STRENGTHENING GENDER AND INCLUSIVITY IN THE NATIONAL SYSTEM OF SCIENCE, TECHNOLOGY, AND INNOVATION (STI) ENGAGING 100% OF MALAWI'S HUMAN DEVELOPMENT POTENTIAL FOR SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT

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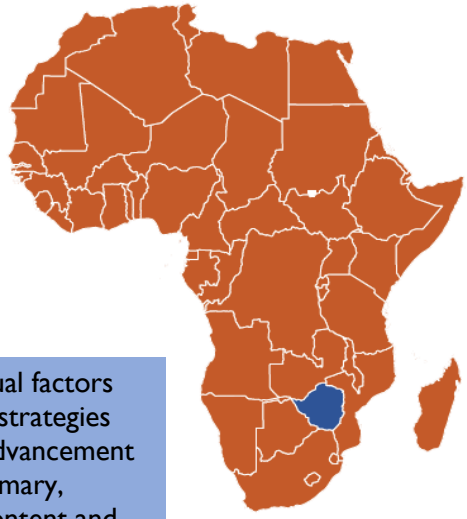
Gender & Inclusivity
A PROJECT OF THE SCIENCE GRANTING COUNCILS INITIATIVE

Malawi Country Profile

Strengthening Gender and Inclusivity in the National System of Science, Technology, and Innovation (STI)

Engaging 100% of Malawi's human development potential for sustainable socio-economic development



Strengthening Gender and Inclusivity in STI highlights the contextual factors driving gender and inclusivity disparities in STI in Malawi and options and strategies for addressing disparity gaps in some of UNESCO's STEM and Gender Advancement (SAGA) policy impact areas: social norms and stereotypes, education (primary, secondary and tertiary), the career progression environment, research content and practice, policy, and entrepreneurship and innovation. The series covers 15 Science Granting Council Initiative (SGCI) African countries and identifies stakeholders with influence in advancing gender and inclusivity in STI at country, regional and international levels.

County Overview

- Malawi is situated in Southern Central Africa and shares borders with Mozambique, Tanzania, and Zambia.
- Women and girls constitute 50,68% of the total population of 19,129,952 million people which is expected to double by 2038. Characterised as a "youthful" population, 51% of the total population is under 18 years. The average annual population growth of 3.3% over the past fifty years is the 6th highest in the world. [1]
- While 70% of the total population live in rural areas, the urbanisation rate is rapidly increasing with an estimated annual urbanisation rate of 4.2% between 2010 and 2015. Overall, the population density is high at 197,6 persons per square kilometre. Forests account for over a third of the total land mass and almost 17% of the land is degraded. The country is therefore vulnerable to external impacts, particularly climatic impacts.
- The country's largely agrarian economy employs 43% of the total number of employed people. Over half (59,2%) of the total number of employed people are in vulnerable employment e.g., contributing as family members and own-account workers.
- The results of the 2019 survey conducted by the Centre for Social Research (University of Malawi) show the country's five-year performance trends on specific Sustainable Development Goals (SDGs) from the perspective of adult Malawians. [2]
    - Trends worsen for poverty and hunger (SDGs 1 and 2), decent work and economic growth (SDG 8), especially in reducing unemployment and the gender unemployment gap, and climate action (SDG 13).
    - Quality education remains unchanged with no increases in the proportion of the population with secondary or post-secondary education (SDG 4).
    - Gender equality worsens for command of economic resources and remains the same for technological use (SDG 5).
    - Availability of clean water is unchanged and sanitation worse (SDG 6).

