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

TANZANIA
COUNTRY PROFILE

Gender & Inclusivity

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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 Tanzania 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

Tanzania is an East African country with 80% of the population being rural-based (World Population Review, 2021).

In 2020, women and girls constituted 50,03% of the total population of approximately 62 420 967 people. The population is characterised as fast-growing, with a yearly growth rate of 2,98% in 2020 (World Data Atlas, 2020; World Population Review, 2021).

Agriculture is at the core of both the Tanzanian economy and Tanzanian society. The sector employs 67% of the nation's workers and accounts for about 23% of the country's gross domestic product. Agriculture is the source of key exports, such as coffee, cotton, cashew nuts and tea (Tanzania Invest, 2020).

Tanzania has stagnated in achieving many of its Sustainable Development Goals (SDGs) and regressed in some (Sachs et al., 2022; UN Women, 2020):

- Major challenges remain for ending poverty and hunger (SDGs 1 and 2);
- Significant challenges remain to attain good health and well-being (SDG 3) as well as access to quality education (SDG 4);
- Access to clean water and sanitation has stagnated (SDG 6).
- Gender equality (SDG 5) shows progress, but critical data gaps exist.
- Only 45,9% of indicators are available for monitoring Tanzania's SDGs from a gender perspective, with critical data gaps in unpaid care and domestic work, key labour market indicators and information and communications technology skills. Closing these gender data gaps is essential for achieving the country's gender-related SDG commitments.

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

- Gender inequality in Tanzania is associated with laws, cultural norms and practices that hamper women's and girls' access to opportunities, resources and power. Gender inequalities are higher in Zanzibar than in mainland Tanzania and higher in rural settings than urban settings (Tanzania Invest, 2020; United States Agency for International Development, 2021). 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).
- Social studies in Tanzania report that only 1% of women and 3% of men experienced gender-based discrimination in 2018. Tanzanians have higher tolerance towards people of other religions (93%) and ethnicities (94%), a slightly lower tolerance for immigrants and foreign workers (74%) and a low tolerance towards people of different sexual identities or orientations (10%) (Howard, 2020).
- Unfortunately, the country has reversed gains 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, SIG Index).
- 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).
- Structural drivers of gender inequality result in Tanzania 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 Tanzania

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.	Tanzania had an HDI value of 0,529 in 2019 to 0.549 in 2021, placing the country in the low human development category, ranked 160 out of 191 countries.
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.	Tanzania has a GII value of 0,560, ranking it 146 out of 191 countries globally in the 2021 index. When the sub-indices disaggregate this value, a more nuanced picture of imbalances emerges. ● Women hold 36,9% of parliamentary seats, higher than the sub-Saharan African average of 25,7%. ● 21,3% of adult women have reached at least a secondary level of education, compared to 28,4% of their male counterparts; the figures are below the SSA averages of 31,1% for women and 44,3% for men. ● For every 100 000 live births, 525 women die from pregnancy-related causes, which is very high and just under the (SSA) average of 536. ● The adolescent birth rate is 123,7 births per 1 000 women of ages 15-19, higher than the SSA average of 101. ● Female participation in the labour market is 79,5%, compared with 87,1% for men. The figures are higher than the SSA 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 49,6 % in 2023, Tanzania's social institutions showed increased discrimination against women compared with 46,1% in 2019. Discrimination is highest in family discrimination and lowest in access to productive resources. ● Family discrimination (86,9%) 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 civil liberties (35,1%) capture social institutions that limit women's access to participation and voice in the public and social spheres. ● Restricted physical integrity (34,9%) 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). ● Restricted access to productive and financial resources (31,4%) 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.
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, Tanzania has closed 72% of its gender gap, ranking 13 out of 36 sub-Saharan African countries and 64 out of 146 countries globally. When the sub-indices disaggregate this value, a more nuanced picture of imbalances emerges, with greater parity on health and survival and stark inequalities in access to political empowerment. ● Health and survival (97%) evaluate parity in sex ratio at birth and years of health life expectancy. ● Educational attainment (96%) evaluates parity on literacy rate and percentage enrolments in primary, secondary and tertiary education. ● Economic participation and opportunity (71%) evaluate parity on measures such as the labour force participation rate, wage equality for similar work, percentage of women legislators, senior/executive management, and professional and technical workers. ● Political empowerment (24%) evaluates parity in the percentage of women in parliament, ministerial positions and years with a female head of state.

