

# RAISING BOTSWANA'S HUMAN RESOURCE PROFILE TO FACILITATE ECONOMIC DIVERSIFICATION AND GROWTH

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## **Outputs of the “Skills for Economic Growth and Diversification in Botswana” analytical work:**

**Policy Note 1:** “Raising Botswana’s Human Resource Profile to Facilitate Economic Diversification and Economic Growth”

**Policy Note 2:** “Labor Market Signals on the Demand for Skills”

**Policy Note 3:** “Skills Needs of the Private Sector”

**Policy Note 4:** “Skills Implications of Botswana’s Diamond Beneficiation Strategy”

**Summary Report**

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# Abbreviations and Acronyms

BGCSE	Botswana General Certificate of Secondary Education
BIUST	Botswana International University of Science and Technology
BNVQF	Botswana National Vocational Qualifications Framework
BOCODOL	Botswana College of Distance and Open Learning
BOTA	Botswana Training Authority
BTEP	Botswana Technical Education Program
CITF	Construction Industry Trust Fund
CPS	Botswana's Country Partnership Strategy
DVET	Department of Vocational Education and Training
EMIS	Education Management and Information System
GDP	Gross Domestic Product
GLS	Grant-Loan Sponsorship Program
ICT	Information Communication Technology
IIT	Indian Institute of Technology
ITE	Institute of Technical Education, Singapore
JCE	Junior Certificate Examination
MIC	Middle-income Country
MoESD	Ministry of Education and Skills Development
MoLG	Ministry of Local Government
MoLH	Ministry of Lands and Housing
MoLHA	Ministry of Labour and Home Affairs
NCE	National Commission for Education
NCQF	National Credit and Qualifications Framework
NDP	National Development Plan
NHRDS	National Human Resource Development Strategy
PPP	Public-private Partnership
PSLE	Primary School-Leaving Examination
R&D	Research and Development
RNPE	Revised National Policy on Education (1994)
SACMEQ	Southern and Eastern Africa Consortium for Monitoring Educational Quality
SENAI	National Service for Industrial Apprenticeship, Brazil
SES	Socioeconomic Status
STEM	Science, Technology, Engineering, and Mathematics
TEC	Tertiary Education Council
TIMSS	Trends in International Mathematics and Science Study
TVET	Technical and Vocational Education and Training
UNESCO	United Nations Educational, Scientific, and Cultural Organization
VAT	Value-Added Tax
VTC	Vocational Training Center
UMIC	Upper-Middle-Income Country

*All dollar amounts in U.S. dollars unless otherwise indicated.*



# Context of the Study

Human development is one of the pillars of Botswana's Country Partnership Strategy with the World Bank (2009–13). The Country Partnership Strategy (CPS) is in line with Botswana's "Vision 2016," which, in terms of human development, envisions the transformation of Botswana to "an educated and informed nation" and to "a prosperous, productive and innovative nation" as two key cornerstones of the strategy. In line with these objectives, the World Bank with support from the Ministry of Education and Skills Development (MoESD) embarked on analytical study entitled "Skills for Economic Growth and Diversification in Botswana." The work is informed by Botswana's need to diversify its economy to facilitate stronger, more sustainable economic and employment growth and, concurrently, equip its workforce with a variety of skill sets that meet employer needs.

The objective of the exercise is to provide the government of Botswana with concrete suggestions for policy interventions that strengthen the skills base of the workforce and thus facilitate economic growth, diversification, and employment. The recommendations offered by this and the other notes that make up the study, are based on analyses of available data and international best practices. Four policy notes were developed, each of which touches on crucial aspects of strengthening the coun-

try's skills base: "Raising Botswana's Human Resource Profile to Facilitate Economic Diversification and Growth" (note 1), "Labor Market Signals on the Demand for Skills" (note 2), "Skills Needs of the Private Sector" (note 3), and "Skills Implications of Botswana's Diamond Beneficiation Strategy" (note 4). The key findings and recommendations of these four notes were then integrated into a short Summary Report.

The first note assesses the strengths and weaknesses of Botswana's education system (i.e., basic, technical and vocational, and higher education) and recommends policy interventions to strengthen students' acquisition of relevant knowledge and skills. The second note examines both current labor and skills demand (based on available labor market data) and expected skills demand (based on the government's economic strategies). On the basis of this analysis, the note offers recommendations on skills development and government programs. The third note uses the findings of an employer-employee survey conducted in Botswana in 2010 to identify skills needs and gaps from the viewpoint of the private sector. The last note examines the skills implications of the government's diamond beneficiation (processing) strategy and suggests actions that can be undertaken to ensure that the nation's skills base supports, rather than hampers, implementation of the strategy.

# 1. Overview

Botswana's economic growth has hinged on its abundant natural resources—particularly diamonds, which generate nearly half of its fiscal revenues. In terms of sustainable growth, this dependency on natural resources poses the biggest challenge for the country. To prepare Botswana for “life after diamonds,” the government developed a growth paradigm in its “Vision 2016” strategy document (Presidential Task Group 1997),<sup>1</sup> which suggests that the development of “new economy” skills will play an extremely important role in the country's future. Botswana is aiming to develop new engines of growth, supplementing the diamond industry with manufacturing, financial, and transport services, and transforming the country's entrepreneurship sector into a buoyant, productive, and innovative private sector led by entrepreneurs with cutting-edge skills. A key ingredient of this strategy is the development of a holistic approach to skills development.

Botswana has achieved high enrollment in basic education (90 percent in primary education) and the government continues to invest a high share of gross domestic GDP—almost 8 percent—in the education sector. In 2010–11, expenditures on education amounted to 25 percent of total government expenditures. Nevertheless, a skills constraint is repeatedly cited as a major challenge for businesses in the country. In 2010, the Enterprise Survey for Botswana reported that of the 10 major business constraints, the majority of firms in the country reported skills shortage as the key problem (World Bank, 2010a). The country also has high unemployment rates reported at approximately 17.8 percent and approximately 27 percent, when discouraged jobseekers are included (CSO, 2011).

This note reviews the current landscape of the education sector in Botswana and attempts to identify key bottlenecks in the supply of relevant skills for economic diversification. Recommendations for preparing students who can be readily integrated into the labor market are then offered, using examples of best practices from successful case studies.

## 2. Education and Economic Growth: The Rationale

The key factors that drive self-sustained economic growth over the long term are innovation, knowledge sharing, and research and development (R&D) (Romer 1986; Lucas 1988; Grossman and Helpman 1991; Aghion and Howitt 1992). Factors such as the quality of education, cognitive skills, technical and specialized skills, innovation, and technology absorption determine the efficiency with which capital and labor are used and thus influence economic growth. According to structural models of economic development, countries need to diversify into manufactured exports to achieve sustainable growth (Chenery 1979; Syrquin 1989). Recent economic literature provides evidence of the positive effects of export diversification on per capita income growth (Lederman and Maloney 2007).

<sup>1</sup> All government documents cited in this report are identified by the ministry or agency of the Republic of Botswana that produced them; they are listed in the Reference list under “Botswana, Republic of.”

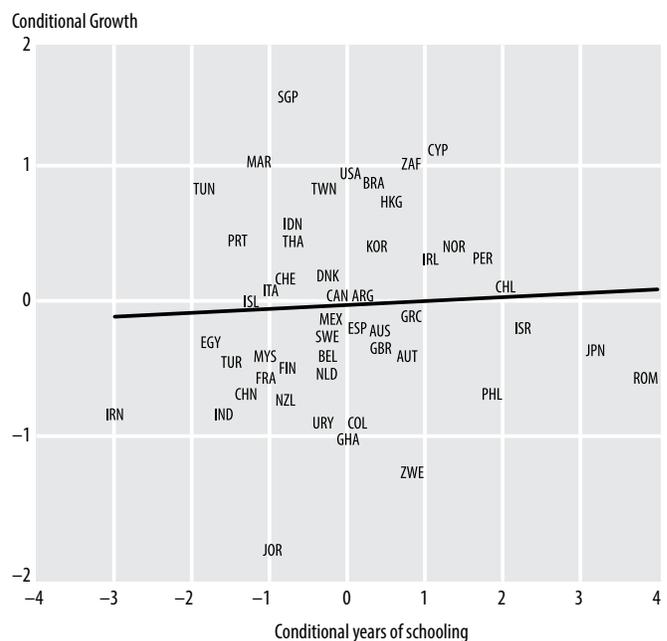
Economic literature has questioned the role of education in driving economic growth because economic modelling has been unable to identify years of education as a key determinant of growth (figure 1A). More recently though, it has been determined that it is not just years of education, but also the quality of education (or actual learning), that determine the contribution of education to economic growth (figure 1B).

The literature thus postulates that the quality of human capital is determined by two factors: (i) various levels of education and (ii) the quality of education provided. There are strong inter-linkages between capital and investment on one hand, and the quality of human capital available in an economic system on the other. R&D can lead to new innovations or the adaptation of existing international and/or national knowledge and technology. Similarly, R&D can develop a nation's capacity to absorb existing technology, thus increasing total factor productivity. In general, tertiary education is expected to create high-end skills needed for innovation. The critical mid-level skills required for the absorption and/or adaptation of technology gained from either tertiary or technical and vocational education.

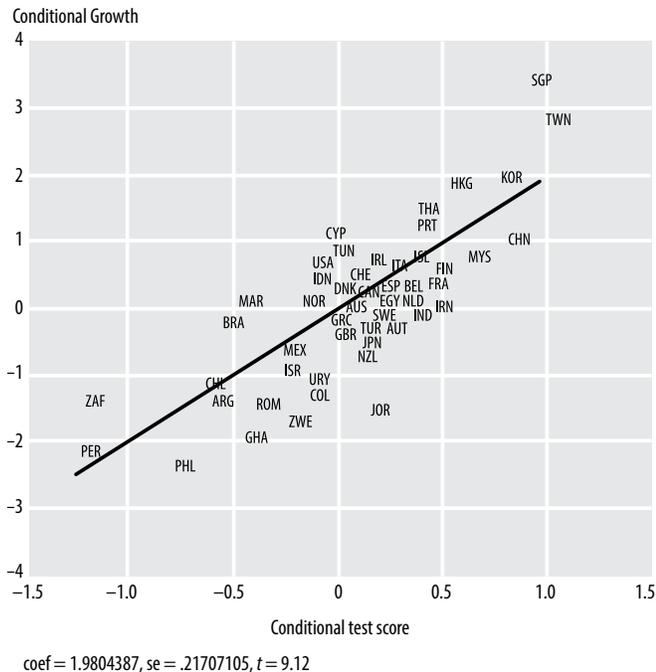
Students who complete basic education are expected to have achieved a certain level of skills that allow them to successfully perform in postbasic education. Recent research shows that rapidly advancing knowledge economies need certain additional key competencies that create the basis for adaptability and continuous learning. In addition to cognitive, academic, and technical skills, these competencies include problem solving, creativity, interpersonal skills, work ethics, and management skills. The primary and basic education sector is responsible for inculcating such skills in individuals who go through the education system (World Bank 2010b).

**Figure 1. Impact of Schooling on Economic Growth**

Panel A. Impact of Years of Schooling



Panel B. Impact of Test Scores



Source: Hanushek and Wößmann (2007).

Note: These are added-variable plots of a regression of the annual rate of growth (in percent) of real GDP per capita in 1960–2000 on the initial level of real GDP per capita in 1960, average test scores on international student achievement tests, and average years of schooling in 1960.

ARG = Argentina, AUS = Australia, AUT = Austria, BEL = Belgium, BRA = Brazil, CAN = Canada, CHE = Switzerland, CHL = Chile, CHN = China, COL = Colombia, CYP = Cyprus, DNK = Denmark, EGY = Arab Rep. of Egypt, ESP = Spain, FIN = Finland, FRA = France, GBR = United Kingdom, GHA = Ghana, GRC = Greece, HKG = Hong Kong (China), IDN = Indonesia, IND = India, IRL = Ireland, IRN = Islamic Republic of Iran, ISL = Iceland, ISR = Israel, ITA = Italy, JOR = Jordan, JPN = Japan, KOR = Republic of Korea, MAR = Morocco, MEX = Mexico, MYS = Malaysia, NLD = Netherlands, NOR = Norway, NZL = New Zealand, PER = Peru, PHL = Philippines, PRT = Portugal, ROM = Romania, SGP = Singapore, SWE = Sweden, THA = Thailand, TUN = Tunisia, TUR = Turkey, TWN = Taiwan, URY = Uruguay, USA = United States, ZAF = South Africa, and ZWE = Zimbabwe.