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

- Gender inequality in Malawi is associated with deep-rooted inequitable laws, norms, and practices, hampering women and girls' access to opportunities, resources, and power. [3, 4]
- In Malawi, almost 22% of women and 9% of men experienced gender-based discrimination in the year preceding Afrobarometer's 2018 survey. Based on this report, of the 13 Science Granting Council Initiative African countries[1], Malawian women experienced the highest level of discrimination followed closely by Zambia at 20% for women and 7% for men. In Senegal and Cote d'Ivoire, 8% of women experienced discrimination compared with 3% of men. Similarly Malawi, (following Uganda, Senegal, and Zambia) has the fourth-lowest tolerance levels for people of different sexual identities or orientations at 5 % for 2014-2018. The country has greater tolerance for people of different religions (92%), ethnicities (88%), and immigrants and foreign workers (72%).[5]
- Structural drivers of gender inequality, such as unequal gender roles and unequal power relations between men and women persist across all social institutions, giving rise to multiple forms of discrimination against women, illustrated in the country's poor performance on various gender-disaggregated socio-economic development indices (Table 1).

Table 1 Key gender indicators for Malawi

Key gender indicator	Meaning	Malawi
Human Development Index (HDI)[2]	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 higher the value to 1, the higher the country's level of human development.	Malawi has a low HDI of 0,483 in 2019, well-below the Sub-Saharan Africa (SSA) average of 0,547. The country is ranked 174th out of 189 countries on the HDI. Malawi's HDI has increased from 0,235 in 1975 because of increasing life expectancy rates and increasing number of mean years of schooling for adults. [3]
Gender Inequality Index (GII) [4]	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 higher the score towards 1, the more disparities between men and women and the greater loss to human development.	With a GII value of 0,565 (56%) GII in 2019, Malawi ranks 142nd out of 162 countries and has the 3rd highest gender inequality index among the participating SGCI countries. **Illustrative contributing factors**: • The adolescent birth rate for 2015-2020 is 132,7 births per 1000 women ages 15-19, significantly higher than the SSA average of 104 and the least developed countries average of 94,8. • Women held only 22,9% of parliamentary seats, lower than the SSA average of 24% and the same as least developed countries. • Only 17,6% of women ages 25 and older have some form of secondary education compared with 26,1% of men, well below the SSA average of 28,8% and 39,8% respectively. • Women are less active in the labour force than men (72,6% and 81,8%) but more active than SSA counterparts at 63,3% and 72,7%.

[1] No data for Ethiopia and Rwanda
[2] http://hdr.undp.org/en/countries/profiles/MWI
[3] http://hdr.undp.org/en/countries/profiles/MWI
[4] http://hdr.undp.org/en/content/gender-inequality-index-gii

Key gender indicator	Meaning	Malawi
Social Institutions & Gender Index (SIGI) [6]	Measures discriminatory social institutions (the gaps between women and men in terms of rights and opportunities as reflected in legislation, practices and attitudes) on four dimensions. A SIGI value of 0 indicates no discrimination and 100% very high discrimination in social institutions.	At 41% Malawi has a high level of discrimination against women in 2019 resulting from discriminatory laws, attitudes and practices. ○ Discrimination in the family, 41,4% ○ Restricted physical integrity, 24,1% ○ Restricted access to productive and financial resources, 37,4% ○ Restricted civil liberties, 62% **Illustrative contributing factors:** • By the age of 15, 9% of girls are married and by the age of 18, 42% of girls are married (2015).[5] • Women spend more time on household responsibilities and unpaid care work than men during a 24-hour period at a female to male ratio of 6,9 hours to one hour. • 36 % of ever-partnered women experience some form of intimate partner physical and or sexual violence. • 16,3% of women aged 15-49 years believe a husband is justified in hitting his wife for specific reasons. • 20% of the Malawian population believe it is not acceptable for a woman in their family to work outside the home for pay. • Less women (38%) than men (62%) have an account at a financial institution. • Less women (32%) than men (68%) have secure landholder assets. • Almost two-thirds of women have limited confidence in the justice system.
The Global Gender Gap Index (GGG)[7]	Measures gender-based inequalities in access to resources and opportunities across four sub-indices. The closer the score to 1 the higher the gender parity.	At 0,671 in 2021 resources and opportunities remain unequally divided between men and women. When this value is disaggregated by the sub-indices a more nuanced picture emerges. ○ Educational attainment value of 0,980 (2% gap) ○ Health and survival value of 0,915 (8,5% gap) ○ Economic participation and opportunity value of 0,624 (~37% gap) ○ Political empowerment value of 0,164 (~83 % gap) **Illustrative contributing factors:** • The literacy rate for women is 55,2% (69,8 % for men); the primary school enrolment rate is higher for women at 97,1% (92,0% for men) as is the secondary enrolment rate at 34,8% (33,7% for men). The tertiary education enrolment drops to 0,6% for women (1,0% for men). • The labour force participation rate is lower for women at 73,9% compared to 80,9% for men and the parity gap widens further for women in the area of senior officials, and managers at 15,6% compared to 84,4% for men, and in the professional and technical workforce at 35,3% for women and 64,7% for men. • The greatest parity gap for women is in political empowerment with women holding only 22,9% seats in parliament (77,1% for men), only 17,4% of ministerial positions (82,6% for men) and with women serving as head of state for 2,2 years over the past 50 years.