STI and sustainable socio-economic development

- The **1996 Science and Technology Policy** and the **2010 National Research and Development (NR&D) Policy** guides the organisation of the STI landscape. These policies, in turn, speak to the country's National Development Vision.
- The country's latest **National Five-year Development Plan 2021/22-2025/2026** (2021) aims at realising competitiveness and industrialisation for human development to achieve the National Development Vision 2025's (1999) founding objective of prioritising human development and industrialisation and the goal of graduating to a middle-income, semi-industrial economy by 2025 (1999) (Fosci et al., 2020; UNESCO, 2015).
- The **Ministry of Education, Science and Technology** (MST) and its agency **National Commission for Science and Technology** (COSTECH) are mandated to coordinate research and development activities in the country. COSTECH, established through law in 1986, is the principal advisory body to the government on all matters relating to scientific research, technological development and coordination of research activities in the country (World Justice Project, 2021).
- The **vision of the 2010 NR&D Policy** is for Tanzania "[t]o be a nation with a strong, dynamic, resilient and competitive economy that is both knowledge-based and innovation-driven" with the mission of developing "a research system that will increase the outcome and efficiency of R&D, leading to sustainable socio-economic development" (page 10).
- This 2010 NR&D Policy outlines ten policy areas for socio-economic development, including gender. The policy was due to be updated in 2020 to incorporate innovation, industrialisation and technology transfer. However, the 2021 edition of the UNESCO Science Report did not show the policy had materialised (Loconto & Simbua, 2016; UNESCO, 2021).
- In its draft form, the **National Science Technology and Innovation Policy 2022** aim to enhance an enabling environment for science, technology and innovation (STI) to increase socio-economic development. The policy's vision is to have a nation with the capacity and capability to harness and apply STI to build a knowledge-based economy (Ministry of Education Science and Technology Tanzania, 2022).
- **African Union Agenda 2063** is a long-term framework collectively directing the African continent by recognising the critical role of science, technology and innovation, with the intention to actively promote science, technology, research and innovation to build knowledge, human capital, capabilities and skills to drive innovations and for the African century (African Union Commission, 2015).

