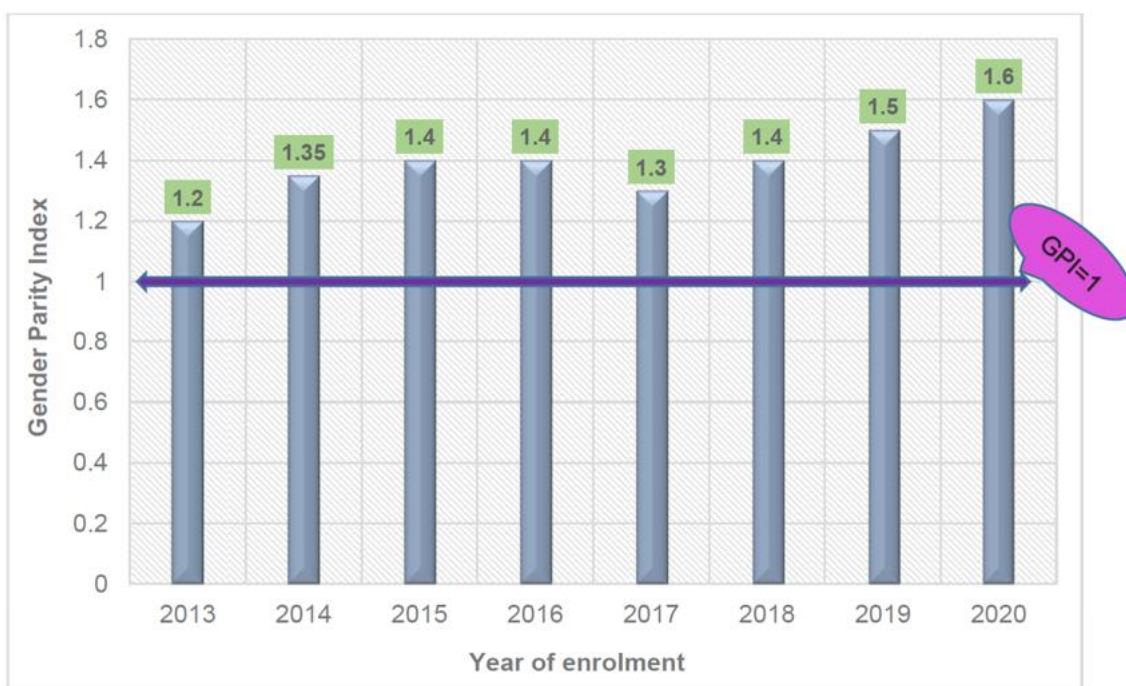
Figure 13: Trends of GPI in student enrolment 2013-2020

Source: Statistics Botswana 2021.

As shown in Figure 10, the breakdown of students by type of institution shows that across the various institutional types consistently show more women than men.

6.4.3. Enrolment by Type of Institution

Table 10: Enrolment by institution type and Sex - 2019/20

Type of Institution	Female	Male	Total	% Female
Private Institutions	6,205	3,957	10,162	61.1
Private Universities	5,284	4,159	9,443	56.0
Colleges of Education	961	448	1,409	68.2
Institute of Health Sciences	805	424	1,229	65.5
Technical Colleges	1,002	986	1,988	50.4
Public Institutions	6,087	3,518	9,605	63.4
Public Universities	14,161	8,669	22,830	62.0
Total	34,505	22,161	56,666	60.9

Source: Statistics Botswana 2021.

6.4.4. Enrolments by Type of Qualification

Table 11: 2020 Students Enrolment by level of qualification

Level	Female	Male	Total	% Female
Certificate	1,828	958	2,786	65.6
Diploma	8,982	4,548	13,530	66.4

Bachelor's Degree	20,658	14,604	35,262	58.6
Post Graduate Diploma	350	194	544	64.3
Master's Degree	1,225	1,009	2,234	54.8
Master of Philosophy	42	52	94	44.7
Doctor of Philosophy	64	87	151	42.4
Professional Qualifications	1,337	701	2,038	65.6
Other	19	8	27	70.4
Total	34,505	22,161	56,666	60.9

Source: Statistics Botswana 2021.

As indicated above, most students were enrolled at undergraduate level, and only 4% of the total enrolment numbers were for master's and doctoral degrees.
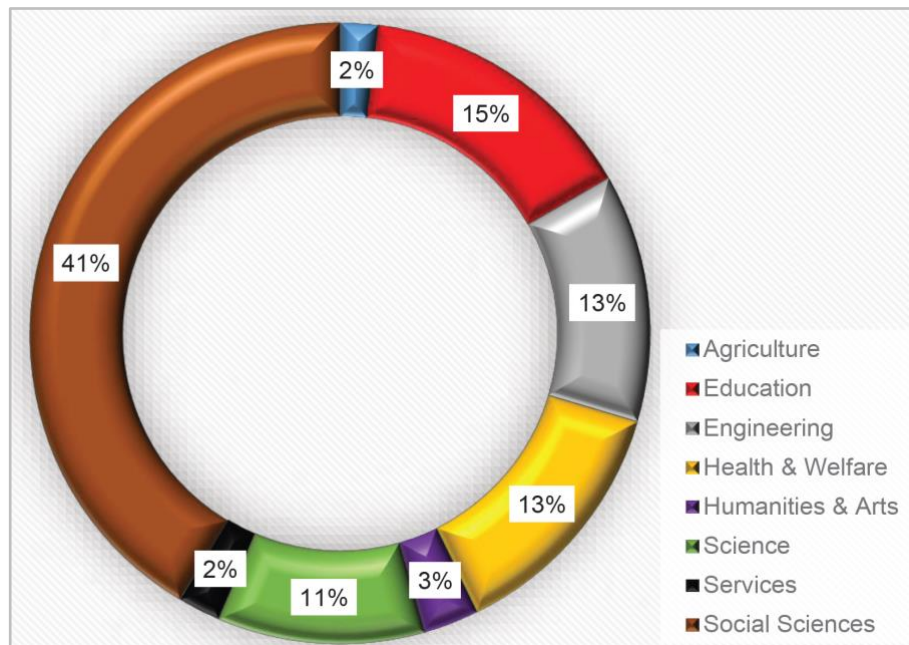
Figure 14: 2020 Enrolment by Field of Education