Source: Reproduced from Hanushek and Wößmann (2007), figure 4a and b, pp7.

The Revised National Policy on Education (RNPE) has been the strategic policy for the education sector in Botswana since 1994 and is consistent with the nation's strategy documents, especially "Vision 2016." A holistic approach towards skills development led Botswana to develop a National Human Resource Development Strategy (NHRDS), which seeks to develop an economy that values "the quality, productivity, and motivation of its people as the country's single greatest and valuable resource" (National Human Resource Development Council). NHRDS aims to transform the country's economy into one that benefits from "value-added" processes contributed by a highly skilled workforce.

NHRDS takes a life-cycle approach to human resource development, where each stage of the learning cycle is strengthened and built upon to create a successful education and learning system. Botswana has achieved a high enrollment rate in basic education, but students' transition to higher levels of education is uneven, with relatively high dropout rates at transition stages. More importantly, more work is needed to

improve the quality of education, as shown in Botswana's participation in international assessments over the last decade.

### 3. Snapshot of the Education System

Primary and secondary education in Botswana lasts for a total of 12 years: 7 years of primary, 3 years of junior secondary, and 2 years of senior secondary education (a 7–3–2 system). Primary and junior secondary school comprises ten years of basic education. Pupils sit for three nationwide examinations: the Primary School-Leaving Examination (PSLE), taken at the end of primary education; the Junior Certificate Examination (JCE), taken at the end of junior secondary school; and the Botswana General Certificate in Secondary Education (BGCSE), taken at the end of senior secondary school. The language of instruction in lower primary schools (grades 1–4) is predominantly seTswana, the local language, while the language of instruction in upper primary and beyond is English.

Preprimary education in Botswana is mainly provided by the private sector and is quite limited in enrollment. Approximately 17.5 percent of children younger than 6 years were enrolled in preprimary education in 2010 (CSO 2012). At the primary level, Botswana achieved the high net enrollment rate of 90 percent in 2002, which has since been maintained. However, in the last 10 years, the remaining 10 percent of children not in school have still not been successfully integrated into the education system (CSO 2012).

The transition rate from primary to secondary education has been quite high—between 96 and 100 percent—over the last five years. In other words, almost all students who complete primary school enroll in lower secondary school, irrespective of their performance on the PSLE. This is a result of the government's drive to achieve universal basic education. Across junior and senior secondary school (Forms 1 through 5<sup>2</sup>), the gross enrollment rate stands at approximately 61.3 percent (CSO 2011). In addition to general education programs, students also enroll in postprimary technical and vocational institutes and teacher training institutes. Total enrollment at the postbasic level in all these institutions was estimated at 80 percent in 2007–08 (WDI and GDF).

Multiple alternatives exist for students who choose to leave school, whether at the primary, junior secondary or senior secondary level. Primary school-leavers who do not progress to the junior secondary level may enroll for vocational training in the Brigades, a vocational training program, or apply to be unqualified teachers for at least two years as a precondition for admission to a Primary Teacher Training College. Junior secondary school-leavers have several options. They may proceed to senior secondary school if they perform well on the JCE; or opt for vocational training at the artisan level, primary teacher training, or secretarial or commercial training.

Students who complete senior secondary education may be admitted to degree programs at the University of Botswana. Finally, the government sponsors students to attend overseas institutions of higher education when the subject of study is not offered locally, as in the case of architecture and pharmacology.

<sup>2</sup> In Botswana education system, primary education grades are called Standard, and secondary education consists of Forms 1–5, which is equivalent to grades 8 to 12 in other education systems.

The Ministry of Education and Skills Development (MoESD) is responsible for the delivery of education in the country. Certain other ministries share aspects of this responsibility, for instance, the mandate for early childhood care and development (for the age group 0–4 years) lies with the Ministry of Health, in partnership with the Ministry of Local Government (MoLG), and the Ministry of Lands and Housing (MoLH). The mandate for preprimary education lies with MoESD, but as mentioned earlier, this level of education is largely delivered by the private sector. Similarly, for primary education, delivery is a joint responsibility of MoESD, MoLG, and MoLH.<sup>3</sup> Additionally, both the Ministry of Labour and Home Affairs (MoLHA) and MoESD are responsible for the delivery of vocational training; the Botswana Training Authority (BOTA) was established as a parastatal corporation under MoLHA.<sup>4</sup> The responsibility for BOTA has since been transferred to MoESD.

Tertiary education also lies under the authority of MoESD. Under RNPE, the Tertiary Education Council (TEC) was proposed as a parastatal agency to coordinate and manage Botswana's tertiary education institutions and inform policy. The Tertiary Education Act of 1999 actually established the Council, which is composed of representatives of the government, the private sector, tertiary education institutions, the academic community, and students (TEC 2010a).

The new National Human Resource Development Strategy aims to achieve Botswana's economic vision by improving the effectiveness of existing components of the country's education and learning systems and by creating a more unified system. For instance, NHRDS will seek to incorporate all postsecondary education under the umbrella of tertiary education. Tertiary education will be governed by MoESD through three units responsible for different areas: the Human Resource Development Council—policy, planning, and steering; the National Qualifications Authority—regulations and accreditation (the Authority will incorporate the National Credit and Qualifications Framework, or NCQF); and the Botswana Examination Council—educational assessments. The act that will enforce NHRDS was due to be presented to parliament for approval in 2012.

## 4. The Quality Challenge in Basic Education

In Botswana, the main challenge of the basic education system remains the low quality of education. This is evidenced not only by international assessments in which Botswana has participated over the last decade, but also by the deteriorating performance of its students on national examinations. As mentioned by the President of Botswana in his State of the Nation Address in November 2011, student performance on the BGCSE has declined consistently over the last five years (Office of the President 2011).

<sup>3</sup> MoESD is responsible for curriculum development, the employment of teachers, teachers' salaries, general welfare, and the provision of textbooks for both students and teachers. MoLG is responsible for providing infrastructure, feeding pupils at school, stationary and school furniture, as well as the salaries of non-teaching staff.

<sup>4</sup> Parastatals include a wide range of enterprises/semi-autonomous entities owned at least 50% by the Government, either profit making or non-profit making.

The analysis in this section uses data from international assessments and identifies the following points:

- Botswana performs poorly on international assessment, for a country with its level of GDP per capita. However, its performance is close to other negative outliers that have a similar economic structure (i.e., lack of a manufacturing industry).
- There are considerable disparities in achievement by region on international assessments.
- Student with lower socioeconomic status (SES) perform much worse on international assessments than students with better SES; however, these disparities in learning outcomes are not driven by the SES itself, but rather, by rural versus urban school characteristics. In other words, if low-performing children with lower SES were to enroll in better-quality schools, the disparity will disappear.

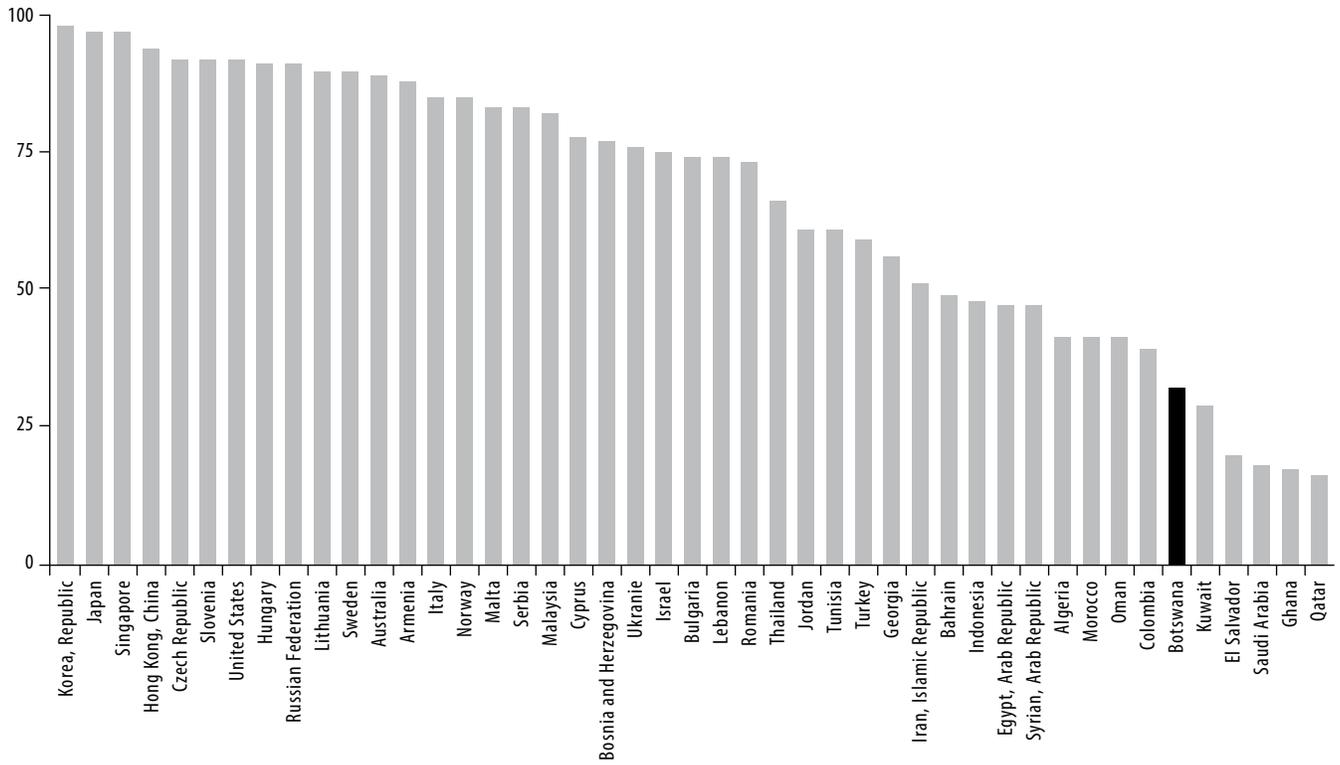
Botswana participated in TIMSS, in 2003, 2007 and 2011. These assessments augment data on primary enrollment and completion rates to help measure how much students have learned throughout the primary cycle through eighth grade. TIMSS data specifically facilitates an estimate of how many grade 8 students are able to attain various performance standards in mathematics and science.

Although Botswana has improved its score over time, the data shows that Botswana lags behind its peers in mathematics and science educational attainment. Figure 2 presents the proportion of students in the country whose scores hit the “low” international benchmark on TIMSS 2007. Students able to attain this benchmark “have some knowledge of whole numbers and decimals, operations, and basic graphs” (IEA 2008, 113). Only 32 percent of students were able to reach this benchmark in Botswana; in other words, 68 percent of Botswana students cannot be described as having some knowledge of whole numbers and decimals, operations, and basic graphs.

Botswana's performance on TIMSS is comparable to countries with similar resource-intensive economies. Though its students ranked “low” on the TIMSS math assessment, comparing these students to those of countries with similar types of economies leads to interesting hypotheses. Looking at the regression analysis of TIMSS 2007 math scores and GDP per capita for countries participating in the assessment (figure 3), it is clear that Botswana is grossly underperforming for a country with its level of GDP. However, it is among the negative outliers—all of which are non-manufacturing, resource-intensive economies (with the exception of El Salvador). If one accepts that TIMSS achievement is a measure of the formation of human capital (analogous to gross fixed, or physical, capital), then a possible implication of this finding—though not conclusive—is that resource-intensive economies use less human-capital-intensive production technology. Improving the quality of education will therefore be crucial if Botswana is to break its reliance on natural resources and develop manufacturing and service sectors.