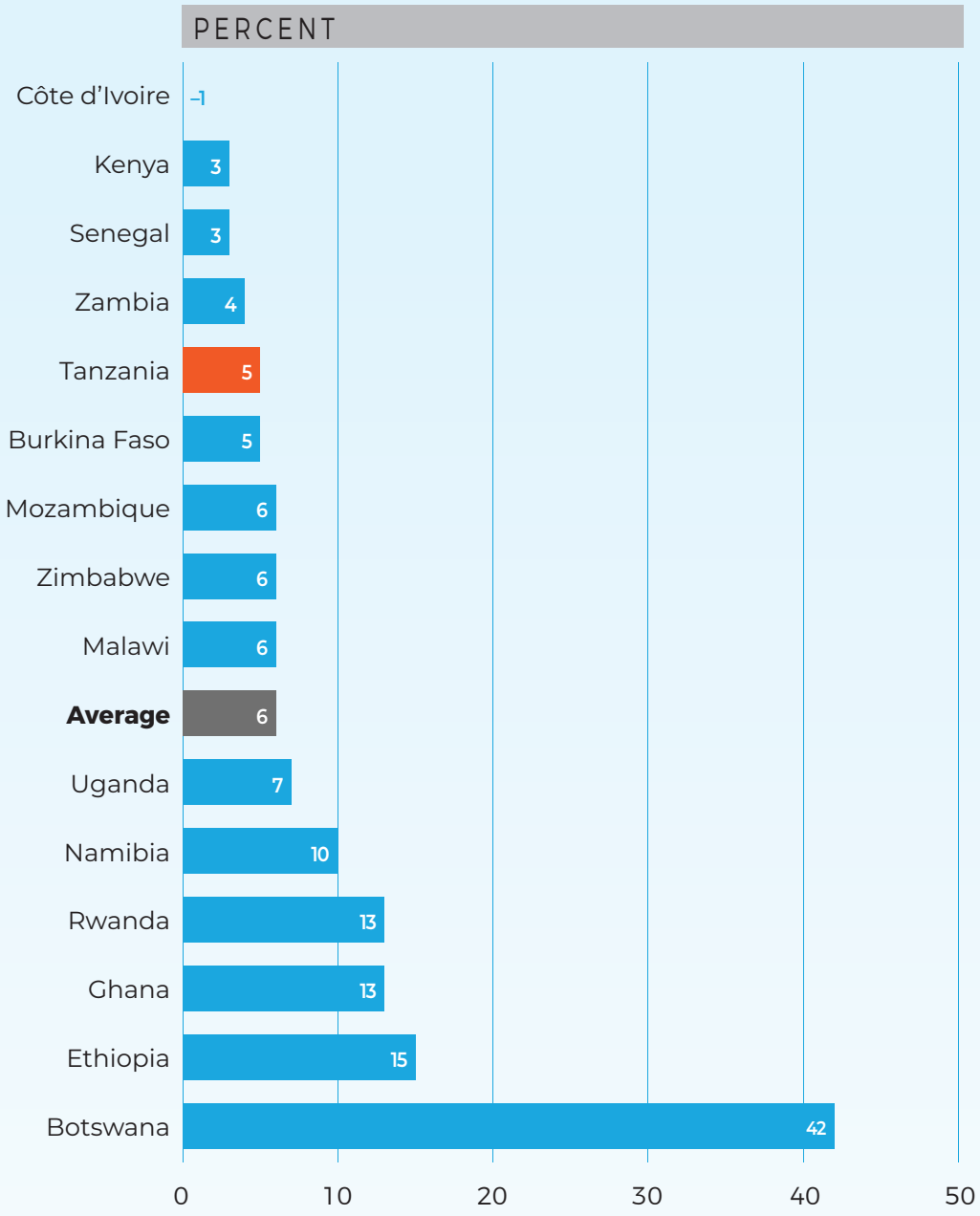


Figure 1: African SGCI participating countries: percentage (%) increase in publications with gender-related content between 2008 and 2017

- Tanzania's scientific **peer-reviewed publications and patents**, used as a measure of research and development (R&D), indicate the following:
  - Tanzanian researchers increased their publication outputs from 244 papers in 1996 to 2854 in 2022 with a cumulative total of 27882, ranking 11th out of 59 African countries
  - Papers are largely related to Medicine, followed by Agriculture and Biological Sciences, Social Sciences, and Environmental Sciences, Biochemistry, Genetics and Molecular Biology (Scimago, 2023).
  - The country's percentage contribution to Africa's publications has remained relatively static at 1,75% between 1996 and 2022 with a 2% peak in 2006 (Scimago, 2023).

- The proportion of papers written with international partners has increased from 54% in 1996 to 81% in 2022 (Scimago, 2023)..
- Between 2008 and 2017, Tanzania had a 5% increase in publications with gender-related content, but it falls below the average rate among the 15 participating SGCIs (Figure 1) (Jackson et al., 2022).
- Residents filed only one patent in Tanzania between 2007 and 2017 and 41 patents were filed abroad. Contributing factors include limited awareness of intellectual property rights and the absence of a strong culture of innovation and invention, worsened by low investment in innovation and commercialisation (Country Economy, 2015).

Status of human capital for STI

- Gender disaggregated data gaps paint an incomplete picture of the status of human capital for STI in Tanzania. 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 2013 women constituted 20% of researchers in the country (Unesco Institute for Statistics, 2021).
- Tanzania has only 18 researchers per million inhabitants. One-third of researchers have doctoral qualifications and research training and capacity-strengthening activities are limited by lack of funding (Fosci et al., 2020).
- In 2013, the total number of women in R&D was significantly lower than men for each category of R&D function (Table 2). For instance, 70% of researchers were males, a trend essentially unchanged in 2020 (The Tanzania Commission For Universities, 2021).
- Disaggregating R&D personnel by gender and function shows gender disparities, with women increasingly and negatively affected across the three functional positions.

