Strengthening gender equality and inclusivity in the national system of Science, Technology and Innovation:

BOTSWANA
COUNTRY PROFILE

Gender & Inclusivity
A PROJECT OF THE SCIENCE GRANTING COUNCILS INITIATIVE


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Strengthening Gender Equality and Inclusivity in Science, Technology and Innovation (STI) highlights the contextual factors driving gender and inclusivity disparities in STI in Botswana as well as options and strategies for addressing disparity gaps in some of UNESCO's STEM and Gender Advancement (SAGA) policy impact areas.

These impact areas are social norms and stereotypes, education (primary, secondary and tertiary), the career progression environment, research content and practice, policy and entrepreneurship and innovation.

This profile synthesizes important data for funding agencies, researchers, policymakers and other actors advancing gender equality and inclusivity in STI at country, regional and international levels.

Acknowledgements

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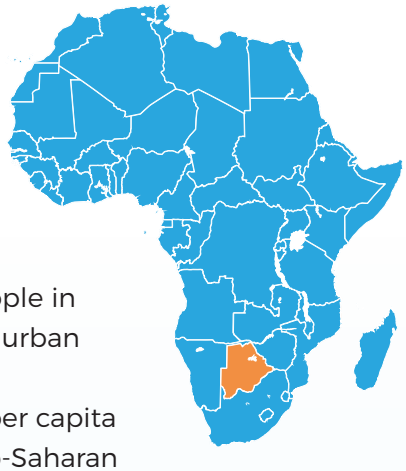
Country overview



Botswana in Southern Africa shares borders with Zimbabwe, Zambia, South Africa and Namibia (The World Bank, 2022).

Women and girls comprised 51% of the total 25 88 423 people in 2021. Just under three-quarters (70%) of the population live in urban areas (The World Bank, 2022).

Botswana is an upper-middle-income country with a high per capita annual growth of 9,6% in 2021, nine times higher than the sub-Saharan Africa (SSA) average of 1,6% (The World Bank, 2022).

The country's progress in achieving many of the Sustainable Development Goals (SDGs) has stagnated, but some are showing moderate improvement (Sachs et al., 2022; UN Women, 2020):

- Significant challenges remain with trends stagnating for poverty, hunger, good health and well-being, affordable and clean energy, decent work, and economic growth (SDGs 1, 2, 3, 7 and 8).
- Quality education remains unchanged, with significant challenges and limited trend data (SDG 4).
- Gender equality faces significant challenges (SDG 5). Only 35.3% of indicators are available for monitoring Botswana's SDGs from a gender perspective. Closing these gender data gaps is essential for achieving the country's gender-related SDG commitments.

Gender and inclusivity disparities negatively impact Botswana's human potential for socio-economic development

- Gender inequalities in Botswana are associated with laws, cultural norms and practices that hamper women's and girls' access to opportunities, resources and power. Structural drivers of gender inequality such as unequal gender roles and power relations between men and women persist across all social institutions, resulting in multiple forms of discrimination against girls and women (Alpin-Lardiés et al., 2019).
- The country has made progress in reducing gender disparities and discriminatory practices in the critical social institutions of the family, civil liberties, reproductive autonomy and access to productive and financial resources between 2019 and 2023 (Table 1, SIGI).
- Gender equality is also a stand-alone human and social development strategy in the country's 2036 Vision (Government of Botswana, 2016). Social studies in Botswana report high support among the population for gender equality in hiring, land ownership and political leadership (Mooketsane et al., 2023).
- However, there remains work to achieve full gender equality; disparities harm female livelihoods and the potential for poverty alleviation and growth on a national level (UNDP, 2021).
- Social attitude surveys indicate that the country holds higher tolerance for people of other religions and ethnicities, and for immigrants and foreigners and a lower tolerance towards people of different sexual identities and orientations (38%), compared to other countries in the region. Following the decriminalisation of same-sex activity in 2019, the tolerance for people of different sexual identities and orientations increased by ten percentage points to 48%, illustrating the power of legal intervention to reduce discrimination (Howard, 2020).
- Structural drivers of gender inequality result in Botswana reporting gender disparities on several socio-economic development indices (Table 1). These indicators do not include data on intersecting marginalised identities and experiences of women and girls, e.g., rurality or disability, which hampers a nuanced picture of gender- and other inequalities in the country.