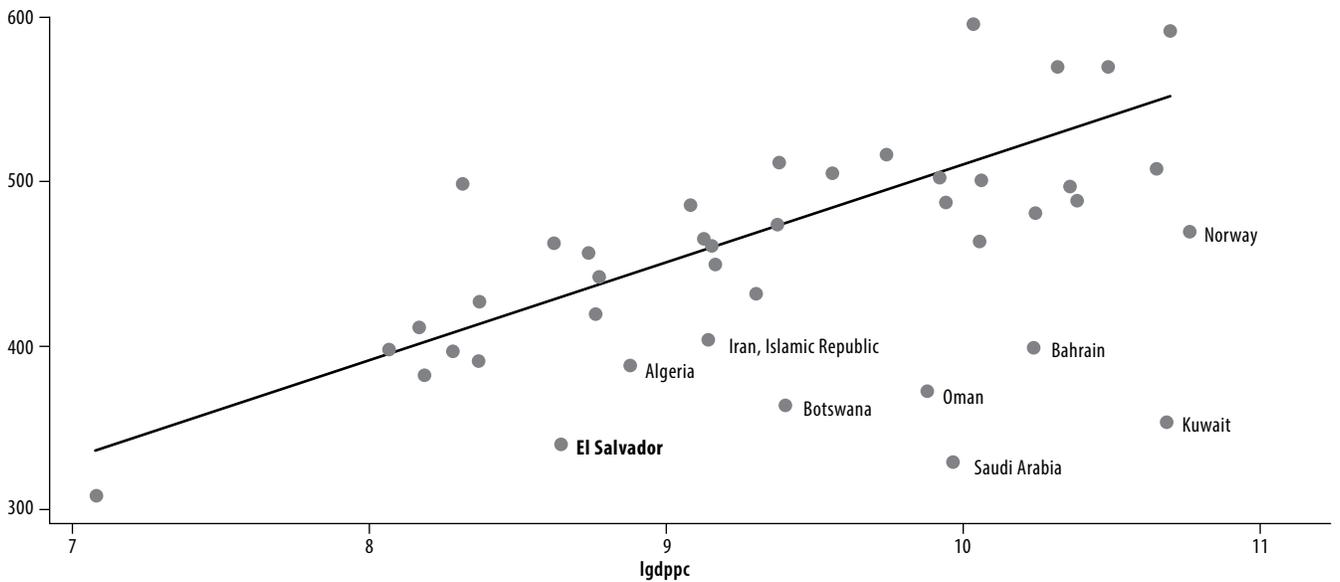
Inequity of educational quality within Botswana is another major challenge for the country. Looking at the grade 6 reading scores of Botswana students on the Southern and Eastern Africa Consortium for Monitoring Educational Quality

**Figure 2. Proportion of Botswana Students Achieving Low International Math Benchmark on TIMMS 2007**



Source: World Bank staff computations using TIMSS data (see IEA 2008).

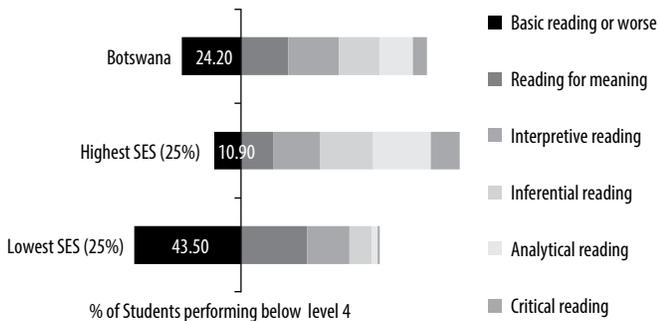
**Figure 3. Regression Analysis of log GDP per capita and TIMSS 2007 Math Scores of Selected Countries**



Source: World Bank staff computations using TIMSS data (see IEA 2008).

(SACMEQ) 2007 assessment, students from the lowest SES fared the worst in learning (figure 4). Almost 90 percent of students with the highest SES could read for meaning or better, whereas only 56 percent of students from the lowest wealth quartile reached the same level of competency.

**Figure 4. SACMEQ 2007: Grade 6 Reading Scores of Botswana Students**

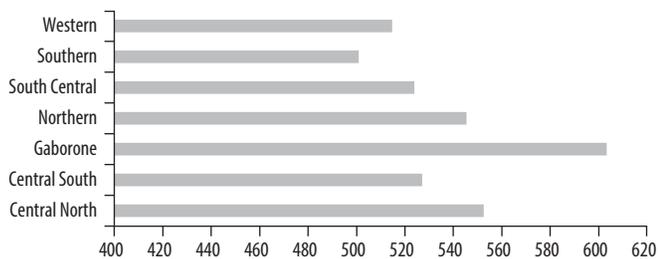


Source: SACMEQ 2010.

Note: SES – socioeconomic status. “Highest” and “Lowest” here indicate income quartile.

Similarly, learning disparities are also apparent among regions (figure 5). Students in Gaborone, for example, performed as much as 1 standard deviation (100 points) better than their counterparts in the southern region of the country on the SACMEQ 2007 reading assessment for grade 6. In fact, the score of the region managing to score next best after Gaborone is already half a standard deviation lower. These findings indicate major disparities in the quality of education delivered across Botswana.

**Figure 5. Grade 6 Reading Scores on SACMEQ 2007, by Region**



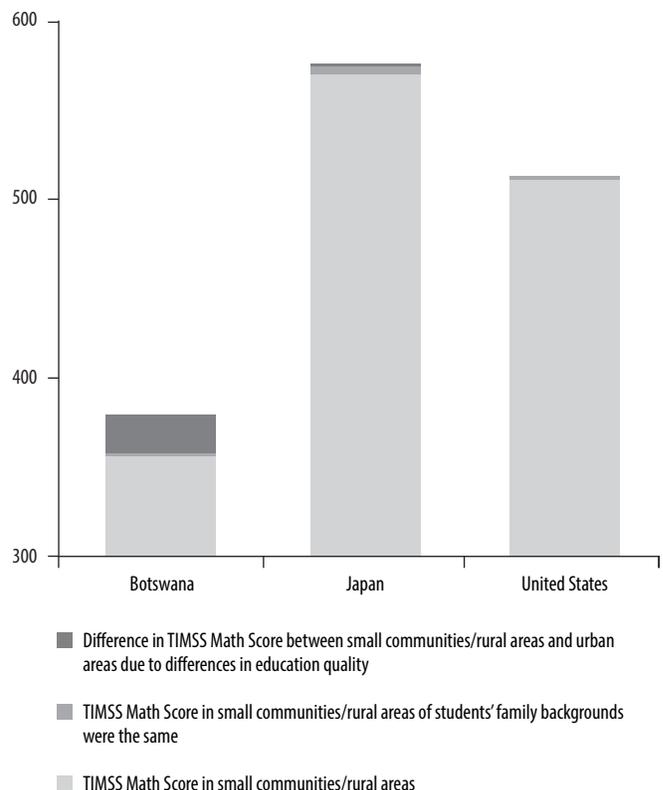
Source: SACMEQ 2010.

In addition to improving educational quality, equity in the provision of quality education must be improved if Botswana intends to compete in the global economy. Going back to TIMSS data, a comparison of Botswana to Japan and the United States reveals differences in the urban-rural divide and the socioeconomic background of students in the three countries. Figure 6 decomposes/disaggregates the urban-rural difference in TIMSS 2007 student scores for each country into a portion attributable to differences in students’ socioeconomic background and a portion attributable to differences in the quality of education in urban and rural areas (in other words, the difference in achievement if students came from

the same socioeconomic background). In Japan and the United States, the urban-rural difference is much smaller than that in Botswana, with most of the difference attributable to socioeconomic background. This finding matches what economic research postulates: that family background has an impact on student achievement. However, in Botswana, the urban-rural difference is both more pronounced and attributable almost entirely to differences in educational quality.

There were almost 810 primary schools in Botswana in 2011, of which 60 were private. In an attempt to identify disparities across regions, a 2005 analysis of SACMEQ II data found that the infrastructure of schools, as measured by an index that tracked classroom furniture, toilets per pupil, classroom libraries, classroom space, teacher housing, and school resources, were quite equitably distributed across regions in Botswana (Keitheile and Mokubung, 2005). However, there were some issues in the distribution of classroom libraries and the allocation of school resources in the Western and Gaborone Regions. In addition, there was a major variation in classroom space among schools in the Central South Region.

**Figure 6. Comparison of Urban-Rural Difference in TIMSS 2007 Scores of Three Countries**



Source: World Bank staff calculations based on TIMSS 2007 data (see IEA 2008).

Note: Math scores were decomposed using the Oaxaca-Blinder model adapted from labor market studies.

Another study using SACMEQ III results from 2010–2011 (SACMEQ 2011) identifies that overall, almost 81 percent of students in standard 6 (grade 6) in Botswana had access to some learning materials, but only 62 percent had sole use of

a mathematics textbook. There were some significant variations among regions with respect to the availability of these school supplies, with the Northern Region recording the lowest proportion of basic learning materials and the Western Region reporting that only 47 percent of students had sole use of a mathematics textbook. On the other hand, classroom size and the pupil-teacher ratio did not show much disparity across regions.

Reluctance or inability to send children to school, together with poor student achievement due to family background, require demand-side interventions to support families in overcoming barriers to accessing education. On the other hand, if the disparity in educational quality arises from the schools themselves, the government needs to invest more in the supply side, including school infrastructure, teaching supplies, textbooks, and school management, among other things (Fasih 2008).

Botswana presents an interesting paradox in this regard. The government pays generously for supply-side inputs for basic education. There are no school fees, though parents contribute some sports and development fees. Students are provided with textbooks, as well as basic learning materials, such as pencils and notebooks. School infrastructure is also relatively good across the country. Finally, virtually all teachers in the country are trained: almost 95 percent of 13,509 teachers in 2011. And yet the country has been unable to attain a higher level of educational quality.

How is it that various countries have managed to improve their learning outcomes? TIMSS and SACMEQ data clearly show that the students coming from poorer socioeconomic backgrounds perform much worse on these assessments than do students from better-off backgrounds. However, the reason for this poor performance is not their socioeconomic backgrounds, but rather, the difference in the quality of education being provided to them.

## 5. Technical and Vocational Education and Training: The Challenge of Creating Relevant Skills

The main aim of Botswana's technical and vocational education and training (TVET) system is to develop a well-trained workforce with the skills necessary to foster economic development.<sup>5</sup> Vocational training is long established in Botswana, even prior to 1966, when the country became an independent republic. The system of evaluating trainees in vocational in-

5 The National Commission for Education (NCE) report of 1993 defined vocational education as training that applies to the development of skills to the level of skilled worker or 'craftsman' and is used synonymously with skills training (NCE 1993). In other words, vocational training is about acquiring business skills for either employment or self-employment. The minimum entry requirement for this type of training is a junior secondary school certificate.

The same document defines technical training as the training that refers to preparation for the technician level of employment, in which the application of technical knowledge is the major component of the skilled worker (NCE 1993). This implies that a technician requires intensive advanced knowledge and is someone who can work with minimum supervision or none at all. The commission specifically stated that this type of knowledge should be acquired in engineering disciplines. Entry requirement for this level of study is a senior secondary school certificate.

stitutions was formalized in 1962, with national trade testing conducted by the Botswana Training Center of the Ministry of Labor.

The most salient characteristics of the TVET system in Botswana are:

- Botswana has continued to modify its skills development and training system to adapt to the changing needs of its economy. However, the country still faces high unemployment despite a trained workforce; clearly, a skills mismatch exists in the labor market.
- The training system in Botswana has a severe shortage of skilled trainers in critical fields of specialization, such as heavy plant, refrigeration and air-conditioning and electrical (BOTA 2010a).
- There is limited potential for mobility across fields of specialization in order for trainees to enhance their employability. Additionally, there is no potential to move from TVET programs into academic fields or vice-versa.
- Employers are not satisfied with the system for monitoring apprentices or the behavioral skills that young trainees bring to the labor force.

### *Organizational Structure of TVET in Botswana*

Vocational and technical training in Botswana falls under the Department of Vocational Education and Training (DVET) of MoESD. However, two organizations monitor this training, namely; the Botswana Training Authority and the Tertiary Education Council. BOTA oversees training up to and including the certificate level, while TEC focuses on the post-certificate through university levels (BOTA 2010a).

There have been past attempts to coordinate TVET in the country, long before the 1993 report of NCE. In 1972, for instance, the National Employment, Manpower, and Incomes Council was established, and in 1985, the National Industrial Training and Technical Education Council was set up. However, these efforts did not yield a unified approach to skills training in Botswana. In the 1993 Report, the National Commission on Education noted that the lack of coordination was due to splitting the responsibility for training between two ministries: the (then) Ministry of Education and the Ministry of Labor and Home Affairs. Therefore, the commission recommended that there be a single organization responsible for skills training in Botswana. According to its report, BOTA would resolve the problem of lack of coordination in skills training by becoming the only organization responsible for implementing TVET in the country.