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

	Women	Men	Total
Researchers	914	2150	3064
Technicians	177	515	692
Support staff	761	901	1662
Total	1852	3566	5418

- In Tanzania, 32,8% of researchers have a doctoral qualification, highlighting the relatively low proportion of qualified researchers. This low proportion is partly explained by the low numbers of undergraduates and postgraduates entering the system (Fosci et al., 2020).
- A second issue affecting the number of postgraduates in Tanzania is the retention of researchers after their studies, primarily influenced by insufficient research funding and poor infrastructure, which are significant barriers to attracting and retaining research talent (Fosci et al., 2020).
- Data from the Tanzania Commission for Universities (TCU) reflects a gender-stereotyped distribution of university academic staff by field of education (The Tanzania Commission For Universities, 2021):
  - The proportion of women and men is relatively balanced in Medicine and Health Sciences (43% women), Humanity and Arts Studies (54% women) and the Social Sciences (42% women)
  - Proportionately men dominate the fields of Engineering (80%) and Physical Science and Mathematics (75%).
- Finally, there needs to be data in the UNESCO statistics database on Tanzania's distribution of researchers by field of research or place of employment.

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

Policy and frameworks

- Gender equality is a crucial feature of Tanzania's national policy landscape, with mainland Tanzania and Zanzibar developing various policies and strategies for strengthening gender equality.
- The country's latest **National Five-year Development Plan 2021/22-2025/2026** emphasises inclusive social development in the results chain, with gender equality as one aspect of social inclusiveness. Other elements include social spending and infrastructure development (including financial services and telephony) that promotes equitable access despite gender and for people with disabilities, youth, disadvantaged sections, and hard-to-reach areas. Addressing gender-based violence across all development interventions figures prominently in this plan. This latest plan addresses one of the key stumbling blocks to advancing gender equality: the allocation of financial resources (Tanzania Ministry of Finance and Planning, 2021).
- The government signed the **Convention on the Elimination of All Forms of Discrimination Against Women** (CEDAW) in 1985 (UN Committee on the Elimination of Discrimination Against Women (CEDAW), 2014).
- The country's **Women and Gender Development Policy (2000)** endorse the establishment of gender focal points in central and local government structures as well as institutions. It also emphasises the importance of an advisory body to unite all women (Ministry of Community Development, Gender and Children, 2000)
- Tanzania's long-term **Development Vision 2025** further asserts gender equality and the empowerment of women in all socio-economic and political relations and cultures (Planning Commission Tanzania, 1996).
- The **National Strategy for Gender Development (2008)** is evident in the importance of gender equality where the socio-economic development of Tanzania is dependent on the full utilisation of its human resources, both women and men.
- Tanzania's **National ICT Policy (2016)** aims to strengthen leadership and cultivate human capital in this field while expanding the provision of reliable broadband. Specifically, one objective is to enhance the participation of gender and social diversity groups (Ministry of Works, Transport and Communication, 2016).