[5] https://data.unicef.org/resources/dataset/child-marriage/

STI and sustainable socio-economic development

- Malawi's STI systems for human development are rooted in long-term national development plans and strategies, legal frameworks and policy instruments emanating from the country's first long-term development plan developed in the 1990's, **Vision 2020** (Figure 1). [8]
  - Vision 2020 identified science and technology-led development as one of nine goals for achieving the overarching sustainable development vision. Achievement gaps, primarily related to pluralistic STI systems, resource allocation not based on the development goals and inadequate progress tracking, underpinned this plan's successor, Vision 2063. [9] Both national development plans, Vision 2020 and 2063, emphasised the importance of reducing gender inequalities and improving opportunities for people with disability.

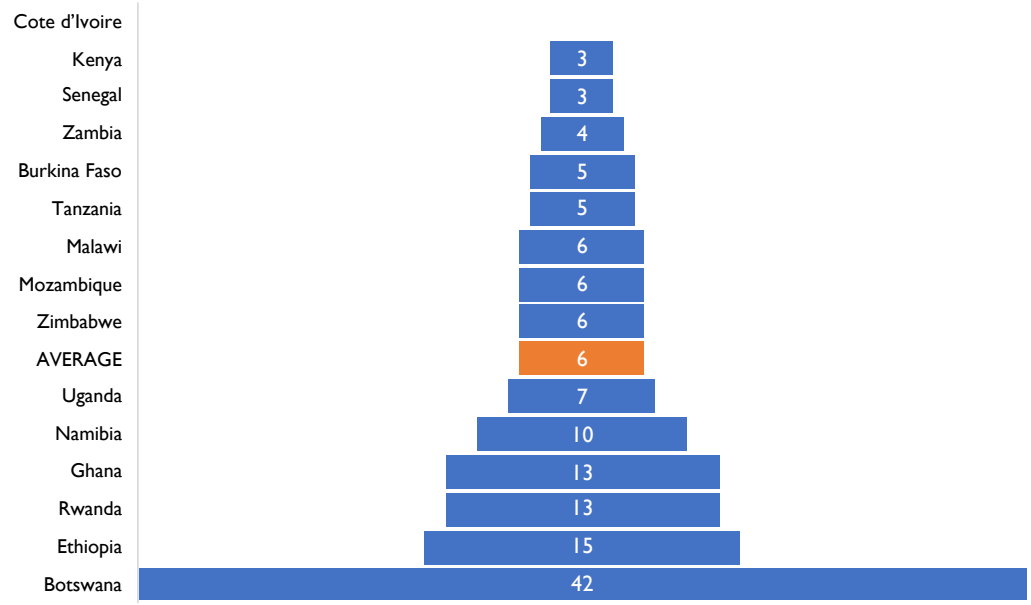
Figure 1 National development visions

Vision 2020 (launched in 1998)
"By the year 2020, Malawi, as a God-fearing nation, will be secure, democratically mature, environmentally sustainable, self-reliant with equal opportunities for and active participation by all having social services, vibrant cultural and religious values and a technologically driven middle-income economy" (Page 27).