Table 1: Key gender indicators for Botswana

Human Development Index (HDI) (UNDP, 2021)	
This index measures average achievement in human development in three dimensions: a long and healthy life (health), knowledge (education), and a decent standard of living (command over economic resources). The closer the value to 1, the higher the country's level of human development.	Botswana had an HDI value of 0,693 in 2021, which ranked the country in the high human development category at 117 out of 191 countries and territories.
Gender Inequality Index (GII) (UNDP, 2021)	
This index exposes the human development costs of gender disparities in three areas of human development: reproductive health (maternal mortality ratio and adolescent birth rate), empowerment (population with at least some secondary education; share of seats in parliament) and the labour market (labour force participation rate). The closer the score to 1, the more disparities between men and women and the greater the loss to human development.	Botswana has a GII value of 0,468, ranking it 117 out of 191 countries in the 2021 index. When the sub-indices disaggregate this value, a more nuanced picture of imbalances emerges. ● Women hold only 10,8% of parliamentary seats, lower than the SSA average of 25,7%. ● 91,3% of adult women have reached at least a secondary level of education, compared to 91,8% of their male counterparts; the figures are significantly higher than the SSA average of 31,1% for women and 44,3% for men. ● For every 100 000 live births, 144 women die from pregnancy-related causes, which is relatively high but lower than the SSA average of 536. ● The adolescent birth rate is 49,3 births per 1 000 women of ages 15-19, precisely half the SSA average of 101. ● Female participation in the labour market is 69,2%, compared with 77,8% for men. The figures are higher than the SSA average of 62,1% for women and 72,3% for men.
Social Institutions & Gender Index (SIGI) (Organisation for Economic Co-operation and Development, 2023)	
This index assesses the extent of discriminatory social institutions- the complex web of formal and informal laws, social norms, and practices that limit women and girls' access to their rights, justice, opportunities for empowerment, and resources and undermines their agency and authority. A SIGI value of 0% indicates no discrimination and 100% very high discrimination in social institutions.	At 31,5% in 2023, Botswana social institutions decreased discrimination against women compared with 39% in 2019. Discrimination in Botswana is highest in discrimination in the family and lowest in restricted physical integrity. ● Family discrimination (53,2%) captures power distribution within households. It evaluates how much girls and women may be undervalued (e.g., child marriage rate, the gender gap in unpaid care and domestic work, and laws on divorce and inheritance). ● Restricted access to productive and financial resources (20%) captures women's restricted access to and control over crucial economic assets and resources, e.g., land ownership, bank account ownership, and the gender gap in management positions. ● Restricted civil liberties (36,5%) capture social institutions that limit women's access to participation and voice in the public and social spheres. ● Restricted physical integrity (14,3%) captures social institutions that make women and girls vulnerable in these areas and limit their control over their bodies and reproductive autonomy (e.g., laws on violence against women, female genital mutilation, and reproductive freedom, the prevalence of intimate partner violence and percentage unmet needs for family planning).
The Global Gender Gap Index (GGGI) (World Economic Forum, 2022)	
This index measures gender-based gaps in access to resources and opportunities across four categories: economic participation and opportunity, educational attainment, health and survival, and political empowerment. The closer the score to 1, the higher the gender parity.	With a GGG value in 2022 of 0,72, Botswana has closed 72% of its gender gap, ranking 66 out of 146 countries. Resources and opportunities still need to be equal between men and women. When the sub-indices disaggregate this value, a more nuanced picture of imbalances emerges, with full parity in educational attainment and stark inequalities in access to political empowerment. ● Educational attainment (100%) evaluates parity on literacy rate and percentage enrolments in primary, secondary, and tertiary education. ● Health and survival (98%) evaluate parity in sex ratio at birth and years of healthy life expectancy. ● Economic participation and opportunity (81%) evaluate parity on measures such as the labour force participation rate (86%), wage equality for similar work (61%), percentage of women legislators, senior/executive management (100%), and professional and technical workers (100%). ● Political empowerment (8%) evaluates parity in the percentage of women in parliament (12%), ministerial positions (20%), and years with a female head of state (9%).