The role of BOTA is to register and accredit TVET institutions and trainers; support and promote training institutions; develop and review programs and curricula; develop national standards and awards schemes; conduct assessments and certifications, research, staff training, and development; and monitor and evaluate training institutions by creating and using a database (Ministry of Labour and Home Affairs, 1997). BOTA was set up in 2000 as a semi-autonomous body responsible for executing and coordinating the National Vocational Education and Training System and worked initially under the auspices of the Ministry of Labor and Home Affairs, and more

recently, MoESD. It is governed by a board composed of representatives of the government, private training institutions, employers, and employee organizations (Ibid.). By 2010, the Training Authority had accredited over 200 TVET institutions in Botswana (BOTA 2010a).

In the 1993 report, NCE also recommended the creation of a Tertiary Education Council, which it argued should be responsible for the coordination and management of tertiary institutions in Botswana and advise the government on tertiary education policy and development (NCE 1993). The commission felt that the establishment of the TEC would encourage competition among tertiary institutions and safeguard academic freedom by removing the direct influence of politicians and civil servants from the management of tertiary education; at the same time, the government would not lose control over technical training programs.

The Tertiary Education Act of 1999 established TEC as a statutory body whose functions are to formulate policy on tertiary education and advise the government accordingly; coordinate long-term planning and the overall development of tertiary education; liaise with both the public and private sectors on all matters relating to human resources development and requirements; develop plans for funding tertiary education research, including the recurrent and development needs of public tertiary institutions; receive and approve applications seeking to establish private tertiary institutions; review and approve programs of study within private tertiary institutions; ensure the establishment of quality assurance procedures in all tertiary institutions; ensure the audit of physical facilities and assessment of their adequacy in tertiary institutions; and accredit<sup>6</sup> private tertiary institutions.

TEC is comprised of representatives of the government, the private sector, tertiary institutions, the academic community, and students (TEC 2010). Its day-to-day affairs are managed by a secretariat, headed by an executive secretary. TEC began operations in 2002 and has since issued the following policy documents: “Tertiary Education Policy,” “The National Human Resource Development Report,” and “The Funding Strategy and Formula for Tertiary Education Institutions” (TEC 2010a).

The government is planning to merge BOTA and TEC in order to enhance coordination and coherence in postsecondary training. It is hoped that the merger will occur during the period of the tenth National Development Plan (NDP 10, 2009–2016).

### ***Institutional and program structures***

Brigades were first established as training institutes in 1965 as a solution to the problem of primary school-leavers. They grew rapidly in the 1970s. These institutions trained pupils up to the level of Trade Test C, offering education combined with work experience in Brigade production units. The three-year training program covered about 10 trades, but concentrated mainly on building and carpentry (NCE 1993).

Brigades operated autonomously until 2006, when the government decided to place them under the Department of Vocational Education and Training of the then Ministry of Edu-

cation (now MoESD). Thus, until recently, a distinction was made between brigades and conventional Vocational Training Centers (VTCs). Brigades were private, small or medium-sized, rural, community-based organizations that combined training with production. Invariably, the organizations received financial and technical support from the government, which consolidated their existence in 1977 by establishing the Brigades Development Center in, what was then, the Ministry of Education. Through this center, the government subsidized the training and infrastructure development of individual Brigades.

Unlike the conventional VTCs, Brigades have been the most widely accessible vocational training centers with the largest enrollment. The main certifications offered by the Brigades are the National Craft Certificate, and the Trade Test Certificates of the London Institute of City and Guilds. The quality of training has been uneven among the Brigades, as some have had better funding and staffing than others. These factors prompted the government to take over the institutions in 2006, enabling it to update training courses and meet the challenges of competition in the world market.

In 1983, Botswana passed the Apprenticeship and Industrial Training Act, which defined the TVET program structure in the country. The act established employer-based training through apprenticeships. Under this system, technical and vocational training consisted of nine months of on-the-job training and three months of institutional training each year. In 1986, the trade testing center, the Botswana Training Center in Gaborone, was expanded and renamed the Madirelo Training and Testing Center. The Center administered Trade Tests B and C, as well as that for the National Craft Certificate. At the same time, institutional training was provided by the Ministry of Education’s Department of Technical Education through Botswana Polytechnic, the Automotive Trades Training Center, and four new VTCs built between 1986 and 1988. Over time, additional VTCs were built, bringing the current number to eight. These conventional VTCs are state-owned, medium-sized or large, urban-based institutions under DVET. Therefore, they have been well-resourced and for the most part, without the financial problems that beset the Brigades.

In the past, TVET programs in Botswana have experienced serious problems. During the period of the sixth national development plan (NDP 6, 1985–91), the number of apprentices in various trades grew. However, employers did not register as many apprentices as expected because they felt the quality of VTC training was lower than expected, which was traceable to the inadequate practical experience of their instructors (MoFDP 1991). As a result, the VTCs were underutilized. It was also felt that the minimum qualification entry for an apprenticeship program (a junior secondary certificate) was too high for this type of training, while the four-year training duration was too long for some trades.

The shortfall in apprentice training prompted the government to introduce a two-year full-time VTC course in order to reduce the excess capacity of these institutions. Thus, the VTCs ran two programs concurrently: (i) the normal four-year program, in which trainees worked with companies for nine months each year, and (ii) the two-year, full-time training program. However, as discussed in a subsequent section, employers continue to consider the training period too long

6 About the Tertiary Education Council-Origins of the Council, [http://www.tec.org.bw/about\\_us/origins\\_of\\_the\\_council.htm](http://www.tec.org.bw/about_us/origins_of_the_council.htm); Downloaded: 09/16/2010.TEC, Gaborone.

and the educational quality inadequate for immediate employment of trainees.

During the Eighth National Development Plan (NDP 8, 1997–2003), the Botswana Technical Education Program (BTEP) was developed. It aimed to diversify the technical and vocational training curriculum and was initially developed at two levels: Foundation and Certificate. The program was designed to improve both the quality of and access to TVET and was developed in collaboration with key employers. Although it combines some theoretical teaching, it focuses principally on practice. BTEP courses are certified jointly by MoESD and the Scottish Qualifications Authority. All BTEP courses integrate training in six key skills, regardless of vocational orientation: communication, numeracy, ICT, personal and interpersonal skills, entrepreneurship, and problem solving (BOTA 2010a).

BTEP presently offers training in the following vocational areas: agro-based industries; applied laboratory science; business; business administration; building construction; clothing design and textiles; electrical and mechanical engineering; hairdressing and beauty therapy; health and social care; hospitality and tourism; hospitality operations, ICT (including network technician and system administrator); mathematics and science; multimedia; and sports, recreation, and leisure (BOTA 2010a).

The current structure of BTEP consists of various levels of training, including Foundation, Certificate, Advanced Certificate, and Diploma, for which the Botswana National Vocational Qualification Framework has established standards. Although the BTEP program has been introduced in most TVET colleges, the National Craft Certificate and the certifications granted by the Madirelo Training and Testing Centre are also still followed in all TVET institutes and colleges. The program and its curriculum are subject to review every five years, but it appears that these reviews are neither comprehensive nor detailed enough to respond to the needs of the economy. According to the National Human Resource Development Strategy, the process of curriculum and program design will be coordinated through sectoral committees in the future, which has the potential to improve the relevance of its training.

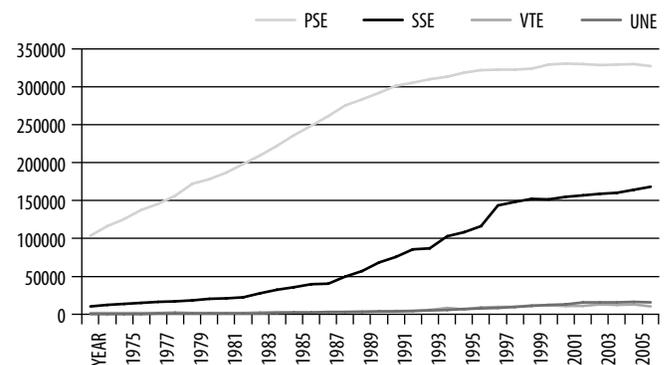
BOTA began to develop the Botswana National Vocational Qualifications Framework (BNVQF) in 2002 in order to regulate technical and vocational education and training provided by Brigades, technical colleges, and private providers. The framework governs courses below the diploma level. The development process is ongoing; as of 2010, 1,421 unit standards and 111 qualifications had been developed by various task forces (BOTA 2010a). However, few providers use the BNVQF qualifications and non-BNVQF qualifications are also recognized. The six key skills taught by BTEP programs also have standards defined by the BNVQF. With the financial and technical support of the European Union, Botswana has also been working to develop a National Credit and Qualifications Framework in conjunction with the country members of South African Development Community.

### Enrollment and access to TVET

The importance of TVET is underlined by the increase in the dropout rate at the junior secondary level. As mentioned in the previous section, the transition rate from primary to

junior secondary education is almost 100 percent, which can be attributed to the country's policy of universal basic education (MoFDP 2009). The transition rate from junior to senior secondary or TVET education rate is 66.1 percent, implying a dropout rate of almost 34 percent. Pupils with junior secondary education who do not proceed to the senior secondary level require skills training for the job market or self-employment. Vocational and technical training at the VTCs is one option for this group. Junior school-leavers may also enroll at other colleges, for example, the primary school teacher training colleges. However, the expansion of primary and junior secondary education has not been matched by a similar growth in skills and academic training at higher levels of the education system. Figure 7 shows the widening gap between secondary education on the one hand, and skills training at the secondary, TVET, and university levels on the other.

Figure 7. Enrollments at Various Levels of Education in Botswana, 1974–2007



Source: Republic of Botswana, *Education Statistics*, various issues.

Note: PSE – primary education; SSE – secondary education; VTE – vocational training and education; UNE – university education (University of Botswana).

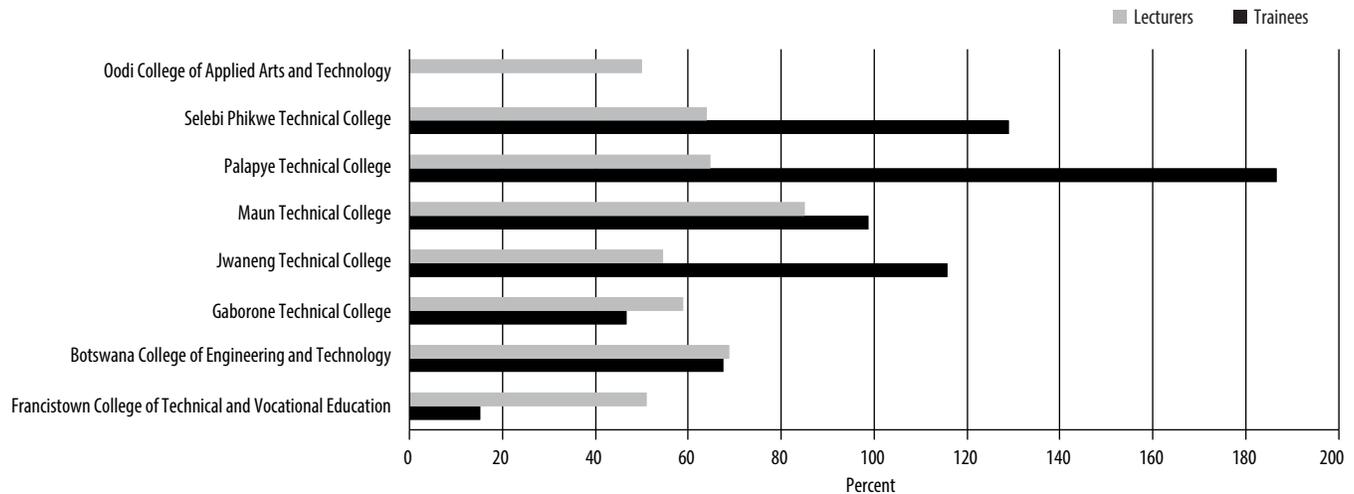
Enrollment in Vocational and Technical Institutions stood at 12,701 students in 2006 (table 1), while enrollment in the eight technical colleges under DVET was 5,098 in 2010. However, these enrollments represent an underutilization of most of these colleges. As per the data received from DVET, the institutions have capacity for 8,450 students, but only 5,098 were enrolled. Botswana also boasts good infrastructure for its TVET colleges, however, most lack properly trained lecturers.