Vision 2063 (launched in 2020)
"We envision a youth-centric inclusive wealth creating and self-reliant nation by 2063. By 2063, we principally aspire to be an industrialized upper middle-income country which primarily finances its own development needs. The Vision builds on that of our founding leaders to not only achieve political freedom, but attain economic independence and high quality of life for all. We are mindful that in our quest for inclusive wealth creation, we must not leave behind those segments of the society that are vulnerable and marginalized" (Page 2).

- The organisation of the STI landscape in Malawi is principally guided by the 1991 and revised 2002 **National Science & Technology Policy of Malawi**. [10] Unlike the 1991 policy the 2002 revised policy specifically integrates STI activities into development planning. A chart showing the organisation of Malawi's research and innovation system is set out in Appendix 1.
- This 2002 National Science & Technology policy, supported by the **Science & Technology Act of 2003** [11], sets out the principles, policy objectives, cross-cutting strategies for an integrated and nationally coordinated science, technology, and innovation system to achieve "*… sustainable socio-economic development through the development and application of science and technology to improve the standard and quality of life of Malawians*". Gender equality and gender equity in human capital development feature prominently in the policy (see Figure 6).
- Authorised by this Act, the **National Commission for Science & Technology** (NCST) advises Government on science and technology matters and coordinates the work of different STI stakeholders to achieve science and technology-led development strategy.
- **On measures for assessing the impact of research and development (R & D) and innovation** (scientific peer-reviewed publications and patents respectively) Malawi's scientific knowledge production has grown since 1996 with tripling growth in the number of publications from 2002 onwards partly attributed to co-publications with other countries. However, this data is not disaggregated by gender or any other equity measures such as socio-economic status, ethnicity, location, or disability, among others.[12]
- The country ranks 16th among 52 African countries and 103rd among 217 countries globally for scientific publications. [12]
- Of the 15 SGCI countries, Malawi has the highest percentage (77%) for international collaborations on publications with gender-related content. Between 2008 and 2017 Malawi increased the number of gender-related publications by 6% from 145 to 238 publications at the average of 6% for the 15 participating SGCIs (Figure 2). Again, authorship is not disaggregated by gender.[13]

Figure 2 African SGCI Participating Countries: percent (%) increase in publications with gender-related content between 2008 and 2017



- Of the 25 national research institutions and laboratories, for 2012-2013, the University of Malawi produced 57,6% of the total publications, followed by the Tea Research Foundation (10,6%) and the Ministry of Agriculture and Food Security Natural Resources (5.7%), with the remaining institutions having a 1,6 to 0,1% share. [12]
- Innovation as measured by patent applications and registrations granted has decreased exponentially between 2005 and 2012. Contributing factors include limited awareness of intellectual property rights, absence of a strong culture of innovation and invention, worsened by low investment in R&D innovation and commercialisation. [12]
- **Notably Vision 2063** reaffirms the government's commitment to addressing youth and human development challenges, envisioning a youth-centric inclusive wealth-creating and self-reliant industrialized upper-middle-income country by 2063. In this plan, research, science, technology, and innovation will drive the industrialization of agriculture and mining and, along with gender equality, be enablers for developing a vibrant knowledge-based digital economy. In pursuit of this vision, Malawi's Gross Domestic Expenditure on Research and Development (GERD) to Gross Domestic Product (GDP) ratio is one of the highest at 1,06%, followed by South Africa at 0,73% (2012).

Current status of human capital for STI [6]

- The latest available data (2010) show a 25% increase in the country's research and development (R&D) personnel from 2,884 in 2007 to 3,809 in 2010.
- The total number of women in R&D is significantly lower than men for each category of R&D function (Table 2). Overall women constituted only one-fifth (20%) of the R&D workforce with a 1% decrease in their percentage proportion during this same period.
- Disaggregating R&D personnel by gender and function shows gender disparities with women increasingly and negatively affected across the three functional positions.