STI and sustainable socio-economic development

- The current organization of the STI landscape in Botswana is under the authority of the **Ministry of Tertiary Education, Research, Science and Technology**, principally guided by the country's development visions of 2016 and 2036, the 2011 National Policy on Research, Science, Technology, and Innovation (under review), and Implementation Plan of 2015 (Government of Botswana, 2016).
- The **2011 Research, Science, Technology and Innovation (RSTI) Policy** aims for RSTI to provide a clear vision, programmes, incentives, measures, roles, targets and monitoring indicators (Jackson et al., 2022). The policy also highlights the need for gender inclusivity and non-discrimination of groups based on race, ethnicity, gender, social standing, age and disability to increase participation in science and technology (Lemarchand & Schneegans, 2013).
- **The 2036 vision** emphasizes a strong science, technology, and innovation sector to support economic development and a knowledge-based economy. The vision calls for an enabling policy environment, including promoting research and development, innovation and commercialization, the protection of indigenous knowledge, and intellectual property rights (Government of Botswana, 2016).
- The 2036 vision for gender equality is that Botswana "...will be a society where all men and women have equal opportunity to actively participate in the economic, social, cultural and political development of the country. In particular emphasis will be placed on ensuring equal women participation and representation in politics" (Government of Botswana, 2016, p. 22).
- Botswana's scientific **peer-reviewed publications and patents**, used as a measure of research and innovation indicate the following (Scimago, 2023):
  - Researchers increased their publication outputs from 112 papers in 1996 to 1015 in 2022 with a cumulative total of 11600, ranking 17th out of 59 African countries.
  - The country's percentage contribution to Africa's publications varies from 0,82% in 1996 to 1,09% in 2006, declining in 2022 to 0, 62% in 2022.
  - Papers are largely related to Medicine, followed by Agriculture and Biological Sciences, then Environmental Sciences and Computer Sciences, and Engineering.
  - The proportion of papers written with international partners has increased from 38% in 1996 to 74% in 2022.

– During 2008-2017 Botswana's number of gender-related publications increased by 42% from 6 to 145 publications (Figure 1). This is the highest growth rate among the 15 participating SGCIs, with an increase in the number of authors contributing to gender-related publications by almost tenfold (Jackson et al., 2022; SGCI, n.d.).