Table 1. Enrollment in Vocational and Technical Training, Selected Years

	1998	2000	2002	2004	2006
Male	6,226	7,092	6,728	7,997	7,698
Female	3,713	4,415	4,154	4,783	5,003
<b>Total</b>	<b>9,939</b>	<b>11,507</b>	<b>10,882</b>	<b>12,780</b>	<b>12,701</b>

Source: Botswana Statistics 2011.

**Figure 8. Institutional Utilization of Technical Colleges, 2010**  
(percent of full trainee and lecturer capacity, respectively)



Source: DVET 2011 (shared with the author by the MoESD).

Note: Oodi College had just been established and hired staff in preparation for enrolling students in 2011.

As seen in figure 8, most of the colleges are operating with a less-than-optimal level of teaching staff.<sup>7</sup> Yet at a glance, there does not appear to be a direct correlation between staff numbers and institutional utilization in terms of enrollment, since three of the eight colleges have higher than full capacity enrollment and very small staffs. It is worth noting that the skills mismatch for trainers is also a major impediment for the colleges. In other words, there is a mismatch in the specialist areas of teachers as opposed to the specialist areas offered by the colleges (BOTA 2010a). (Disaggregated data by teacher specialization was not available at the time this note was drafted to confirm this assertion.)

### Funding TVET in Botswana

Students in technical and vocational colleges in Botswana are either government sponsored or self-sponsored. Government-sponsored students (at the diploma level or higher) have their tuition and living expenses paid by the Grant-Loans Sponsorship Program. This program was designed to offer support on a sliding scale through a combination of grant and loans, based on a student's field of study; however, given the virtual non-repayment of loans, it has become entirely a grant program (BEST 2009). In 2006, the government stipulated that all government-sponsored students must pay 5 percent of the total annual cost of the TVET programs offered by secondary schools and technical and vocational colleges, or 750 pula a year. The amount paid by the government is 14,250 pula, resulting in a total annual training cost of 15,000 pula.<sup>8</sup> Non-government-sponsored students, who

include those that are sent by companies, must pay the total cost of the training programs that they attend.

In 2007, the government also began sponsoring trainees enrolled at the diploma level in private TVET institutions. This increased enrollment in private institutions at the cost of the government's technical colleges. However, every year the government specifies the number of students who can enroll in various private institutions and in specific fields of study. And it specifies which courses in particular institutes are available for sponsorship. This is also the case at the tertiary level (see the section below on tertiary education). In a way, this policy appears to be a government quality control mechanism for training providers. Support for the private sector has also created some competitiveness between providers, which helps improve the quality of the education provided.

Overall, TVET in Botswana is funded through taxes imposed on employers. The construction and tourism industry had already been employing a levy for training, and in 2008, the Ministry of Labor and Home Affairs introduced the levy system for all vocational training in the country. The levy is based on the annual turnover of any company in Botswana registered under the value-added-tax (VAT) system. The tax rates are as follows: (i) for companies with an annual turnover of less than 250,000 pula, no technical and vocational training tax; (ii) for companies with an annual turnover of between 250,000 and 2 billion pula, 0.2 percent of turnover; and (iii) for companies with an annual turnover of more than 2 billion pula, 0.2 percent of turnover for the first 2 billion pula, and 0.05 percent for any amount in excess of that amount (BOTA 2010a).

The Botswana Unified Revenue Service collects the training levy through the VAT system; the monies are then deposited into the Vocational Training Fund. Employers are reimbursed in the form of training grants issued by the fund for the costs incurred in training citizen employees, provided their courses

<sup>7</sup> DVET figures provided to author in 2011. It is not clear how DVET determines the optimal level of staff.

<sup>8</sup> To give an indication of the costs, according to the 1997 National Policy on Vocational Education and Training, the estimated annual cost of apprenticeship in a big company was 22,000 pula per trainee, while the institutional cost of training in a VTC was between 11,000 and 15,000 pula per trainee (MoLHA 1997). Apprenticeships in smaller companies were estimated to cost, on average, 4,000 pula per trainee annually, and apprenticeship in the

Brigades, 6,000 pula (Ibid.). This situation has not changed significantly over time, particularly for training in the VTCs. (Note: One U.S. dollar is approximately equivalent to 6.5 pula).

are approved or accredited by BOTA. Despite the existence of a mandatory training levy, the volume of grants reclaimed by employers is very small. Of the 7,000 firms that contribute to the Vocational Training Fund, only 1,000 have utilized a grant to date. As a result, approximately 200 million pula remained unutilized in the Fund in 2010 (BOTA 2010a).

### ***Relevance and employment of TVET graduates***

Despite the various steps taken by the government to improve the TVET system, employers still appear to be unsatisfied with the labor force in Botswana. They complain of “unfinished products” or the low-quality of skills produced by the education system.<sup>9</sup> Additionally, employers are not satisfied with the long duration of BTEP apprenticeship programs.

A tracer study conducted by the Construction Industry Trust Fund suggested that roughly 59 percent of its graduates found employment after completing its training course (CITF 2006). Employers responded that the training did contribute to skills formation, but that worker skills still need to be substantially improved. The 41 percent unemployment rate among CITF graduates, coupled with the fact that over the last 10 years the number of legal foreign workers has been among the highest in the construction industry (22 percent of all such workers were employed in construction in 2010 (CSO 2012)), points to either a quality issue or an issue of a high reservation wage on the part of Botswana workers. With respect to quality, the tracer study found that unemployed respondents claimed that employers did not accept CITF training or that they sought work experience.

Another tracer study, of students graduating with BTEP qualifications in 2007 (BOTA 2010a), found that almost 51 percent of these graduates did not find employment after graduation. The key reasons for unemployment were cited as a mismatch of the skills in demand with their areas of study, low salaries, and employers’ demand for more practical experience (e.g., via apprenticeships).

BOTA has conducted two tracer studies of vocational training institute graduates, in 2005 and 2010. The results also suggest a graduate unemployment rate of around 50 percent. The key reason for unemployment was the unavailability of employment opportunities in their field of specialization. Additionally, 33 percent of employers interviewed in 2005 stated that graduates lacked industry experience. The 2010 tracer study also emphasized the lack of mobility across areas of specialization as a barrier to employment and suggested the need to offer courses that equip trainees with multiple skills. There is, moreover, no vertical or horizontal articulation across the academic, technical, and vocational education streams in Botswana. This problem contributes to the low prestige of the TVET system and contributes to unemployment if job opportunities within a specific field of specialization are not available.

Further, as indicated by the results of the various tracer studies, another major concern for Botswana is that both mechanical and electrical engineering graduates as well as ICT graduates of technical institutes also have high unemployment rates. Similar to other fields of training, employers regard the

training provided by the VTCs to be insufficient or dated, given rapid changes in technology, particularly ICT.

Employers also do not find new graduates’ behavioural skills or work ethics appropriate for the world of work. A World Bank supported survey of employers and employees (World Bank 2010a) suggests that only 28 percent of employers in Botswana ranked general technical and vocational skills as very important or critical for their skilled employees, whereas 62 percent ranked responsibility and trustworthiness in this category. This finding resonates with the findings of the BTEP tracer study, in which most employers were willing to hire unqualified employees who were both willing to learn and easily available (BOTA 2010a). In terms of apprenticeships, there is no regular monitoring of apprentices by VTCs once graduates enter the workplace. Employers felt that apprentices tended to drop out of the program, leaving them with sunk costs and no replacements.

Given the above discussion, Botswana’s skills training system urgently needs to improve the relevance and quality of its programs if the country is to achieve its goal of becoming a knowledge-driven economy. Graduates of the TVET system still face high unemployment because employers are dissatisfied with the level and quality of training provided. The infrastructure for training is in place, but there is a shortage of trainers with critical skills. Employers are paying a training levy, but these funds are underutilized.

## **6. Tertiary Education: Supporting the Transition to a Knowledge-Based Economy**

Globalization has encouraged higher education to embrace a role in economic development and the creation of knowledge societies. In the initial period after independence, Botswana primarily focused its efforts on primary and secondary education. Given its successes in basic education and the growing importance of skilled graduates in the global economy, higher education has assumed greater importance in Botswana. In response, tertiary education policy became more market oriented, entrepreneurial, and geared towards satisfying labor force demands. As discussed earlier, the Tertiary Education Council was formed in the early 2000s to address the demands of changing and expanding tertiary education. Botswana’s current postsecondary education system (including the postsecondary technical education discussed in the previous section) has been classified by UNESCO, as shown in table 2.

Student enrollments in tertiary institutions have increased in recent years due to increased transition and completions rates in basic and secondary education. Specifically, the share of 18–24-year-olds who participate in tertiary education increased from 5.8 percent in 1996 to 12 percent in 2001. The tertiary education attainment rate has now reached 7 percent overall (up from 2 percent in 1995). As of 2002, more than 20,000 students were enrolled at the undergraduate level in Botswana and South Africa.

As recently as 2010, 22 percent of full-time students enrolled in the University of Botswana were studying science, technology, engineering, and mathematics (STEM) subjects (University of Botswana 2011). A major increase in enrollments occurred in 2007 when the government agreed to provide grants for stu-

<sup>9</sup> Author interviews with individual employers conducted in 2010–11.

**Table 2. UNESCO Classification of Post-secondary Education in Botswana**

Level	ISCED	Qualification level	Institution
Post-secondary Non-tertiary	4A	Certificate	Botswana Institute of Administration and Commerce Teacher Training College
	4B	Diploma	Institutes of Health Sciences Auto Trades Training Center Roads Training Center Vocational Training Center
Tertiary Stage 1	5	Bachelor's, post-graduate, master's degrees	University of Botswana Botswana College of Agriculture
Tertiary Stage 2	6	Doctoral degree	University of Botswana Botswana College of Agriculture

Source: TEC (2006).

dents in certain faculties of some private institutions. Enrollment in these institutions rose by 9,946 between 2006–07 and 2007–08 (BEST 2009). Recently, 16 institutions registered with TEC to offer diploma and undergraduate programs in Botswana. Additionally, a school of medicine was established at the University of Botswana to train medical doctors.

### **University of Botswana**

Established in 1982, the University of Botswana was until recently the only university in Botswana. Through 1994, the university mainly focused on certificate, diploma, and bachelor-degree programs. But given the evolving role of tertiary education in the economy, the university has begun to offer more advanced degrees. Total enrollment at the university was 15,731 in 2010, with 56 percent of these students female and almost 11,952 enrolled in bachelor-degree programs (University of Botswana 2011). However, looking at table 3, it is clear that the majority of students are concentrated in social sciences, business, or humanities faculties. As of 2010–11, approximately 50 students were enrolled in master- and doctoral-level programs.

It is clear from the distribution of student enrollment shown in table 3 that the focus of these students is on developing mid-level skills, not highly specialized, research-oriented skills.

### **Botswana International University of Science and Technology**

Botswana International University of Science and Technology (BIUST), the second university developed by the government, was established by an Act of Parliament in 2005. BIUST, which will ultimately have a capacity of 6,000 full-time equivalent students, is currently under construction on 2,500 hectares in the town of Palapye. BIUST is expected to be a high-quality research-intensive university with a focus on STEM degree programs at the bachelor's, master's and doctoral levels. It will have only four faculties: Science, Engineering, Technology, and Management/Entrepreneurship.<sup>10</sup>

BIUST was conceived as a world-class African university that would offer cutting-edge knowledge, attract first-rate faculty (recruited internationally as well as from the African diaspora), provide a resource-rich environment, foster links with industry (via the existing Botswana Innovation Hub, among other programs), and promote applied research and modern teaching methods conducive to innovation and entrepreneurship. Public-private partnerships (PPPs) are at the heart of the university's strategy, which aims to have the private sector—via funding the development of university infrastructure, and direct participation in university governance—ensure not

<sup>10</sup> See the university's website at <http://www.biust.ac.bw>.

**Table 3. University of Botswana, Enrollment by Faculty/School, 2008–2011**

Faculty	2008–09	2009–10	2010–11
Business	3818	3935	4141
Education	1711	1710	1970
Engineering and Technology	822	852	961
Graduate Studies	1416	1448	1391
Health Sciences	445	498	571
Humanities	2376	2489	2805
Science	1475	1314	1277
Social Sciences	2358	2439	2615

Source: University of Botswana (2011).

only the quality and relevance of its programs, but also facilitate cost containment and efficient resource use.