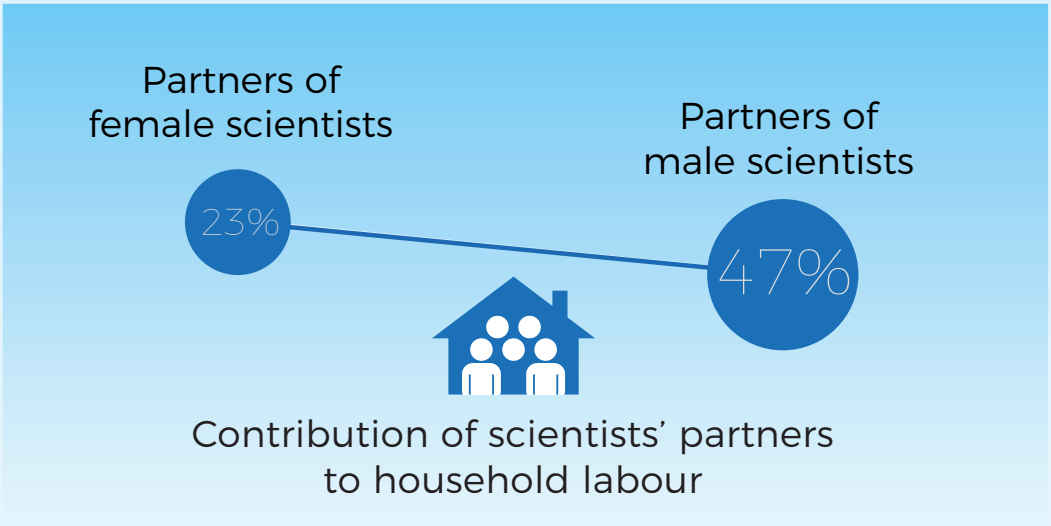
- The country does not currently have a **School Continuation or Retention Policy** that outlines measures to guarantee girls' rights to stay in school during and after their pregnancy. The country does have a ministerial decree (2021) that protects girls' rights to education and prohibits expulsion from government schools on the grounds of pregnancy and motherhood. This policy gap contributes to gender-related barriers to girls' educational attainment.

Gender social norms and the education pipeline

- As illustrated in the Gender Inequality Index (Table 2), women have achieved primary school educational parity, showing higher secondary enrolment rates but significantly lower tertiary enrolments.
- Girls have a primary school enrolment rate of 82,9% (79,9% for boys) and a secondary school enrolment rate of 27,3% (25,8% for boys), and women have a tertiary enrolment rate of 2,8% (5,2% for men). Thus, girls are more likely than boys to complete primary school, but there has been less progress in reducing gender disparities in tertiary education (Tanzania Ministry of Finance and Planning, 2021).
- Women are less likely to terminate university studies compared with men. In the 2018/9-2020/1 academic years, 34% of the 8 919 dropouts were female (The Tanzania Commission For Universities, 2021).
- Statistics show that the male-female ratio in university enrolment is also gender-stereotyped, with a relatively balanced ratio seen in four fields, namely, Library, Archive and Museum Studies (0,69), Social Sciences (1,01), Business Studies (1,07), Law (1,13) and Education (1,26). The opposite applies to Engineering (3,81), Mining and Earth Sciences (2,77), Physical Sciences and Mathematics (2,37) and Information and Communication Technology (2,36) (The Tanzania Commission For Universities, 2021).
- The 2016 ICT policy recognises that accessing the male-dominated ICT pipeline is more difficult for girls than boys. In Tanzania, there are few girls in the Information and Communication Technology (ICT) field, and those who want to join the field frequently opt for more traditional occupational areas contributing to the scarcity of female role models who have thrived in STEM and ICT (Bateyunga & Mashiba, 2017).
- Indicators tracking gender equality in human development (Table 1), though, do reveal contributing factors for gender gaps and disparities linked to Tanzania'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 2013 women constituted 20% of researchers in the country (Unesco Institute for Statistics, 2021).
- 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 Tanzania, 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 Tanzania aim to create an enabling and empowering environment for women in science. Examples include the Forum for African Women Educationalists (Tanzania) which has implemented a STEM model that focuses on increasing girls' participation in STEM subjects; She Codes for Change aims to bridge the gender gap in STEM and ICT in Tanzania by introducing coding in early school to increase the number of women in ICT (Kimotho, 2019). Tanzania has partnered with the World Bank to develop and enact deliberate policy frameworks, such as the Human Capital Project. It addresses the enrolment gap of female students in higher education. It allows those who score highly in mathematics and science subjects in secondary schools automatic placement in STEM fields in post-secondary institutions (World Bank, 2022).

Conclusion

Harnessing 100% of the country's human development for accelerated socio-economic development is entrenched in policy instruments across the STI pipeline. The Tanzanian 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 Tanzania'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 Tanzania is slowly 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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