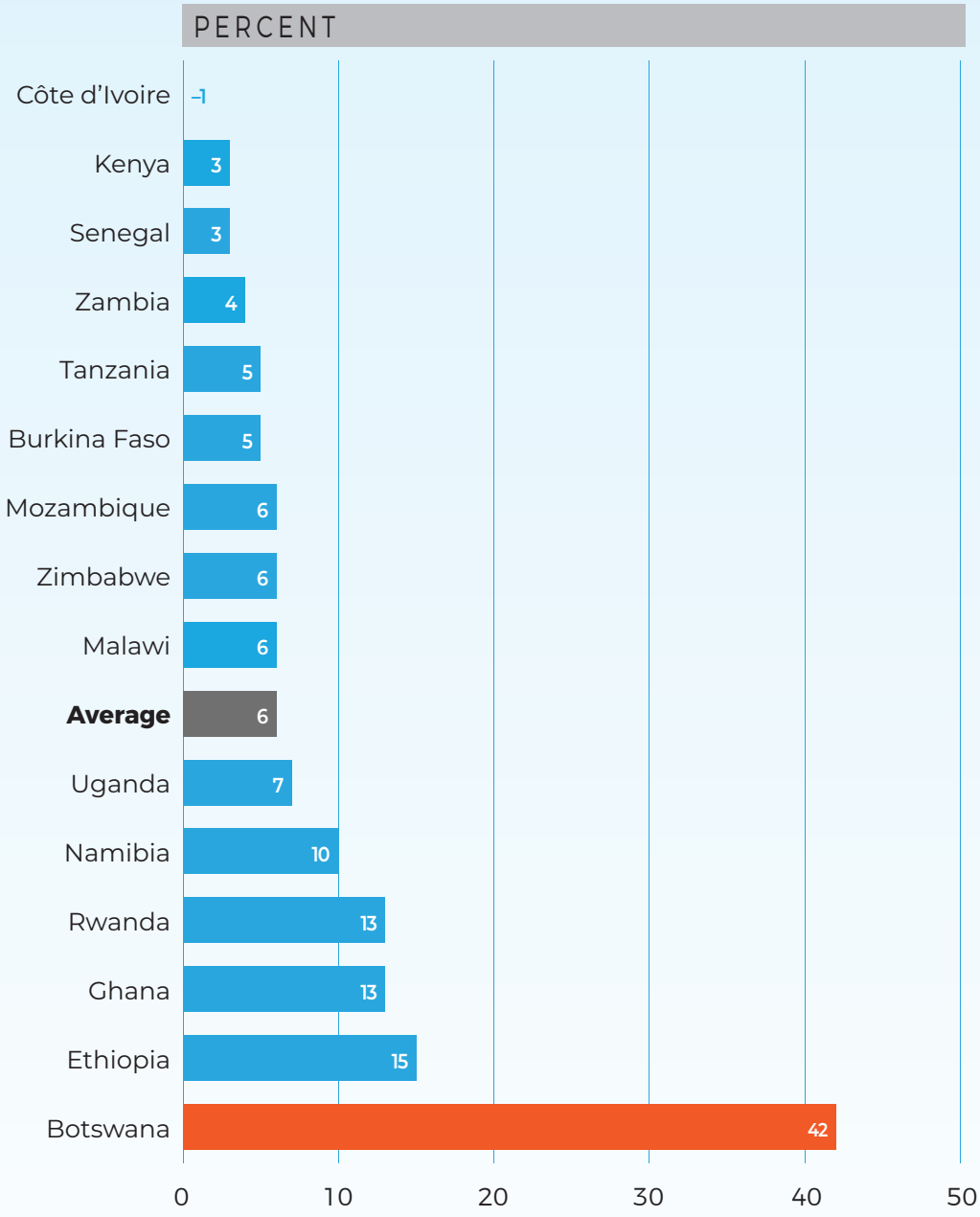


Figure 1: African SGCI participating countries: percentage (%) increase in publications with gender-related content between 2008 and 2017

Status of human capital for STI

- Gender disaggregated data gaps paint an incomplete picture of the status of human capital for STI in Botswana. A lack of regular data reporting on the researcher pool is a global challenge: "In 2018, 50 countries recorded the number of researchers (in head counts), down from 97 countries in 2015" (UNESCO, 2021, p. 47).
- Bearing this global data challenge in mind, in 2012 women constituted 27,2% of researchers in the country, increasing to 29,6% in 2013 (Unesco Institute for Statistics, 2021).
- In 2013, the total number of women in Research and Development (R&D) was significantly lower than men at 35% vs 64% (Table 2).
- Disaggregating R&D personnel by gender and function shows gender disparities with women increasingly and negatively affected across the three functional positions (Unesco Institute for Statistics, 2021).

Table 2: Total number of R&D personnel (headcount) by category and gender for 2013

	Women	Men	Total
Researchers	225 (30%)	535 (70%)	760
Technicians	110	218	328
Support staff	282	346	628
Total	617 (35%)	1099 (64%)	1716

- Botswana's distribution of researchers by scientific field of research in 2013/14 illustrates gender disparities. It is evident in Figure 2 that there were more men than women in all the scientific fields in 2013/2014 (Unesco Institute for Statistics, 2021).
- A decisive move away from the stereotypic notion and practice of the hard sciences as mainly a male domain has yet to be apparent.
- Distribution by field of employment among researchers (Figure 3) shows that women were more concentrated in private, non-profit, and business enterprises in 2012, with a large shift towards business enterprise in 2013.