The BIUST project has, however, been beset by serious troubles. Phase 1, the construction of a small seed campus for several hundred students (the so-called “Founding Development”), has incurred significant delays and cost overruns. As of September 2010, completion progress was at about 60 percent, against a scheduled 80 percent, so the opening planned for March 2011 was delayed until December of that year. Phase 2, the formulation of the university’s academic strategy and completion of campus infrastructure via PPPs, is similarly facing serious setbacks. For one thing, current estimated costs for this phase have nearly doubled since 2008, with the required government contribution increasing commensurately. Another central problem appears to be BIUST’s struggle to develop an academic strategy, in particular, one that maintains the PPP philosophy.

The revised strategy aimed at attracting high-level academic staff also seems to be facing opposition not only because it costs more than other options, but also because of the opposition of vested interests. For example, the University of Botswana recently expanded into engineering programs, raising questions about “program alignment”—that is, whether it makes sense to duplicate existing programs. In addition, after some uncertainty about the fate of BIUST, given the high cost of its development, the key issue remains whether or not to be guided by the PPP philosophy or turn to a more traditional financing model. However, the potential consequence of that approach would be to turn the university into a low-quality educational institution.

### ***Other institutes of higher education***

There are a number of other institutes that offer tertiary education in Botswana, such as the Botswana College of Agriculture, Institutes of Health Sciences (currently five in number), teacher training colleges, the Botswana Accountancy College, and a number of private institutes accredited by TEC. However, these institutions mainly offer diploma or bachelor-level courses. As mentioned above, some programs in certain private colleges are allowed to enroll government-funded students, a policy that has increased enrollment in these schools substantially.

According to private providers, TEC plays a quality assurance role, as the accreditation process is quite comprehensive and ensures a high-quality education.<sup>11</sup> Indeed, they claim that the quality of government-run tertiary institutions tends to be lower because these institutions do not have to go through a quality assurance process. However, no data on student assessment scores or employment outcomes was available to verify such claims. In addition, private education providers express concern over the quality of students enrolling in their institutions, as these students do not appear to be well trained for a high standard of undergraduate study.

### ***Financing students in higher education***

In Botswana all students enrolled in government-run higher education institutions are sponsored by the government through the Grant-Loan Sponsorship Program. As discussed

earlier in this Note, GLS was created in 1995 and was originally designed to attract students to fields in high demand. For instance, the scheme had five categories of classification, the first being for education in skills in highest demand. This category offered students the incentive of a 100 percent grant both for tuition and living expenses. Category 2 fields were supported by a 100 percent grant for tuition and 50–50 grant-loan as a maintenance allowance. At Category 5, both tuition fees and living expense support were offered on a 100 percent loan basis. As pointed out previously, the program has in practice become exclusively a grant program. Lack of an effectively managed beneficiary database and lack of follow-up on individual cases (the result of limited staff numbers and poor recovery capacity), as well as the limited information provided to beneficiaries on their roles and responsibilities, all led to the limited recovery. (This issue is not discussed further here because it falls outside the scope of this note).

Based on their field of study, tertiary students can be enrolled within or outside of Botswana. In 2007, approximately 7.5 percent of all such students were enrolled in South Africa, another 7.5 percent in universities across the world, with the rest enrolled in Botswana. It is clear that as Botswana strengthens its own tertiary education system, fewer students will be sent abroad for specialization. In terms of the distribution of enrollment in various priority areas, the lowest percentage enrolls in Category 1 programs, despite the fact that the government offers the best financial incentives for these programs. Rather, the highest concentration of students has consistently been in Category 3 fields.

A detailed review of the GLS system conducted for the Department of Student Placement and Welfare of MoESD in 2009 (BEST 2009) points out several key problems with the program. The report suggests that the reason why enrollment in Category 1 skills is low is that these courses require a strong basic education in mathematics and science. By the time students reach the tertiary level, it is hard to remedy weak or poor-quality learning in these subjects, thus enrollment in science and engineering remains low. Additionally, there is a lack of career education in basic and secondary school that would highlight the potentials of these courses at the tertiary level.

Second, specialization in engineering and the sciences require students to be enrolled outside of Botswana because specific fields of tertiary study are not offered in the country. Such external placements are much more expensive than placements in Botswana, hence budgetary constraints sometimes hinder enrollment. And even though the government has declared certain fields of study to be a priority, programs in lower-priority categories offer good job opportunities and a good return on the labor market. For example, a law degree is a Category 3 program in the GLS framework, but the government offers hardly any incentive for this course of study.

In order for tertiary education to produce high-level research and innovation, emphasis must be placed on teaching research skills at existing tertiary institutions. However, GLS finances students only at the undergraduate level. At present, employers finance the studies of students pursuing master’s and doctoral degrees, based on employer requirements. Given that the government is the largest employer, most highly qualified individuals are employed in the public sector. More-

<sup>11</sup> Author interviews with private tertiary education providers in 2011.

over, it is not economically viable for the relatively small private sector to cover the cost of postgraduate training. As a result, employers are more likely to hire expatriates with the skills acquired in tertiary education.

## 7. Conclusion and Policy Recommendations

This Policy Note has discussed the landscape of Botswana's education sector and its current outcomes. The country boasts high investments in education, yet faces significant challenges of educational quality compared to countries with similar levels of GDP per capita. Given the country's vision of reducing its reliance on its main natural resource—diamonds—and shifting towards a knowledge-based economy, the education sector will need to be a principal focus of reform in coming years.

As the preceding sections have made clear, several major initiatives are needed. These actions are briefly listed here in terms of chronological priority, and are followed by more detailed recommendations grouped by educational level. First, the quality of basic education needs to be improved. Second, the capacity of TVET training staff must be bolstered. Third, collaboration between universities, industry, and other research centers must increasingly be developed so that tertiary education is aligned with the needs of the labor market and the nation.

In terms of priority, in the short-term the government should:

- Focus and prioritize the quality of inputs supplied to remote and rural schools to ensure equitable distribution of basic education resources and outcomes so that every Botswana student is equipped with basic literacy and numeracy skills.
- Urgently complete the Botswana National Qualification Framework and introduce the process of articulation within the education system. This framework will establish horizontal and vertical pathways across technical and academic streams of study, improving students' employment and life-long learning opportunities.
- Introduce pre-entry courses in STEM college programs to improve the quality of learning at higher levels of education.
- Hire expert trainers in the fields of TVET specialization that are in demand and ensure that the technical training curricula respond to the needs of employers.

In the medium-term, Botswana should:

- Adopt a monitoring, evaluation, and research system in order to understand the process of student learning, identify issues related to inadequate student performance on international assessments, and inform the design of interventions that would align national educational outcomes with the needs of the global economy.
- Define mechanisms for using the training levy so that these funds cater to the specific needs of employers, for instance, by supporting specific types of technical training at BO-TA-accredited institutions.

- Develop a system of monitoring and evaluation for the BTEP apprenticeship program that uses continual feedback mechanisms to improve the responsiveness of these positions to employers' skills demands.
- Complete BIUST and attract international talent—both faculty and students—through the use of incentives.

In the long-run, it should:

- Establish an educational research institute under MoESD.
- Redesign the GLS program so that it targets higher-level STEM skills at the postgraduate level.
- Develop selected faculties at University of Botswana and BIUST as a center of excellence in science and technology teaching through viable, sustainable financing, including research and consultancy revenues, donations, and private capital.

The following paragraphs detail specific policy recommendations for different levels of the education system in Botswana.

### *Basic education*

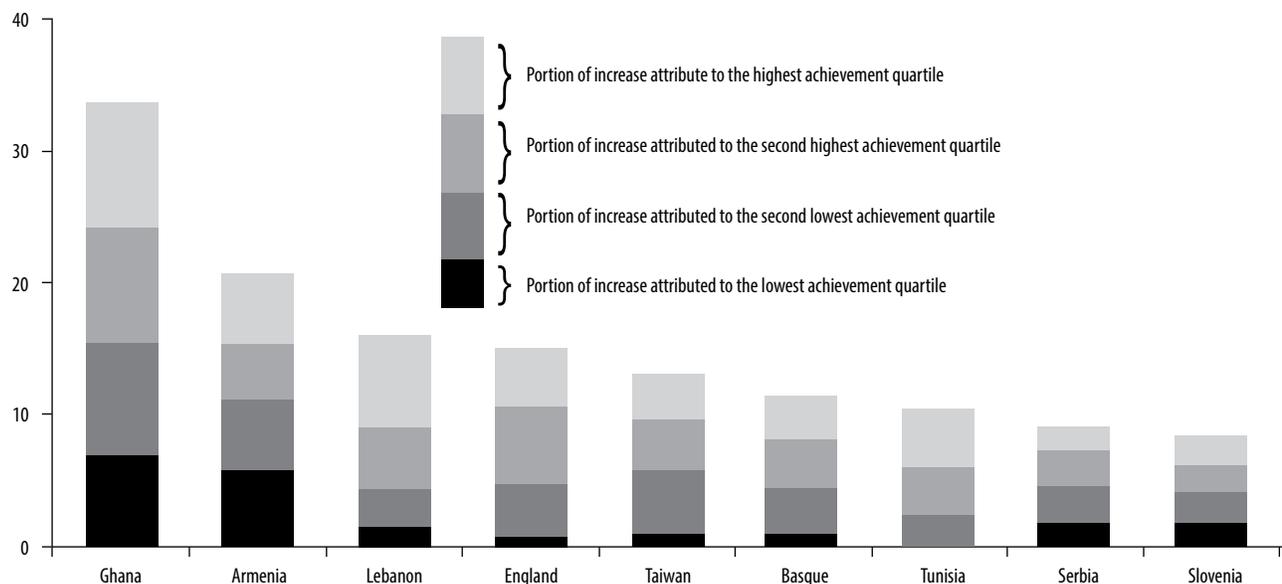
**Policy recommendation #1: Target underperforming schools and populations.** The experience of other countries lends credence to the notion that targeting underperforming subpopulations benefits educational quality and equity. In general, targeting these groups has been crucial to the progress of countries that have shown large increases in TIMSS scores. Figure 9 presents the scores of the three most improved countries that participated in TIMSS 2003 and 2007 and shows how much each student achievement quartile contributed to their increased scores. For example, Ghana experienced a 34 point increase on TIMSS math scores between 2003 and 2007. Increases in the average score for the lowest-achieving student quartile contributed 6.8 points, or 20 percent, of that 34 point increase. In Armenia, the increase in the average score of the lowest-achieving student quartile contributed 30 percent of the increase, and in Lebanon, 9 percent.

As the figure makes clear, the top three most improved countries did not ignore their lowest-performing students, a finding that suggests that if improvement in educational quality is to occur in Botswana, it must target interventions to poorly performing students. Such targeting would not require additional resources, as the country already has a high level of education expenditure; what is needed is better allocation of these resources to ensure that all regions are equitably served.

**Policy recommendation #2: Develop a monitoring and evaluation system for student achievement.** For effective policy making, good data and country-specific research are prerequisites. A number of countries experiment with various policies, engaging in constant monitoring and evaluation to identify positive or negative impacts. Most countries have dedicated institutions that are tasked with monitoring educational quality through student assessments and instructional quality.

To date, the government of Botswana has not created a dedicated institution to conduct research in education. The Department of Education of the University of Botswana has par-

**Figure 9. Three Most Improved Countries in Math Scores, TIMSS 2003 and 2007, by Student Achievement Quartile**



Source: World Bank staff calculations, based on TIMSS 2003 and 2007 data (see IEA 2004 and 2008).

tially served this role. MoESD has only a Division of Planning, Statistics, and Research, the role of which includes monitoring, research, and the collection of statistics for the country’s education management and information system (EMIS). The division has been unable to be effective. Due to limited capacity, the EMIS is still not well developed; for instance, only information on total enrollment in primary and pre-primary education is available through 2011. For postprimary education, however, the data is less current. Even the enrollment data that is available is generally not disaggregated geographically. This makes it difficult to meaningfully analyze data for policy making. Available data is also not effectively researched or utilized for policy purposes, such as that on educational quality available through TIMSS and SACMEQ. Given the availability of such valuable data, Botswana could make much better use of its monitoring and research systems to improve educational quality (see box 1 for a good-practice example).