The above chart shows the enrolments by fields of education, indicating (as do other universities in the region) that the fields of Social Sciences, Business and Law have the largest concentration of students (41% of the total student population). Education is the second largest field with 15% and, as the statistical body points out, Technology, Engineering and Mathematics (STEM), (Engineering and Science combined), accounted for 24% of the enrolments (13% Engineering and 11% Science). The Engineering and Science programmes included four and three areas from science and engineering respectively, including mathematics and statistics, computer engineering and engineering trades. Agriculture and Services streams were the lowest and accounted for 2% each of the total enrolment numbers. The following figure shows the gender breakdown of students in each field.
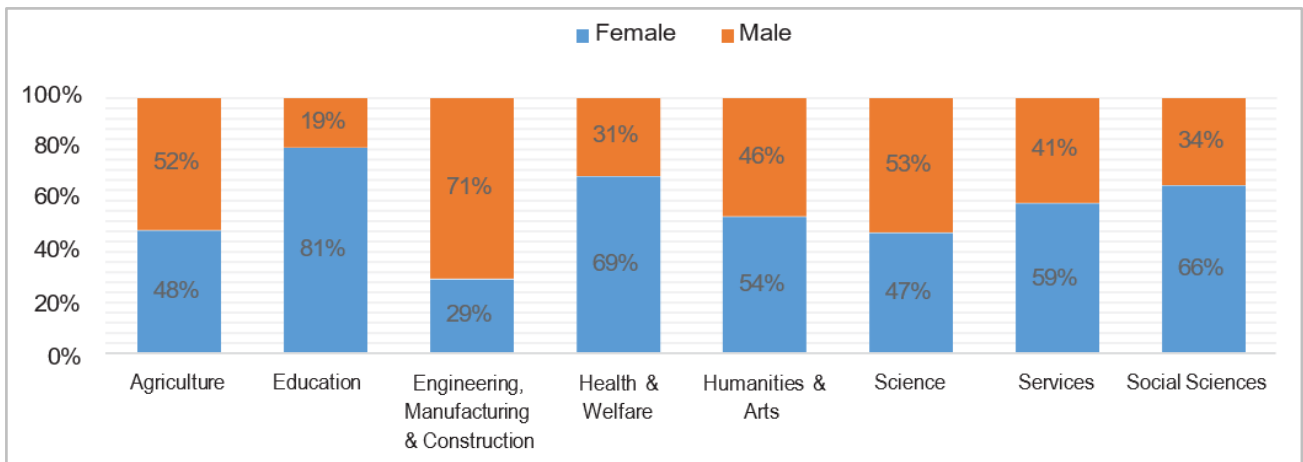
Figure 15: Gender breakdown of fields of education

Source: Statistics Botswana 2021; Higher Education Institutions 2019/20.

The following table shows the breakdown of TVET students by gender and by qualification level pointing to the increasing numbers of female students in what is traditionally considered male domain.

Table 12: TVET enrolments by level of qualification 2019

	Male	Female	Total
Certificate	2110	954	3064
Diploma	8479	5034	13513
Total	**10589**	**5988**	**16577**

Source: "Tertiary Education Statistics 2019", Human Resource Development Council, August 2020.[9]

6.5. Technical programme provision

The extent to which technical provision can be supported by distance education modalities need to be explored. This could enable expanded access by offering more blended approaches with the theoretical components taught using online modalities, simulated learning, and time in workplaces to gain practical skills. Currently technical programmes are offered through Brigades and four Technical Colleges (Maun, Jwaneng, Palapye and Selebi-Phikwe Technical Colleges) which offer vocational training qualifications up to certificate level (National Craft Certificate). These trades[10] include:

- Architectural Draughting
- Auto Mechanics
- Borehole Mechanics
- Bricklaying and Plastering
- Carpentry and Joinery
- Dress Making

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[9] *https://unevoc.unesco.org/home/Dynamic+TVET+Country+Profiles/country=BWA*

[10] https://www.gov.bw/learning-and-teaching/vocational-education-training

- Electrical Installation
- Forestry
- Horticulture
- Livestock Farming
- Machine Fitting
- Painting and Decoration
- Panel Beating and Spray Painting
- Plumbing and Pipe Fitting
- Refrigeration and Air Conditioning
- Welding and Fabrication

6.5.1. Enrolments by mode of study towards blended learning

While distance education has gained traction in Botswana because of the Covid-pandemic, the following table based on 2020 statistics does not reflect this although it does show the high number of distance learning students.

While the traditional dichotomy between distance and contact learning has been blurred, many tertiary institutions use blended modes, combining face-to face with podcast support, online discussions, study guides/materials and activities with most universities diversifying their modes of delivery. Analysis of the study mode for the 56, 666 students enrolled in tertiary institutions reflect high use of distance modalities and this is likely to be much higher in the 2021 and 2022 statistics as distance modes became the default modes in most tertiary institutions.

	Private Institutions	Private Universities	Colleges of Education	Institute of Health Sciences	Technical Colleges	Public Institutions	Public Universities
Full Time	9,314	8,851	1409	1229	1,783	7,789	14,900
Part-Time	744	189	0	0	205	1,461	1,518
Distance	104	403	0	0	0	355	6,412
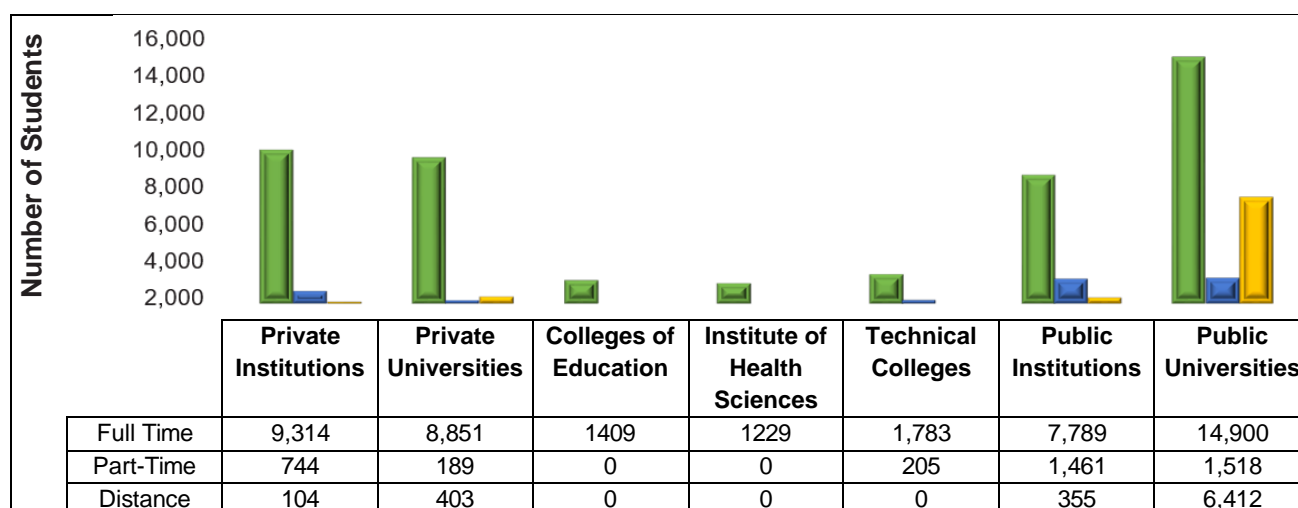
Figure 16: Student Enrolment by study mode (2020)