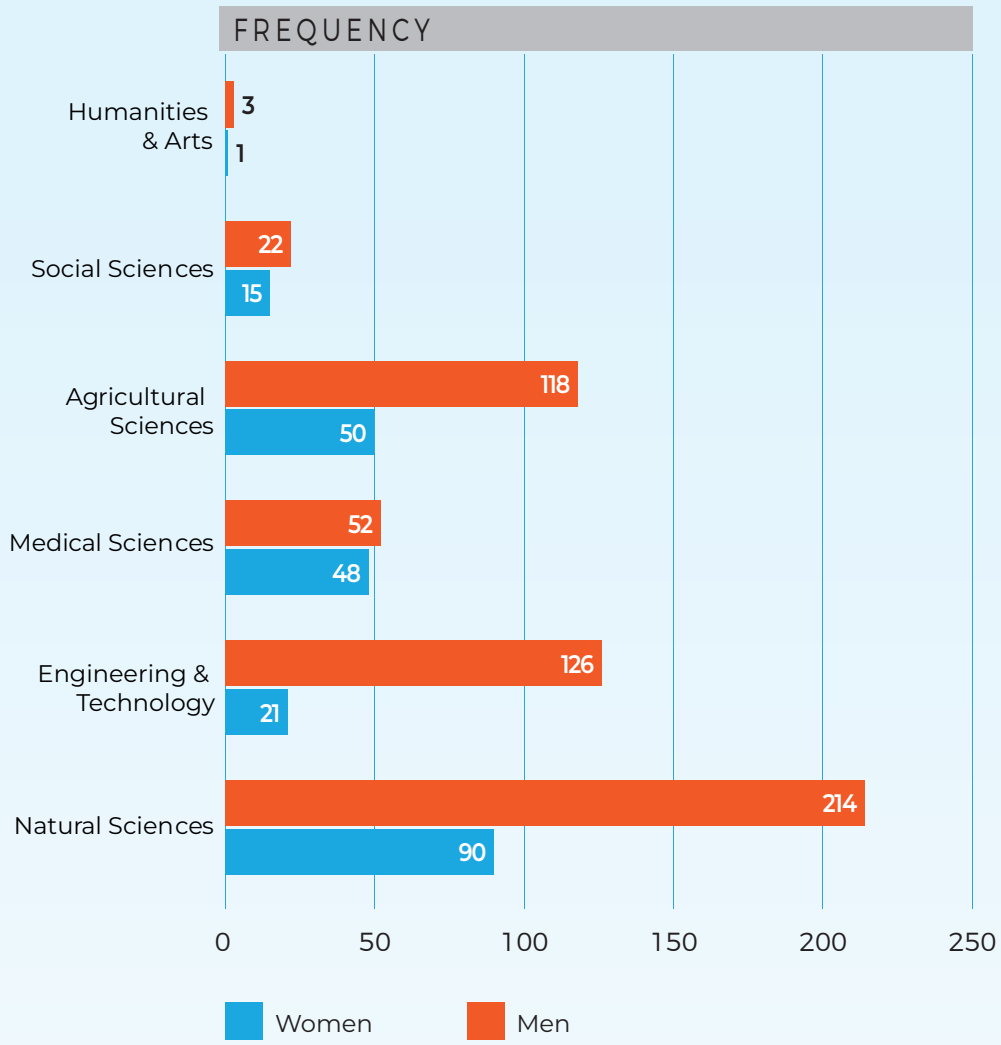


Figure 2: Distribution of researchers (headcount) by scientific field and gender for 2013/14