MoESD recently approved the structure of a reorganized Department of Planning, Statistics, and Research that upgrades the current division into a department. The new department needs to be equipped with appropriate human and physical inputs as soon as possible so that it may begin performing the important task of monitoring and evaluation in the education sector. It is urgent that this department become rapidly fully operational with the capacity to ensure effective implementation of the various ongoing educational programs in the sector (see box 2 for a description of four core programs specified by National Development Plan 10). In sum, it is proposed that the ministry adopt the following approach:

**Policy → Experiment and Measurement → Evaluate → Scale Up/Adapt**

**Policy Recommendation #3: Give MoESD Inspectorate Services a more effective role in the education system.** This

unit of MoESD, which operates across its primary, secondary, and TVET departments, needs to develop key input and performance indicators across the education sector, which inspectors would then monitor by school. Additionally, this division should report to the Planning, Statistics, and Research Department of MoESD, where it can support the monitoring of educational outputs.

### **Technical and vocational education and training (TVET)**

Whereas unemployment caused by lack of demand in the labor market cannot be addressed by education and training systems, unemployment caused by skills mismatches should be. As evidenced by the tracer studies reviewed in this section, unemployment in Botswana appears to be the consequence of inadequate training or training in fields of specialization that are not in demand on the labor market. The recommendations discussed below complement one another and seek to reduce the information asymmetry that can cause skills mismatches, while providing opportunities for the workforce to improve its skills base for the emerging knowledge economy.

**Recommendation #4: Establish better linkages between TVET and academic education programs.** Trainees completing TVET programs in Botswana have the opportunity to enter the labor market or become self-employed. However, there are no opportunities for further education for this group, for instance, entering diploma-level training or the academic stream in order to improve their skills. As such, they have no further opportunities for skills growth. This is a characteristic of many education and training systems around the world, leading the TVET system in Botswana to be dubbed a “dead-end stream.”

Yet successful education systems and growing knowledge economies have managed to develop flexible systems that sup-

### Box 1. Current Landscape of TVET in Botswana

There are presently eight colleges run by the Department of Vocational Education and Training of MoSED:

- Botswana College of Engineering and Technology in Gaborone, the commercial and administrative capital of Botswana located in the southeast part of the country.
- Gaborone Technical College in Gaborone.
- Francistown College of Technical and Vocational Education, located in the second-largest city of Botswana the northeast.
- Jwaneng Technical College in a diamond-mining town in the southwest.
- Maun Technical College in a tourist town in the northwest.
- Oodi College of Applied Arts and Technology in a township close to and north of Gaborone.
- Palapye Technical College in Palapye, a fast-growing town in the central part of the country, soon to host the second university in Botswana.
- Silebe-Phikwe Technical College in a copper-mining town in the eastern part of the country.

**Description of TVET institutions.** Geographically, the technical colleges are spread across Botswana, although two are in Gaborone, while a third (Oodi College), is only 30 kilometers from Gaborone. The Botswana College of Engineering and Technology was previously the National Centre for Vocational Training, which was upgraded in 1979 to become Botswana Polytechnic. The Polytechnic has become the major center for training technicians in the country and offers certificates and diplomas in civil, mechanical, and electrical engineering in association with the City and Guilds London Institute. The most recently created colleges are those in Francistown and Oodi. All the colleges offer the new vocational educational and training courses of study of the Botswana Technical Education Programme (BTEP).

In addition to the eight colleges listed above, other government institutions train technicians, such as the Botswana College of Agriculture, the Botswana Institute of Administration and Commerce, and the Roads Training College. Furthermore, large employers, such as government departments and parastatal corporations, have their own training centers in which they conduct employer-based technical and vocational training. Currently there are more than 200 training institutes accredited by BOTA to provide vocational training in the country.

**Distance and open education programs.** These programs are expected to soon offer additional options for school-leavers. In 1998, Botswana established the Botswana College of Distance and Open Learning (BOCODOL), a semi-autonomous institution that offers distance education courses in preparation for the JC and BGCSE examinations. The college is intended for school-leavers who either want to upgrade the level of education they previously completed or are enrolling at the JC and BGCSE levels for the first time. BOCODOL inherited courses and programs that were previously administered by the Ministry of Education's Non-formal Education Department. Presently, it also offers professional and vocational courses at various levels, from certificate to degree programs. These courses are accredited by BOTA and the Tertiary Education Council. Student enrollment at BOCODOL has risen significantly, from 3,758 in 2002 to 5,162 in 2004, 5,513 in 2006, and 6,488 in 2008.

Sources: MoFDP 2009; BOTA 2010a.

port learners to advance through a system according to their ability. For instance, in Singapore, after 10 years of basic education (6 years of primary and 4 years of secondary education), students enter Junior Colleges for a General Certificate for Education Advanced Level, which prepares them for university study; or the Polytechnics, which offer a wide range of three-year diploma courses that prepare students for mid-level professions and management; or the Institute of Technical Education, which offers certificate-level courses that emphasize hands-on learning. The complete education system has formal articulations that allow students to progress from the Institute of Technical Education to diploma-level studies in a Polytechnic to a degree program in a university, depending on their performance (figure 10).

The Botswana National Vocational Qualification Framework, in development since the early 1990s, and BTEP are

moving the country towards a competency-based approach to learning and accreditation. Rapid completion of the framework and its implementation are urgent in order for Botswana to create a credits-based training and education system with horizontal and vertical articulation. The merger of BOTA and TEC is one of the key steps towards implementing this approach.

There are two main benefits of articulation. First, it improves the image and prestige of TVET because this educational stream is no longer a dead-end, but offers opportunities for further growth based on student performance. Second, the credit-based system offers students the flexibility of transferring credits across specializations in both vocational and technical education.

**Recommendation #5: Improve the quality of TVET curricula and training.** The skills training system in Botswana

## Box 2. Informed Policy Making: The Case of Jordan

A successful example of the monitoring and evaluation of educational outcomes comes from Jordan, a middle-income country (MIC). Over the past two decades, the Jordanian education system has made significant advances. Net enrollment in basic education increased from 89 percent in 2000 to 97 percent in 2006. Additionally, the quality of education has improved, as witnessed by improved student scores on international educational assessments. Jordan participated in TIMSS 1999 and ranked third from the bottom in both science and math. Additional international assessments were also conducted around that time, in particular, the International Assessment of Educational Progress in the early 1990s (for which the results were also poor).

These results sparked efforts to reform educational quality. Jordan established benchmarks for 13-year-olds' achievement relative to 19 countries that participated in TIMSS 1999; identified areas of strength and weakness in different subjects; conducted a thorough review of curricula and developed new textbooks to meet the learning needs associated with international benchmarks; compared the performance of students by school and region; identified cognitive processes with a view toward informing teacher training; conducted a massive upgrade of teacher training through a university bridging program; and targeted negative and positive influences of classroom practices, together with those of out-of-school activities and attitudes.

In 2003, Jordan again participated in TIMSS and showed a remarkable improvement over its 1999 scores. Its students performed above the international average in both math and science, and have since shown further improvement. A recent study estimates that more than two-thirds of the improvement in TIMSS scores came from improved effectiveness in the use of resources, or the increased value-added of Jordan's teachers.

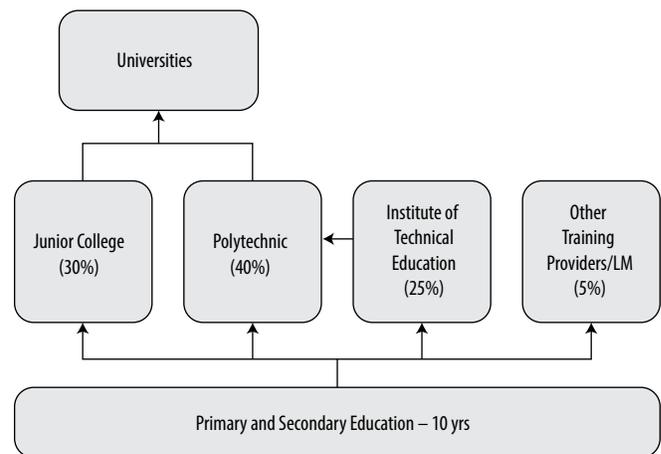
Source: Abdul-Hamid, Abu-Lebdeh, and Patrinos (2011).

needs to be responsive to its main stakeholders and clients, including students and employers. Expert trainers are needed to attract students to TVET colleges and/or institutes so that these institutions can be operated at capacity. Expert trainers, however, are in short supply. There is thus an urgent need to hire trainers internationally and/or train them locally. MoESD has a teacher training program in the Francistown College of Technical Vocational education that offers a two-year teacher training diploma course. The government is currently reviewing this course, creating a critical opportunity to incorporate the competency-based approach to teaching and learning in the curriculum.

An additional challenge in TVET is retaining well-trained technical and vocational teachers, given the high demand for such experts in the industrial sector. The government has introduced a scarce skills allowance for such trainers that appears to have helped educational institutions retain staff, but better incentives are needed, in particular for subjects like engineering and ICT.

**Recommendation #6: Build responsiveness to employer demands into the TVET system.** A strong feedback mechanism is required in this regard. Employers complain of a lack of skilled staff while TVET graduates remain unemployed. An important way to address this mismatch would be to have representatives from the employer guide TVET curriculum development and training processes. Currently, industry representatives work through advisory committees in DVET; eventually, the plan is to have sectoral committees work within the framework of the National Human Resource Development Strategy. In either case, effective employer representation will make a difference. A continual feedback loop on whether training programs are working as planned, whether the skills being imparted are the right skills, and whether the graduates are working as expected is integral to a successful TVET system.

Figure 10. Articulations in the Education System of Singapore



Source: Adapted from Seng 2009.

The Institute of Technical Education (ITE) in Singapore provides a good-practice example of how training providers can work with employers to respond to their demands (box 4). The institute operates under the Ministry of Education as a statutory board (parastatal corporation); its internal and external accountability is ensured through a board of governance, academic advisory committees, technical advisory and certification councils, and a CEO for the institute as a whole and principals for its individual colleges. The academic advisory committees help respond to the demands of employers, as do employer and student satisfaction surveys. The government of Botswana is in the process of revamping its brigades system of vocational education by taking over these institutes, creating an opportunity to introduce a model such as ITE to improve

### Box 3. Education Programs of National Development Plan 10

Four core programs were identified by National Development Plan (NDP) 10 for addressing the educational challenges of economic diversification. These programs are focused on general education, tertiary education, teacher development and management, and skills development.

**General Education Program.** The General Education Program involves the provision of accessible, equitable, quality education for all levels below the tertiary level, delivered through both in- and out-of-school modes. The program aims to provide a base for an educated, trained labor force by preparing learners to participate in tertiary education or providing them vocational and technical skills relevant to participation in a competitive labor market.

**Teacher development and management program.** This program focuses on skills development through a broadened teacher education curriculum aligned with the needs of the economy. It will introduce degree programs in colleges of education; establish centers of excellence in specific areas; and build teacher capacity in various areas, including the education of gifted and talented children, orientation and mobility, sign language, inclusive education of children with severe multiple profound disabilities (i.e., special-needs education), early childhood education/pre-primary education; and vocational education and training.

The program will also establish an efficient management information system, enabling it to conduct projections of human resource growth, job analysis, and other related administrative functions. Finally, it seeks to improve teacher motivation through training teachers in change initiatives and offering other incentives.

**Skills Development Program.** This program aims to achieve three outcomes: improved student vocational and technical skills, employability, and an adequate supply of skills for the labor market.

**Tertiary Education Program.** This program will provide a strategic support to public-private partnerships in the provision of training facilities, the determination of relevant skills and their quality, as well as the development of industry-relevant research initiatives.

Source: MoFDP 2009

the quality and responsiveness of skills training programs in the country.

**Recommendation #7: Make effective use of training levy funds.** As noted earlier, the training levy imposed on firms in Botswana is not effectively utilized. Firms can use this levy to train their workers to improve the relevance of their skills and, hence, their productivity. Looking at the enterprise survey carried out by the World Bank with support from MoESD in 2010, firms in Botswana do offer on-the-job training more frequently than do firms in other countries in Sub-Saharan Africa (SSA) or in upper-middle-income (UMI) countries (figure 11).

This trend is an improvement compared to the recent past, particularly for large firms. In 2006, for example, only 43 percent of large firms offered formal training, compared to 64 percent of firms in SSA and upper-middle-income countries (UMICs). By 2010, however, more than 75 percent of large firms in Botswana offered worker training. The levy is probably not used for these job-training programs because firms can be reimbursed only for BOTA-accredited courses (World Bank 2006, 2010a; World Bank 2010c).