Source: Statistics Botswana 2021.

While the figure shows a high proportion of part-time students, 6,412 students enrolled for distance learning at the Botswana Open University which is a dedicated distance education provider. Since these figures reflect the 2020 enrolments, it is likely that the statistics will be vastly different for the 2021 cohorts and that most of the institutions would be using blended learning approaches after the onset of the pandemic.

6.6. The Botswana Open University (BOU)

The BOU is ideally placed to assist the education sector with its transition to distance teaching. BOU's students are supported through five regional campuses which are spatially distributed across the country, in Gaborone, Francistown, Palapye, Maun and Kang, overseen by the BOU headquarters in Gaborone whose leading role revolves around policy development, strategy, budgeting, programme development, monitoring and evaluation.

The pandemic accelerated BOU's strategic objective of having all its programmes delivered in blended mode which would involves delivery that is predominantly online, but which is supplemented with face-to-face activity. Prior to the pandemic, 16 of the 20 tertiary programmes have an online presence and BOU's *Strategy for Technology Enhanced Learning, Teaching, Assessment and Student Support* provides to future-ready the institution for the next generation digital learning environment beyond 2023. BOU's council also approved the *Learning Analytics Policy*, which constitutes guidance for implementing innovative approaches to programme improvement and student support.

BOU offers a full suite of teacher education programmes; the School of Science and Technology was set up in 2017 and consists of the following - Department of Computing and Information Systems Programme(s):

- Bachelor of Technology in Information Systems (BTech Information Systems) – ICT Academies
- The Huawei ICT Academy with courses covering the basics of IP network connectivity, TCP/IP technologies, Ethernet technologies such as STP and RSTP, VLAN and Link Aggregation and their implementation within Huawei switches. Certified Huawei students can have various career prospects such as Network engineers, network administrators, network technicians etc.
- Huawei Certified ICT Associate Course on Routing & Switching (BQA Registered)

BOU's School of Education (SOE) has grown and enables BOU to offer several teacher development programmes which could provide the teaching capacity the country needs and when combined with the ICT programmes referred to above, Botswana could provide the much-needed teacher development programmes for in-service and preservice teacher.

Another component of Maitlemo's ICT-enhanced education vision that was recommended at the time was the professional training and support of school heads, school IT managers and teachers so that they acquired a greater understanding of ICT and how it can be used both as a classroom tool and as educational content, focusing on basic computer use and maintenance, how to use the internet and the school network and how to integrate ICT into classroom teaching. Later phases of the Professional Development Programme were projected to broaden the number of teachers and administrators who have basic ICT skills and to integrate ICTs into all aspects of the curriculum and educational management system.

The National Development Plan 11 (NDP 11) outlines the systems to be developed to improve the management of the education sector. The most noteworthy systems are the Teacher Management System, the Student Selection System used for processing and placement of student in tertiary institutions while an Education Information System was initiated (Republic of Botswana, 2007).

BOU could play a key role in such capacity development. Discussions with the Ministry of Basic Education (MOBE), on the training of teachers to integrate technology into teaching and learning were slowed down by the COVID-19 pandemic since March 2020. The BOU/MOBE discussions are therefore, still at initial stages, but could yield a long-term value adding partnership.

BOU's strong and relevant partnerships and collaborations help to drive innovation and knowledge transfer to promote continuous and lifelong learning. In the year 2019/20, BOU signed new partnerships with local and international partners. To operationalise these partnerships, its Council approved an *Internationalisation Plan and a Partnerships Policy* (March 2020) to provide a framework for reports on value addition from the partnerships.

6.7. Literacy rates and the need for adult education

Illiterate population	TOTAL	MALE	FEMALE	
15-24 years	10,210	8,474	1,736	(2013)
15 years and older	176,911	88,103	88,808	(2013)