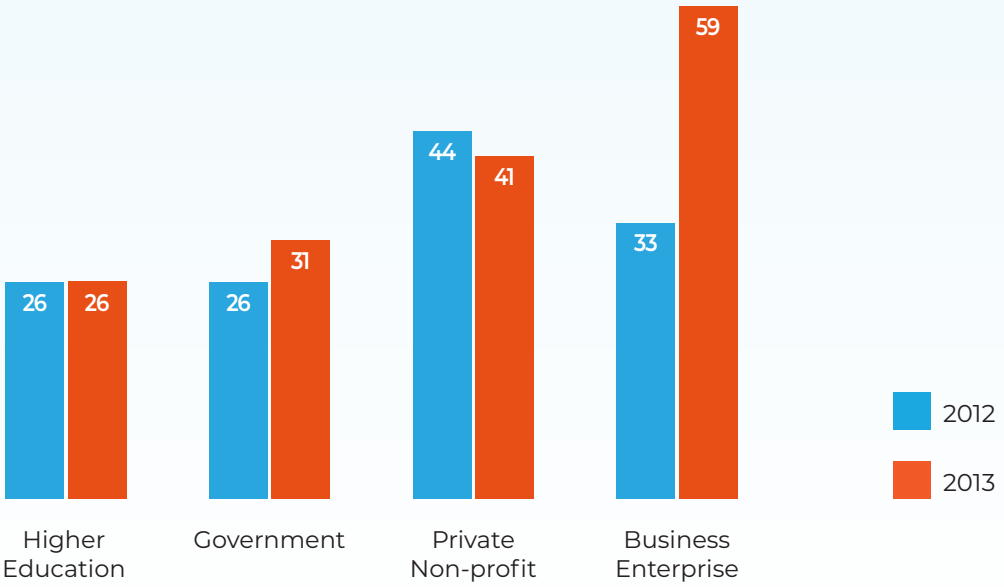


Figure 3: Proportion (%) of women researchers (head count) by employment sector for 2012 and 2013

What factors encourage (or discourage) women's participation in the national system of science, technology and innovation?

Policy and frameworks

- **Botswana's 1996 constitution** "is at best gender blind; at worst contains discriminatory clauses at odds with its international obligations" (Women Speak Out, 2022, p. 1). The constitution has no gender equality provisions, limiting the extent to which political actors can successfully pursue policies that contribute to women's equality.
- Still the focus on addressing gender disparities and inclusivity has grown significantly between the **Development Vision of 2016 and 2036**. Whereas the 2016 vision mentions the importance of gender equality, the 2036 vision has gender equality as a stand-alone strategy for human and social development. The 2036 vision introduces the principles of empowerment and participation of women, youth and persons with disabilities and social inclusion and equality (Government of Botswana, 2016).
- The Botswana government has implemented the **1998 National Gender Programme and the National Gender Policy Framework** to guide gender mainstreaming within the country (Ministry of Labour and Home Affairs & Women's Affairs Department, 2000).
- In 2016 the Government established the **National Policy on Gender and Development and the National Gender Commission** to pay close attention to a range of issues, systems and institutions in which the same opportunities should be available to men and women to improve their potential as human beings and valuable citizens of Botswana. The long-term goal of the policy is to decrease the inequalities in opportunities and outcomes of social, economic, political, cultural and legal development for both men and women (UN Women, 2015).
- The **National Policy on Research, Science, Technology and Innovation (RSTI) 2011** is committed to addressing the structural drivers of gender inequality to increase participation of women in science and technology fields from a young age to fully engage the country's human potential in support of national development. In addition, targeted schemes aim to provide equal opportunity for men and women to engage in careers in science and engineering (Ministry of Labour and Home Affairs & Women's Affairs Department, 2000).