The levy could also be used to fund industry-specific training institutes and/or the development of courses tailor made for specific industries within existing training institutes accredited by BOTA. Botswana has experience with the former in the form of the CITF (Construction Industry Trust Fund), which has its own training institute. However, as discussed earlier in this note, a large proportion of CITF trainees cannot find employment. This is a disadvantage that sectoral training funds face worldwide: they lock up funds in a sector despite a potential need for reallocation of these funds across sectors based on demand (Johanson 2009).

Another way to efficiently utilize the training levy is to use the funds to support pre-employment training through specific sub funds. For instance, the Brazilian S-System is the largest consolidated professional training system in Latin America. It comprises a group of institutes offering advanced skills training and other services to workers. The system began as a single institution in the industrial sector in the 1940s—the SENAI (National Service for Industrial Apprenticeship)—and was created by presidential decree. Its mandate was to train manpower for the basic industries that were about to be launched in Brazil (Rodriguez, Dahlman and Salmi, 2008).

Today the S-System is a group of nine loosely related national institutions organized by sector. It offers an estimated 2,300 courses per year and has an annual enrollment of more than 15 million students. A compulsory levy in the form of a payroll tax finances 85 percent of these activities; remaining costs are covered by contracts with the public sector, companies, communities, and out-of-pocket payments by participants. SENAI, which is still the largest of the nine institutions, has a training infrastructure of over 500 vocational training centers, more than 200 mobile training units, and several personnel development centers.

Given the small size of industry in Botswana, it may not be feasible to create industry-specific training institutes. But a mechanism such as SENAI could be used to develop industry-specific courses in existing VTCs and technical colleges to meet the skills demands of the employers. Such collaborations could be funded by training funds in partnership with the private sector, with industries participating in curricula development and providing experienced trainers and apprenticeships.

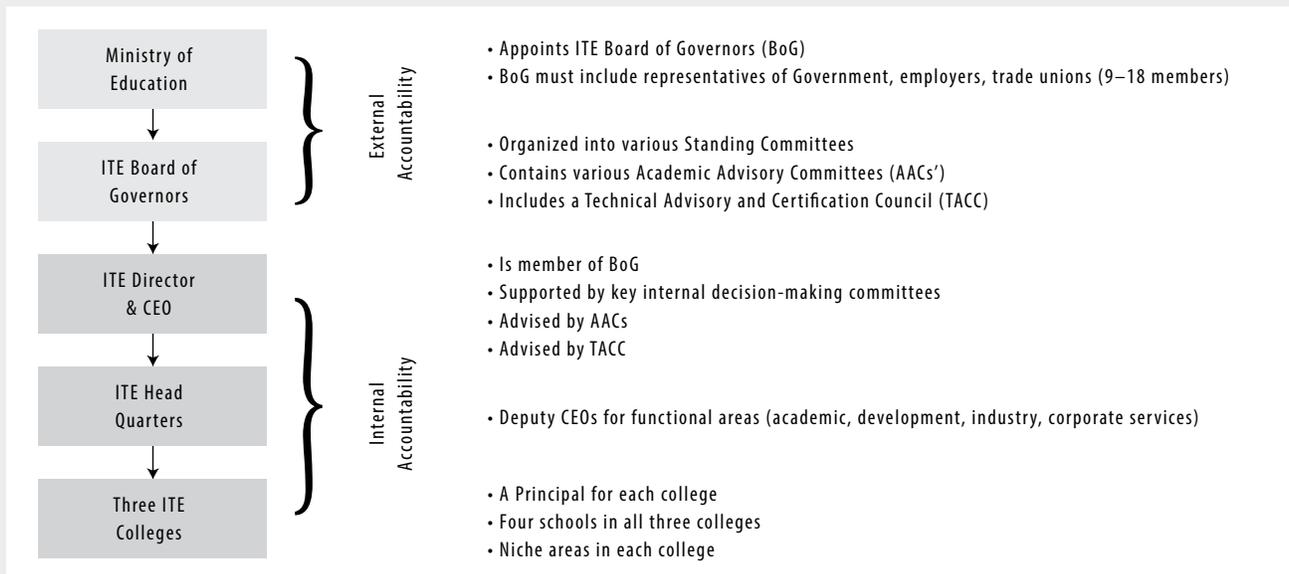
#### Box 4. Institute of Technical Education of Singapore

The Institute of Technical Education (ITE) is a statutory board (i.e., parastatal agency under the Ministry of Education of Singapore, with well-defined functions that include the provision of: (i) full-time pre-employment technical training and education; (ii) continuing education and training for the purposes of upgrading the technical skills of the workforce; (iii) regulation and promotion of industry-based training and education; (iv) regulation of certifications and standards for technical skills; (v) consultancy services and research in technical training and education.

In terms of its relationship with the Ministry of Education, ITE receives annual operating and development budgets from the ministry, based on student headcount. In return it is accountable for meeting annual government targets and educational outcomes that specifically aim to produce market-relevant, entrepreneurial, adaptable graduates for the global economy, together with lifelong learners (to improve employability). The governance structure for ITE is shown in figure B4.1.

**Figure B4.1 ITE Governance Structure**

A distinguishing factor of ITE as a post-secondary training institution is that it operates as a business entity following a



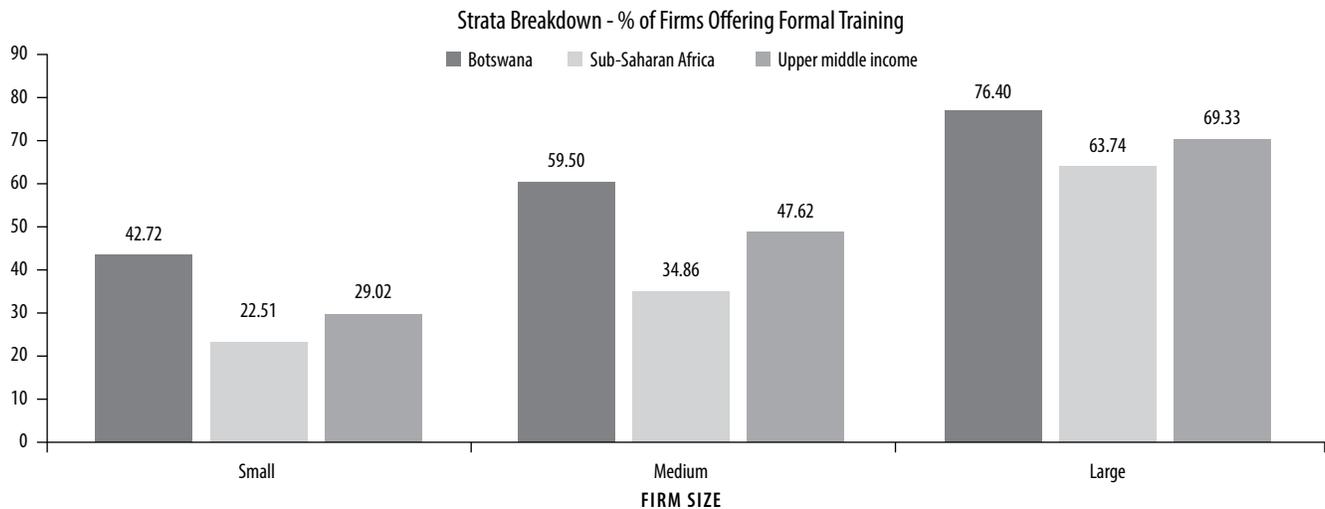
business model. **The Director is also a CEO** who makes strategic long-term plans with detailed implementation blueprints. In addition, Singapore’s business excellence framework serves as a benchmark for organizational excellence for the Institute. The institute is **responsive to stakeholders and relevant to the market**. Students and employers are considered customers; the institute practices active listening by receiving feedback from multiple channels and on the basis of this feedback, develops new course offerings.

ITE is both **quality and brand conscious**—it maintains skills standards, grants certifications, and adheres to a quality assurance framework. For example, it has undertaken continuous branding exercises to improve the public perception of an ITE education. The institution is **efficiency-conscious**. Organized according to the slogan, “One ITE, Three Colleges,” the Institute formulates policy, develops curricula, admits students, and conducts quality assurance, among other tasks, at the central level in order to enhance efficiency. However, it operates three colleges, each of which has sufficient autonomy to compete with the others and grow in niche areas. ITE also uses state-of-the-art technology for service delivery (this technology facilitates e-students and e-tutors). ITE is **results-conscious**. It tracks the performance (e.g., employer and student satisfaction surveys) of its three colleges and reports this data through the Annual College Excellence Report.

Through constant review and revision of its policies, Singapore’s TVET system has evolved over the last decade to become a nimble, practice-oriented system that is responsive to the needs of industry.

Source: Fredriksen and Tan (2008); Seng (2008).

**Figure 11. Comparison of Botswana, Other SSA, and UMIC Firms Offering Formal Training, by Firm Size, 2010**



Source: World Bank (2010a); World Bank (2010c).  
 Note: UMIC – upper-middle-income country; SSA – Sub-Saharan Africa.

### Tertiary education

**Recommendation #8: Align tertiary education with the needs of a knowledge economy.** The education hub, one of the six priority economic development hubs created by NDP 9, aims to increase the quality and relevance of education in the country at all levels, making Botswana more competitive by attracting leading tertiary institutions, scholars, researchers, and students to the country. However, this goal will only be possible if financial and academic incentives within Botswana are aligned with tertiary education programs that teach skills crucial to the new economy, such as ICT and STEM programs. Additionally, higher-order skills (i.e., the cognitive and behavioral skills associated with mid-level management positions, including learning to learn, problem solving, creative thinking, communication, negotiation, and teamwork) are needed in the economy,<sup>12</sup> making it urgent to develop a cadre of well-trained postgraduates who can lead technology adaptation and innovation in the country.

**Recommendation #9: Take immediate steps to improve the level of learning at the tertiary level and target priori-**

**ty disciplines for student enrollment.** Specifically, it is proposed that the government:

- Develop pre-entry STEM courses for universities in the immediate term in order to ensure high-quality input into the tertiary system. Such courses have been introduced in a number of countries (e.g., Namibia) to address the shortcomings of poor-quality secondary education.
- Re-align the GLS program to promote the study of priority- and higher-order skills at the tertiary level. In addition, GLS should be re-evaluated to ensure that it sponsors qualified students for postgraduate studies. For example, the government’s Top Achievers Scholarship Program has placed a total of 49 candidates in the best tertiary institutions in the country since 2010; these students are studying skills areas for which there is economic demand.
- Establish the tertiary sector as a niche centre of excellence to make the sector economically viable and attract international students. This work will advance Botswana’s economic development plans. India, for instance, adopted a model of investment in science and technology education that supported its policy of import substitution (box 5).

<sup>12</sup> See Sondegaard and Murthi (2012, chapter 1) for a more detailed discussion of these skills.

### **Box 5. India: Building Specialized Tertiary Education Institutions for Economic Growth**

Despite having a highly inequitable education system at the basic level and large numbers of primary school-age children out of school, India has managed to become an emerging force in the supply of engineering and ICT experts. The human capital development path followed by India sharply contrasts with those of such countries as Singapore and South Korea, but has nevertheless gained the country a spot in the emerging BRIC (Brazil, Russia, India, China) category.

Soon after its independence in the late 1940s, India started focusing on the development of a tertiary education system, particularly in science and technology, as an engine for economic growth. Its import substitution industrial policies, for example, required strong science and technology graduates to succeed. The first Indian Institute of Technology (IIT) was established in 1951 in West Bengal with the support of UNESCO, based on the model of the Massachusetts Institute of Technology. Seven years later, a second IIT was established in Mumbai with the help of the Soviet Union (via UNESCO). Establishment of three other IITs closely followed, with each institute supported by different international donor partners, including Germany, a consortium of U.S. universities, and the British government and U.K. industries. To date, seven IITs have been established; the parliament has dubbed them institutes of national importance. The Institutes of Technology are publicly funded and enjoy maximum managerial and academic freedom (Rodriguez, Dahlman and Salmi, 2008). All IITs offer undergraduate through postdoctoral degrees in engineering, technology, applied sciences, and management. Entry into the colleges is based strictly on merit. In 2005, the institutes were ranked as the third best engineering schools globally by the *London Times Higher Education Supplement*.

Though initially a large number of graduates of these universities emigrated, sparking a brain drain, this trend eventually helped India via the return migration of highly experienced entrepreneurial individuals who linked the country to international markets. Today IIT alumni are well represented at the highest levels of responsibility in the education, research, business, and innovation sectors around the world.

*Source:* Rodriguez, Dahlman, and Salmi (2008).

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