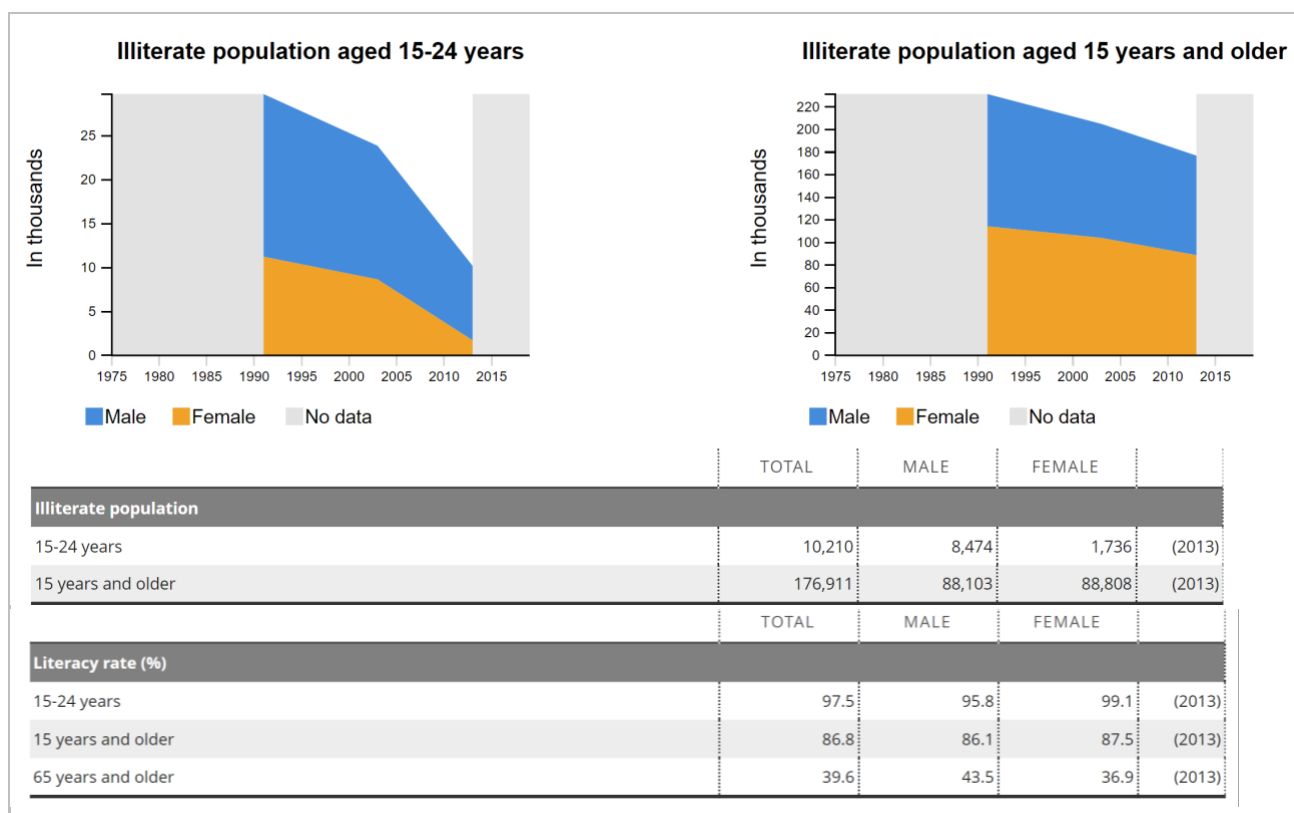| Literacy rate (%)	TOTAL	MALE	FEMALE	
15-24 years	97.5	95.8	99.1	(2013)
15 years and older	86.8	86.1	87.5	(2013)
65 years and older	39.6	43.5	36.9	(2013)

Figure 17: Literacy Rates by age group and gender

Source UIS.

Statistics Botswana shows a 15+-year old literacy rate based on its 2014 survey to be at 90%. Despite close on universal schooling, the high numbers of dropouts do signal the need for adult and continuing education programmes most of which can be delivered by distance education by expanding BOCODOL's offerings.

7. QUALITY, EQUITY, AND EFFICIENCY

7.1. Quality

Clearly the education system provides equity of access however, as the statistics show, many learners fail the JCE and are thus prevented from continuing to Form 4. In 2017, only 36% of JCE candidates achieved a C-grade with a higher number of lower quintile learners more likely to dropout, thus restricting their access to senior secondary and university education and impacting on their future earning potential.

Furthermore, as the World Bank (2019) points out that Botswana's performance on international assessments (Pre-PIRLS, PIRLS, and TIMSS) has been lower than the average [international] middle-income countries highlighting cumulative learning deficits and strengthening the case for improving ECCE, pre-primary education, as well as the need to improve early-grade reading, writing, and arithmetic. The teaching of these foundational skills could be enhanced through the development of national courseware to upgrade teachers' pedagogical practices and the role of ICT could be well used to enable this.

While the country's performance on internal examinations have been constant over the years, the differentials in learning outcomes have been largely attributed to the unavailability of educational resources. This is clearly shown in the data from TIMSS, and PIRLS show a correlation between poor performance the and the availability of textbooks, amongst others. Moreover, the TIMSS, PIRLS, and SACMEQ data show that while learning gaps between urban and remote rural areas are low, SES still impacts on the learning outcomes of low quintile learners and is related to the average SES of learners in a school. Direct interventions should be made in underperforming schools. The use of high-quality digital materials can contribute to improving learning outcomes and these can be professionally developed for learners with special needs and for improving the quality of classroom teaching. Moreover, learning deficits could be addressed by upskilling teachers and through the utilization of well-crafted ICT and other learner resource materials.

7.2. Equity and inclusivity

Since independence, Botswana has endeavoured to achieve universal education whilst striving to ensure fair and inclusive system of education. Schooling is largely free, and learners receive school meals and other resources that are provided to improve access and inclusivity. However, it is recognised that despite the fee-free system, there are still direct schooling costs that impose a heavy burden on lower SES families, such as the cost of uniforms and travel costs for long commutes for many learners. Moreover, while boarding schools are not the modes of choice, they never-the-less provide schooling for learners in hard-to-reach areas thereby opening access for all learners transitioning from primary to secondary school, more especially those from low SES households.

As the World Bank (2019) notes, Botswana's allocation of teachers across the country's schools contributes to an equitable education system as there is a high correlation between learner enrolments and the numbers of teachers employed – despite the shortage of classrooms. With more than 15000 educators, only 25 were listed as being under-qualified.

Botswana has achieved gender parity with a Gender Parity Index (GPI) just over 100 in junior secondary schools and 128 in senior secondary grades. In addition, female learners are less likely to repeat grades than their male counterparts with repeating grades more common in the higher grades and this is more so with the GPI of 160 in tertiary education.

7.3. Efficiency

While the country meets the criteria for an efficient system, the dropout rate (measured by the proportion of learners who exist the system without completing a given grade in a given year). Statistics Botswana (2021) states that these are in higher proportions in Form 1, 2 and 3. Generally, dropout rates are more prevalent in the lower level of secondary schooling and continues to decline in the higher levels.

7.4. Challenges in education

Botswana has a youthful population, with 30.3% of the population of 2.3 million aged 10–24 years. Strengthened investments in education at this stage are critical for the country to harness its human capital and accelerate the achievement of a demographic dividend while also contributing to sustainable development. Some of the challenges encountered in the sector include the fact that while Botswana invests significantly in the education sector which consistently receives a sizeable proportion of the annual budget, allocative inefficiencies exist within the sector. It should also be underscored that transition rates from secondary to tertiary level education remains low (30.3%). This suggests that the large tertiary education allocation only benefits a small segment of the population. Botswana pursues a bursary approach to fund tertiary education for its citizens through a revolving fund. Although this has bridged the access gap to tertiary education, challenges with collections due to non-compliance persist.