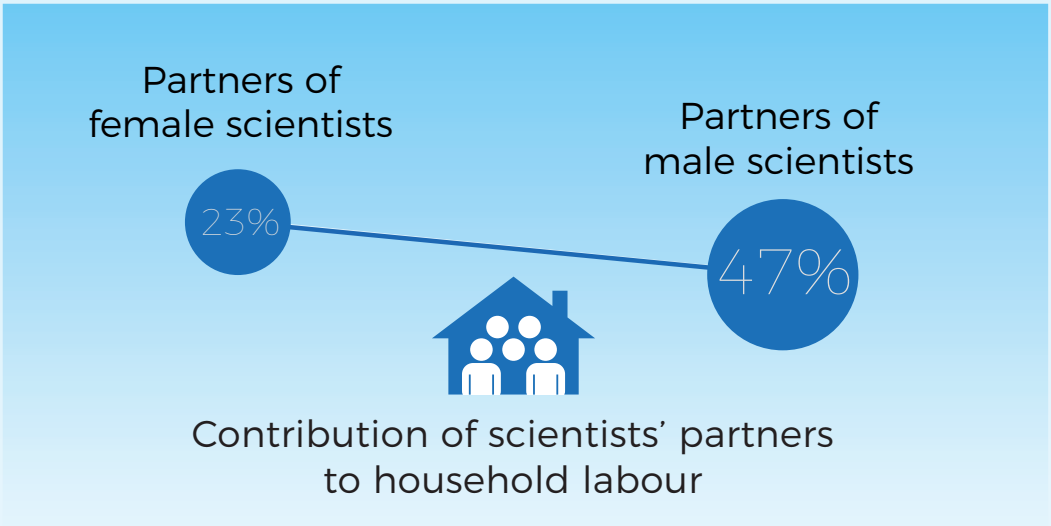
- The **Convention on the Elimination of all Forms of Discrimination Against Women (CEDAW)** in Botswana aims to eliminate discrimination. It is committed to upholding the rights of women. However the 2019 CEDAW evaluation signalled several institutional and women's rights areas of concern and recommendations for improving its implementation (Ministry of Labour and Home Affairs & Women's Affairs Department, 2000; Women Speak Out, 2022).
- The Government adopted a **School Re-entry Policy** for pregnant students. The re-entry policy initially only allowed girls to return to school 12 months after the pregnancy, amended in 2000 to 6 months. The country does not currently have a continuation policy that protects girls' right to stay in school during and after their pregnancy, a policy gap that contributes to gender-related barriers to girls' educational attainment (Human Rights Watch, 2022).

Gender social norms and the education pipeline

- Girls generally outperform boys at the primary school level in Botswana, including in science and mathematics subjects. At the senior secondary level, male learners surpass female learners in participation and performance in physics, chemistry, biology and mathematics (World Economic Forum, 2022).
- This sudden drop in girls' performance in STEM subjects is attributed to gender stereotypes, where girls are made to believe that some subjects, such as science and technology, are associated with masculinity. In addition, a lack of proper mentorship and advice by teachers and parents may lead to negative attitudes to STEM careers (Mpuchane, 2005).
- Enrolment in tertiary education indicates higher participation by female students than male students; however, women remain underrepresented at the doctoral level, where men outnumber women graduates (Human Resource Development Council of Botswana, 2022).
- STEM-specific data, and in particular gender-disaggregated data for tertiary education in engineering, manufacturing and construction, show gender disparities, with female students (29%) outnumbered by male students (71%) (Human Resource Development Council of Botswana, 2022).
- Indicators tracking gender equality in human development (Table 1) reveal contributing factors for gender gaps and disparities linked to Botswana's loss of human development potential across the life course, including those related to STI.

Gender science norms and the STI career progression environment

- In 2021, women constituted 41,7% of academics (vs 58,3% for men) and 36% of PhD enrolments. The report does not provide gender disaggregated data for the 33 PhD graduates (Human Resource Development Council of Botswana, 2022).
- Under-representation of women in STI in SSA is better explained by discriminatory practices that prevent women's participation in science than by supposed preferences for or aptitude in STI. Gender-science leaks emerge in women's tertiary education participation, affect completion rates and continue as leaks or blockages in their research career trajectory. Gender-science stereotypes are perceptions that connect scientific achievements with men more than with women. The STI landscape is rife with gender-science stereotypes (Elu & Price, 2017; Huyer, 2019).
- Gender bias during grant review processes impacts women's success in securing research funding (Sato et al., 2021). A continent-wide study found that men received more funding than women in engineering and applied sciences (Fisher et al., 2020).
- Other factors constraining women's participation in STI include workplace sexual harassment, gender pay gaps, low job security for young women scientists who often hold contract positions, and a lack of mentors and role models (Mukhawana et al., 2020; Prieto-Rodriguez et al., 2022; Prozesky & Mouton, 2019). In academic institutions, women scientists generally have higher teaching, supervisory and administrative loads, leaving less time for publishing and fundraising. Interestingly, when controlling for this additional workload, women researchers in Africa publish more than their male peers (Beaudry et al., 2023).
- Overwhelmingly, the most widely cited structural barrier to women's full participation in STI is unequal gendered beliefs and expectations about their role as caregivers (Beaudry et al., 2023; Fisher et al., 2020; National Academies of Sciences, Engineering, and Medicine, 2020). A study about African scientists' career experiences notes that balancing work and family life was reported as the most significant career challenge for 80% of women researchers. Overall, male scientists' partners contributed a much higher percentage (47%) than women scientists' partners (23%) to alleviating the household labour burden (Prozesky & Mouton, 2019).
- A study conducted in 17 African countries, including Botswana, compares the performance of men and women in STEM PhD programs (Fisher et al., 2020):
  - Men and women had similar completion rates, but women took longer to earn their PhD. This was attributed to women being more likely than men to take a break due to family reasons such as having children (11% of women compared to 2% of men). This delay in completion time for women is known as the 'motherhood penalty'.