With regard to education expenditure, at 7.1% of GDP in 2019 or 22.2% of the government budget, Botswana's public spending on education is high relative to other countries of the region. The country allocates a large share of its education budget to tertiary education, both for subsidies to universities and bursaries/loans to university students. As the VNR report points out (Republic of Botswana, 2022), the prominent level of spending on universities is inequitable given the gross tertiary enrolment are of 19.5%.

The Budget allocation 2022/23 is, on a combined basis, BWP 13.13 bn for Basic education and Tertiary education, research, science and technology, and continue to be the highest (22% of overall budget) to drive the country's transition to a knowledge-intensive and competitive-based economy. However, there is a 7% drop on Year-on-Year (YoY) basis due to transfer of Tuition Fees vote from the Department of Tertiary Education Financing (DTEF) to the Ministry of Finance and Economic Development as part of measures to reform the Tertiary Education financing grant/ loan scheme.
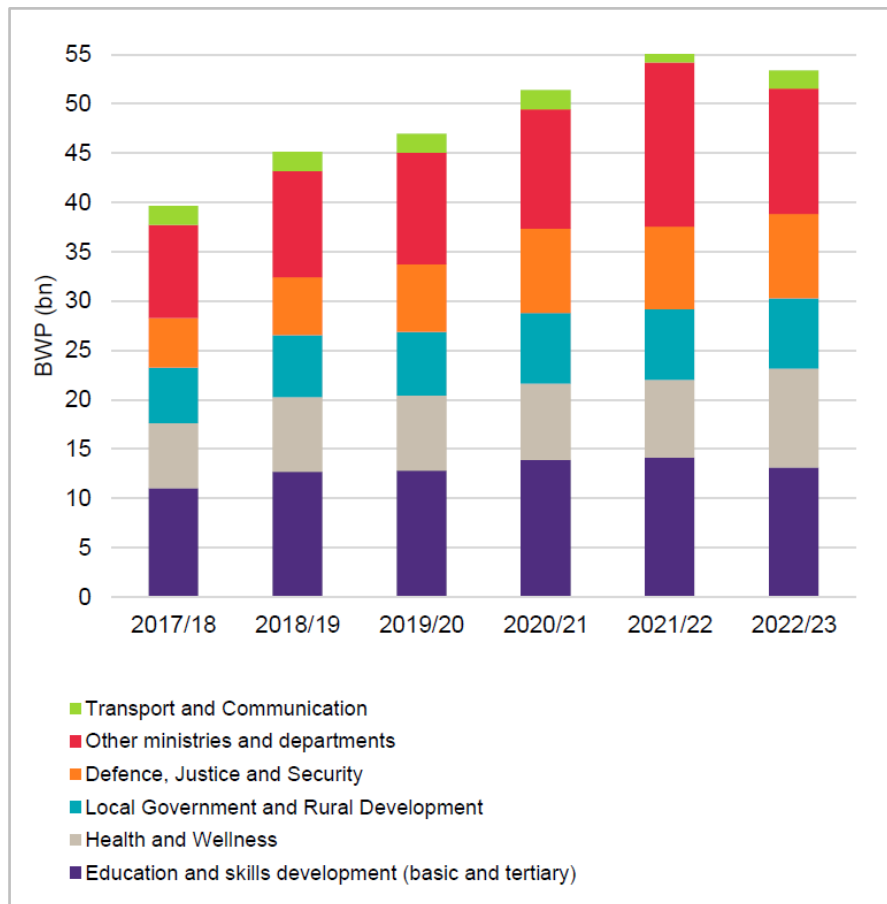
Figure 18: Budget Allocation for 2022-3

Source: Grant Thornton Botswana, 2022.

7.5. Human capital development

In November 2020, the government announced the Botswana Pula (BWP) 14.5 billion Economic Recovery and Transformation Plan (ERTP) with the aim to mitigate against the disruptive effects of COVID-19 and stimulate an economic recovery (BTI, 2022). The government also undertook a mid-term review of its current eleventh National Development Plan (NDP 11) for 2017-2023, which the first medium term plan towards the implementation of the country's Vision 2036.

The NDP 11 was brought into line with the country's Vision 2036 and United Nations' Global Goals (i.e., Sustainable Development Goals) and was expected to address social risks: inequality, poverty and unemployment. Vision 2036 aspires to a country with quality education. The government undertook a mid-term review (MTR) of the NDP 11 in 2021. The MTR emphasised the need for building human capital by maintaining high levels of spending on education, but also by addressing deficiencies. It indicates that 'a crucial component will be improving the effectiveness of education spending […] as education is not currently equipping many Batswana with the soft and hard skills required by employers, or the ability to generate their own incomes (Republic of Botswana, 2020). This will include extending the scope of pre-primary education, and improving the quality of primary education, with a rebalancing of educational resources towards primary. At the secondary level, there will be a focus on improving outcomes for learners in terms of maths and science. The quality and

status of Technical and Vocational Education and Training (TVET) will also be raised, so as to create an alternative pathway to educational excellence.

The MTR stressed upon the need to equip Batswana with the skills to successfully transition to a knowledge-based economy and stated that some of the more specialised skills required to create and manage "Fourth Industrial Revolution" (4IR) technologies – such as coding, genetics, data science and analytics. It points out that in due course these would need to be central to school and college curricula. However, it noted that "it is essential to ensure that learners first master the essentials of maths and science. Furthermore, the speed of change in technology and production means that learning will be a lifelong process, and that today's learners will need to have the capacity to re-equip themselves with skills perhaps several times during their working lifetimes".

The NDP 11 MTR recognised that improving the quality of human and social development will also be dependent on enhanced infrastructure, especially for schools, health facilities and information technology. This will mean addressing Botswana's infrastructure deficit in electricity and digital connectivity.

8. OVERVIEW OF THE ICT4E PARTNERS

The European's Africa RISE (Reform for Investment and Sustainable Economies) programme has started two key projects in Botswana in support of the Government of Botswana Digital Transformation Strategy (SmartBots). The programme was launched in January 2021 and is one element of the EU's activities to achieve the SDGs, primarily SDG 8 (inclusive and sustainable economic growth, employment and decent work for all). One of the projects aims ensuring optimal digital skills development and training on business support packages and targeting Women Entrepreneurs with a view to increasing their participation in business to expand opportunities for women to engage in the economy. The Digital Business Package for Women Entrepreneurs is aimed at bridging the "gendered" digital divide to enable women to play a full role in the economy. Through digital access, women are enabled to participate enhance their productivity in the digital-economy[11].

Youth Impact has recently renewed its Memorandum of Understanding (MOU) with the Ministry of Basic Education to scale-up Teaching at the Right Level (TaRL) nationwide for a total of 8 years. This partnership aimes at scaling up the TaRL across the nationals primary schools by 2025. Youth Impact also collaborates with Teaching at the Right Level which was initiated to address the learning disruptions during the COVID-19 crisis offering remote "low-tech" services via phone calls and SMS, in addition to launching a national radio broadcasts to providing educational instruction for learners across 10,000 Botswana households. Youth Impact conducted a randomised trials on their impact, producing some of the first experimental evidence on minimizing the fallout of the pandemic on learning, showing how the mobile phone and SMS can reduce innumeracy by up to 31% for less than $14 per child. The trial was run in partnership with the University of Oxford, Columbia University and the Jameel Poverty Action Lab (J-PAL).

[11] https://www.biztechafrica.com/article/eu-throws-weight-behind-botswana-digital-transform/16598/

8.1. Other partnerships discerned from the literature

Table 13: Partners

Partner	Sector	Contribution
GIZ	TVET	Strengthening employment relevant TVET in Botswana Enhancing capacities for TVET management and implementation at institutional and personnel level. Supporting the participation of the industry / the private sector in TVET. Training TVET staff to deliver and assess these programmes. GIZ has supported the development of training models for the various levels NCQF levels with TVET to enable articulation. ("Strengthening Employment Relevant TVET in Botswana II")
Bocodol	Schooling, TVET and higher education	Assist with ODL skills development for the education workforce
SADC Centre for Distance Education	Schooling, TVET and higher education	Has worked with the benchmarking of the development of an ODL Policy for Botswana with the SADC ODL policy
COL	Schooling, TVET and HE	COL has played a role in the establishment of BOCODOL and has abilities to expand the ODL skills base.
UNICEF	Schooling	Communications
Government of Japan	Across the education sector	Wellness Partnership Launch and health sector support to Botswana
Commonwealth of Learning	Higher Education	Improved access to distance education pedagogy and programmes.
Huawei Technologies Botswana	Higher Education	Provision of the Huawei Authorised Information and Network Academy Programme (HAINA).
Open University of Mauritius	Schooling sector	Licensee for the BEd Early Childhood Education and BEd Primary Education

9. FACTORS ENABLING AND CONSTRAINING ICT USE IN EDUCATION (SWOC)

9.1. Strengths

Botswana has several advantages compared with most developing countries, which in turn make it easier to address new challenges. These include:

- The country's systematic introduction of ICT skills into the education system, induced by Maitlamo through the Thuto Net school connectivity initiative launched in 2014 contributed to all schools being linked to the internet and all secondary schools and institutions of higher learning can play a role in providing skills training for schools.

- A relatively favourable fiscal situation, and projected sustainability in the short-to-medium term.

- A largely youthful population when considering the ration of young people as a percentage of the adult population for future capacity development.

- Universal education for the school-going age population. The NER in primary education is above 90% and almost all learners participate in secondary schooling.

- An education system aims to be inclusive and fair and to provide an equitable distribution of resources and inputs. School meals, and other resources are distributed relatively evenly across communities and regions.

- Botswana's geographical location in the Southern African subregion is an economic strength that can be leveraged. Its membership in SACU gives companies duty free access to the entire Southern African subregion.

- The high literacy rate and the high number of secondary school completers with widespread knowledge of the English language and ICT skills enables Botswana to link with international networks and further facilitates the integration of ICT in education.

- The country already has the highest rates of ICT penetration in education institutions in Africa ensuring that all schools and higher education institutions are equipped with computer laboratories.

- The integration of ICT in learning will entail ensuring devices, electricity and digital content and resources for all learners across the system. Botswana's policy requires the integration to begin at preschool level.

- Workforce training and the continuing professional development in ICT remains an institutional challenge for Botswana as with many African countries. The challenge to universalise ICT usage, update policies and shift to a fully ICT mode or a blended mode is one which the current ADEA project could address.

- The Botswana Communications Regulatory Authority (BOCRA), provides oversight of the broader telecommunications network systems for ensuring the development of data intensive services and providing a regulatory framework.

- Botswana has a long tradition of offering ODL learning. Currently the Botswana College of Distance and Open Learning (BOCODOL) and the University of Botswana's Centre for Continuing Education and the Francistown College of Technical and Vocational Education offer secondary and tertiary level programmes using distance education modalities.

- BOCODOL and BOU, established in 2016, offers both school equivalency programmes (Open Schooling), a suite of degree, diploma Higher Education qualifications as well as TVET programmes.

- Capitalising on the strengths of BOCODOL the country could accelerate training of the workforce and the development of digital and e-learning resources for the broad education sector.

- ODL has traditionally been used in Botswana to enable those who could not access higher education opportunities to do so – this includes those youths who had little or no schooling, and those in the NEET category who require training to access the labour market as part of the country's endeavour to address the high youth unemployment rates.

- ODL is ideal for reaching the very sparsely distributed population and the wide geographic spread across which education needs to span. ODL has the potential for reaching learners in the "difficult to reach" areas of the country making it possible to upgrade their education levels, thereby improving job prospects.

- The Southern African Development Community Centre for Distance Education (SADC-CDE) which is an Open and Distance Learning Centre of Excellence in Southern Africa, an initiative of the Commonwealth of Learning (COL) and the Southern African Development Community (SADC) ministers of Education and Training can play a critical role in capacity development for tertiary education. The SADC-CDE is hosted in Botswana by the Ministry of Tertiary Education, Research, Science and Technology and housed at the Botswana Open University (BOU).

- In addition, Botswana has led the field in internet provision and computer integration. For a country the size of Botswana the country can capitalise on the ICT development in place, and use more distance education to expand access, equity, and quality. Already the country offers a complex range of institutions with similar offerings. Much can be gained from including more distance learning programmes and using a more blended approach that can reduce costs and ensure more equitable access.