  - Women with a female supervisor, who attended an institution with gender policies in place, and pursued their PhD in a department where sexual harassment by faculty was perceived as uncommon were more likely to complete their program on time.
  - Marriage during PhD studies had different impacts on men and women. Women's publication productivity decreased, while men's increased, likely due to changes in domestic responsibilities associated with marriage. Research consistently shows that marriage benefits men while disadvantaging women regarding the division of household labour.
  - Gendered relationship norms are also relevant. The study notes that 33% of married women felt compelled to downplay their successes and career prospects to avoid conflicts with their spouses.

- Interventions to address gender-related barriers in STI environments include implementing family-friendly policies and facilities that support women's roles as mothers, incentivising men's involvement in childcare, addressing workplace sexual harassment, and creating broader networks and linkages for women in STEM fields including mentoring and supervisory support (Fisher et al., 2020; Prieto-Rodriguez et al., 2022).
- Networks of stakeholders with interest and influence in advancing gender and inclusivity in STI in Botswana aim to create an enabling and empowering environment for women in science. Examples of such stakeholders include WEGSA (Forum for Women Engineers and Girl Scientists in Africa), AAS (African Academy of Sciences) and Debswana (a joint venture between the De Beers group and the Government of Botswana supporting girls and women in STEM) and OWSD (Organization for Women in Science in Developing Countries), Botswana Chapter. These institutions and networks address inequality among boys and girls and men and women and motivate girls and women to take on science-based education and careers.

Conclusion

Harnessing 100% of the country's human development for accelerated socio-economic development is entrenched in policy instruments across the STI pipeline. The Botswana Government has taken comprehensive policy measures to promote gender equality. While the country has made remarkable progress over the past decades to improve the rights protections of women, the impact of national gender policy is tempered by uneven implementation and structural barriers to equality, and the fallout is evident in persisting discrimination against girls and women across critical development domains.

In Botswana's policy context, gender equality and inclusivity considerations are conceptualised mainly in terms of male/female disparities. Social exclusion and disadvantage based on social factors beyond gender – such as disability, ethnicity, gender diversity, rural/urban location, and socio-economic status – are generally not meaningfully engaged in policy. Applying an intersectional lens to gender-related policy concerns will provide a more nuanced understanding of the interlocking systems of inequality that place women and other marginalised groups at a disadvantage in STI.

The absence of up-to-date education and R&D data disaggregated by sex, gender, and other diversity stratifiers hampers the ability of Government and other STI stakeholders to monitor policy implementation and impact. Moreover, very few science granting councils in Africa collect and make available gender and diversity-related data in their research and grants management processes (Global Research Council, 2021).

Publication trends show that Botswana is making strides in growing knowledge production on gender-related topics. Further investing in research to define and drive intersectional gender equality in STI is vital. Insights gleaned from such research will deepen understanding of the lived experience of girls and women in their diversity. Research to better understand gender and STI policy implementation gaps is also critical. These efforts will help the country attain equitable social, political and economic development outcomes for its entire population.

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Notes

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