- Clearly Botswana has led the field in internet provision and computer integration. The key question is, can a country the size of Botswana justifies not using more distance education to expand access, equity and quality? A small country the size of Botswana with a population of just under 2,4 million and a total tertiary student enrolment of just over 30,000 could use more distance learning across the sector to ensure that complex range of institutions can provide access across the large country.

9.2. Opportunities

- The equalizing of education quality and opportunity could be addressed using distance teaching methods. Digitised materials and lessons could be used in-classes or independently by learners, and in this way bolster learning outcomes across the sector.

- Botswana has a strong history in distance learning with the Botswana College of Distance and Open Learning (BOCODOL) offering tertiary and secondary education to meet the increasing local demand for ODL tertiary level programmes and creating equitable opportunity, access, and inclusion, for learners who otherwise would not have had access to formal education. This experience of ODL is an advantage for the country.

- The University's mandate is to provide all Batswana access to education, especially the out of school youth and adults, using Open and Distance Learning (ODL) to offer secondary school equivalent programmes, as well as a full suite of certificate, diploma and degree programmes. This experience is critical for the expansion of digital and online teaching and learning and BOCODL could capacitate the schooling and TVET sectors on the pedagogies of open and distance learning.

- Botswana has a youthful population, with 30.3 per cent of the population of 2.3 million aged 10–24 years. Strengthened investments in education at this stage are critical for the country to harness its human capital and accelerate the achievement of a demographic dividend while also contributing to sustainable development. Some of the challenges encountered include allocative inefficiencies within the sector although Botswana invests significantly in the

education sector which consistently receives a sizeable proportion of the annual budget. Transition rates from secondary to tertiary level education remains low (30.3 per cent). This suggests that the large tertiary education allocation only benefits a small segment of the population.

9.3. Challenges

There are several core challenges facing Botswana's education sector, including:

- Low student achievement scores and needs to improve its performance on TIMSS and PIRLS (however the country ranks close to the average on the assessment performed by SACMEQ.)

- Fragmented decision-making with responsibilities in the education sector devolved across various ministries, resulting in a lack of financial prioritization and strategic planning.

- A shortage of textbooks, classrooms, and specialist rooms for teaching such as science laboratories and a classroom backlog.

- Insufficient teacher training, especially at preschool level.

- The early ICT policies focus on improving school infrastructure in terms of electricity and internet coverage necessary for the introduction of ICT in primary education has been in place. However, there is a need to update some of the policies in line with actual implementation and emerging needs however, the digital divide in schools, especially between rural and urban schools as well as those in hard-to-reach areas is still a reality.

- Botswana's large geographic land mass with a highly dispersed population requires large ICT logistics and other forms of investment to ensure full national coverage and this poses a challenge for increasing ICT infrastructure.

- The small size of the Botswana population engaged in learning makes economies of scale difficult to achieve.

- To fully implement its ICT policies, the country will need to ensure access to devices, electricity, digital content, and resources for all learners across the system.

- The challenge to universalise ICT usage, update policies and shift to a fully ICT mode or a blended mode is one which the current project could address. In addition, workforce training and continuing professional development in ICT remains an institutional challenge for Botswana as with many African countries.

- While it is recommended that teachers need to acquire ICT skills, teachers are *not* expected to be digital instructional designers. This is another category of staff that needs to enable teachers to translate their lessons into high quality digital material. To develop high quality material which includes content and quizzes, gaming, randomisation for testing, proctoring and similarity checks, artificial intelligence, and learner analytics – teachers should not be human resources to be relied on. In a small country like Botswana, it would be worth considering having digital materials developed centrally and rolled out to schools for teachers to integrate and mediate in their classrooms. It will not be possible for a country like Botswana, with only 256 primary schools, to expect individual teachers to develop digital content. Each subsector could have a similar materials development for its targeted content.

- There is an opportunity for accelerated action to reduce costs and increase enrolment at tertiary education level through the integration of affordable technology supported learning. Government, through the village connectivity project under SmatBots, is aiming to connect all schools to the internet.

9.4. Weaknesses

- According to the African Development Bank, Botswana is placed at 117 out of 180 countries on the Global Climate Risk Index (2021) (Botswana Economic Outlook - African Development Bank). The IMF assessment (2019) of the long-term macroeconomic effects of climate change states that Botswana could lose 0.13–0.30% of per capita income in the period 2030–2050 if the 2015 Paris Agreement on limiting global warming is not met.

- According to the 2021 SDG Index, Botswana has achieved 61.9% of the 17 SDGs, and is ranked 115 out of 165 countries. However, the country has stagnated on SDG 13 on climate action.

- Despite the relevance of Botswana's strategic plan, if Vision 2036 is to be realised, "Botswana's policy and implementation will need to be more agile to meet the requirements of a knowledge-based society". (Botswana ICT Challenges: In Quest for A Knowledge-Based Society - CIPESA)

- There are long term economic setbacks caused by the Covid-19 pandemic and these are likely to remain in the medium term.

- Notwithstanding the high levels of infrastructure investment, there has been modest improvement in an incoming flow of ICT-related foreign direct investments. (Botswana ICT Challenges: In Quest for A Knowledge-Based Society - CIPESA) These kinds of initiatives would create more employment opportunities in areas like content development, animation, digital design etc.

10. RECOMMENDATIONS

The findings provide clear direction for funding initiatives with regarding to:

- **Policy and implementation:** While the policies and commitment are in place, there are challenges in translating of policy into practice arising from lack of various forms of access. .

- **Workforce competence:** As this study shows ICT has long been part of the vision of the country. However there is a need for ensuring ongoing workforce training, both during preservice and in-service in order that educators acquire and maintain the ability to integrate ICT into their classrooms. Similarly, training for learners and administrators need to be ongoing since ICT in education affects the entire system. It is proposed that a skills audit be conducted to establish new a skills baseline subsequent to the progress already made.

- **Curriculum development:** The study found that while there was increased use of ICT in education as well as ICT as part of the school curriculum, a more specific curriculum indicating how and where ICTs might be incorporated will be useful for teachers. This process can be supported by well-developed e-learning materials.

- **Connectivity:** With regard to access to connectivity it was clear that more, better and cheaper connectivity is needed. This need is coupled with the need for other infrastructure including optimal devices, a regular supply of electricity, particularly in remote areas.

- **Harmonising interventions:** Given that Botswana has a number of development and international partners actively supporting its economic development, it should harmonise and align its diverse digital initiatives for accelerated implementation and impact.

11. CONCLUSION

Despite national investments, the literature review shows, the Last Mile Network is thwarting increased Internet penetration countrywide. While mobile broadband subscriptions are on the rise with the increasing coverage costs are high, and devices are limited. In addition problems of electrification persist.

Notwithstanding the major improvements made across the education sector with regard to expanding access to primary and secondary schooling, TVET and HE those who are digitally marginalised, including remote schools and households fall outside of the net. Special focus is needed for the high numbers of school dropouts, and learners with disabilities.

The growing demographics of young people (1 – 14 years; 15 – 24 years), the number of out-of-school youth and the increasing unemployment rates give a sense of urgency for using ICT to expand learning opportunities. These numbers are bound to escalate as a result of the impact of the pandemic and to make up learning losses caused by the expansion of the system.

As the country moves into post-pandemic digital future, it is necessary for the country to ensure the "right-skilling" and "future-proofing" its population.

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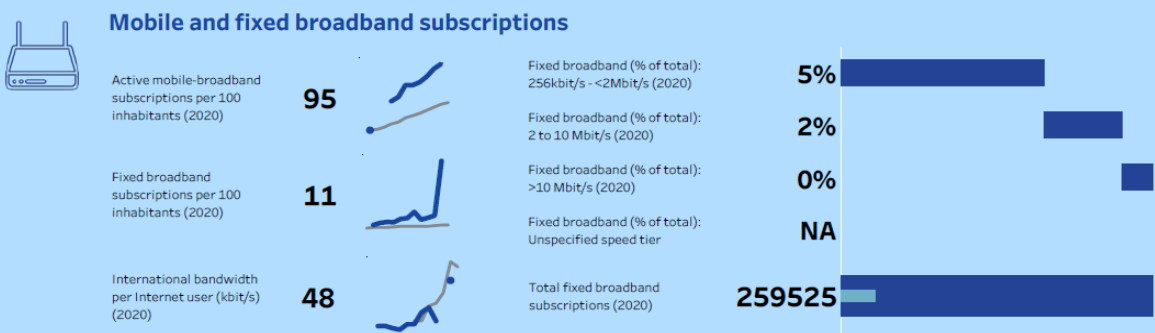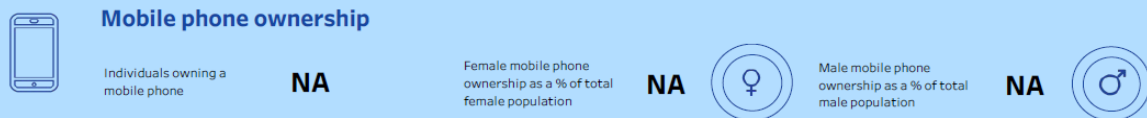Information and Communication Technology Statistics Report 2017.pdf (statsbots.org.bw)

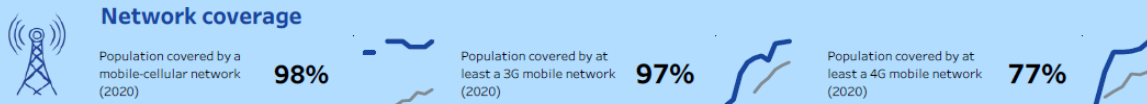https://www.gov.bw/learning-and-teaching/vocational-education-training

INTERNET USE

Percentage of population using the Internet

Individuals using the Internet, total (2020) (ITU estimate) — **64%**

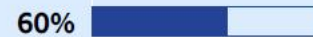Female Internet use as a % of total female population (2014) — **34%**

Male Internet use as a % of total male population (2014) — **41%**

25-74 years as a % of all 25-74 years (2014) — **34%**

15-24 years as a % of all 15-24 years (2014) — **60%**

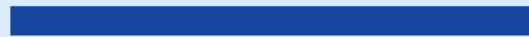< 15 years as a % of all < 15 years (2014) — **17%**

75+ years as a % of all 75+ years (2014) — **0%**

Broadband traffic

Average monthly fixed broadband Internet traffic per fixed broadband subscription (MB) (2020) — **5262**

Average monthly mobile broadband Internet traffic per mobile broadband subscription (MB) (2020) — **2226**

ENABLERS & BARRIERS

ICT prices

Fixed broadband basket as a % of GNI p.c. (2021) — **7.4%**

Mobile data and voice basket (high consumption) as a % of GNI p.c. (2021) — **3.5%**

Mobile data and voice basket (low consumption) as a % of GNI p.c. (2021) — **2.1%**

Mobile cellular basket as a % of GNI p.c. (2021) — **1.2%**

Mobile broadband basket as a % of GNI p.c. (2021) — **1.2%**

ICT skills

Individuals with basic skills (2014) — **27%**

Individuals with standard skills (2014) — **17%**

Individuals with advanced skills (2014) — **5%**

About this dashboard

The Digital Development Dashboard reports the latest values for selected indicators drawn from three ITU data sets:

· **Telecommunication/ICT infrastructure and access data,** collected annually through one short and one long questionnaire. These indicators are defined in the ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT.

· **Price data,** collected through an annual questionnaire. Price indicators are also defined in the ITU Handbook for the Collection of Administrative Data on Telecommunications/ICT.

· **Data on access to and use of ICTs by households and individuals,** collected annually through one short and one long questionnaire. These indicators are defined in the Manual for Measuring ICT Access and Use by Households and Individuals.

This version of the Dashboard uses data collected up to November 2021. When a value is not available, NA is reported. In some cases, it is possible that the value reported for disaggregated indicators is for a different period than the main indicator. For most indicators, values are rounded to the nearest integer. As a result, it is possible that the sum of the values of disaggregated indicators does not add up to 100%.

ICT skills

· **Basic skills:** the highest value among the following four computer-based activities: copying or moving a file or folder; using copy and paste tools to duplicate or move information within a document; sending e-mails with attached files; and transferring files between a computer and other devices.

· **Standard skills:** the highest value among the following four computer-based activities: using basic arithmetic formula in a spreadsheet; connecting and installing new devices; creating electronic presentations with presentation software; and finding, downloading, installing and configuring software.

· **Advanced skills:** the value for writing a computer programme using a specialized programming language.

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