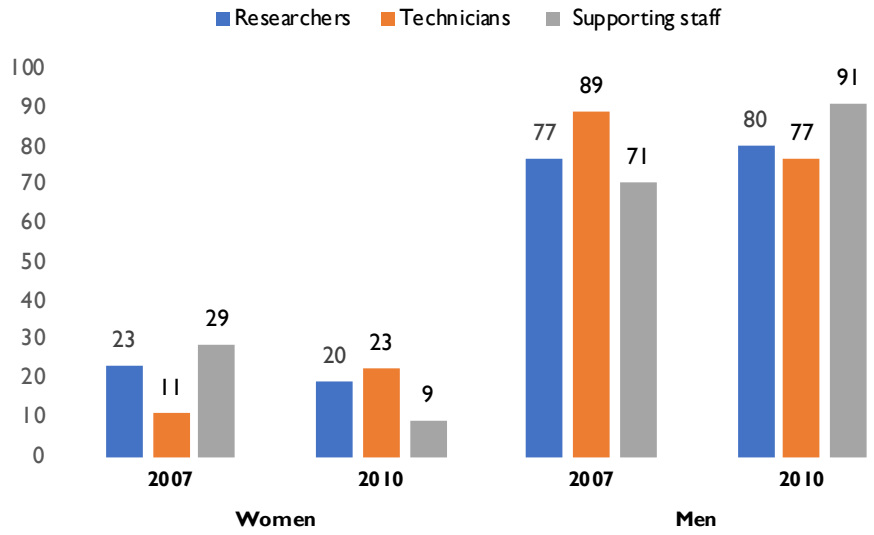
[6] All data for this section is from: http://data.uis.unesco.org/Index.aspx?DataSetCodeEDULIT_DS&popupcustomisetrue&langen

Table 2 Malawi's total number of R&D personnel (head count) by category and gender, for 2007 and 2010

	2007			2010		
	Women	Men	Total	Women	Men	Total
Researchers	170	563	733	360	1483	1843
Technicians	115	907	1022	352	1196	1548
Supporting staff	325	804	1129	39	379	418
Total	610	2274	2884	751	3058	3809

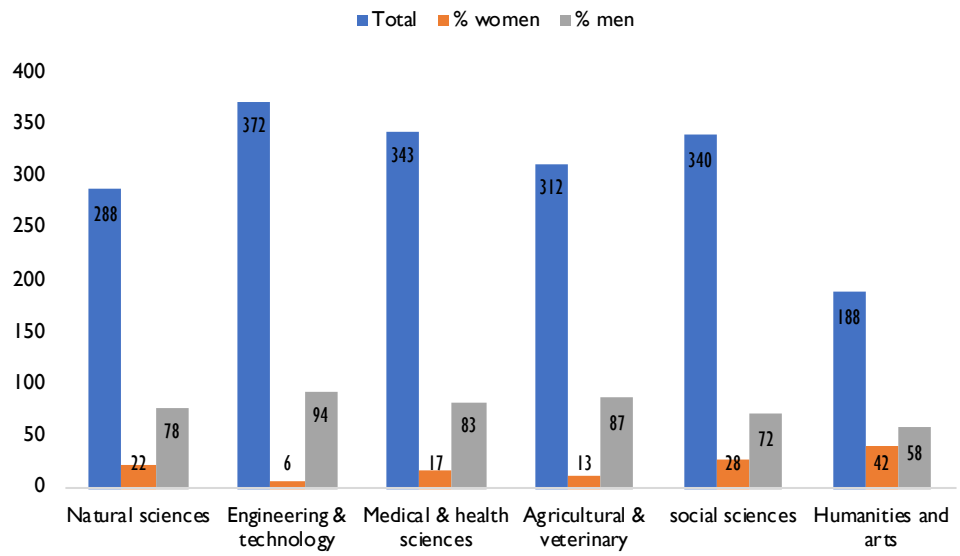
- While the number of women in R&D has increased, the percentage proportion of women researchers decreased by 3% and support staff by 20% (Figure 3).
- The proportion of women technicians increased by 12% (as indicated in Table 2, from a low baseline of 115 in 2007 to 352 in 2010) and the proportion of men decreased by 12% (from a significantly higher baseline). Overall, the R&D personnel at all levels is predominantly and disproportionately male.

Figure 3 Malawi's proportion (%) of R&D personnel (head count) by function & gender, for 2007 and 2010



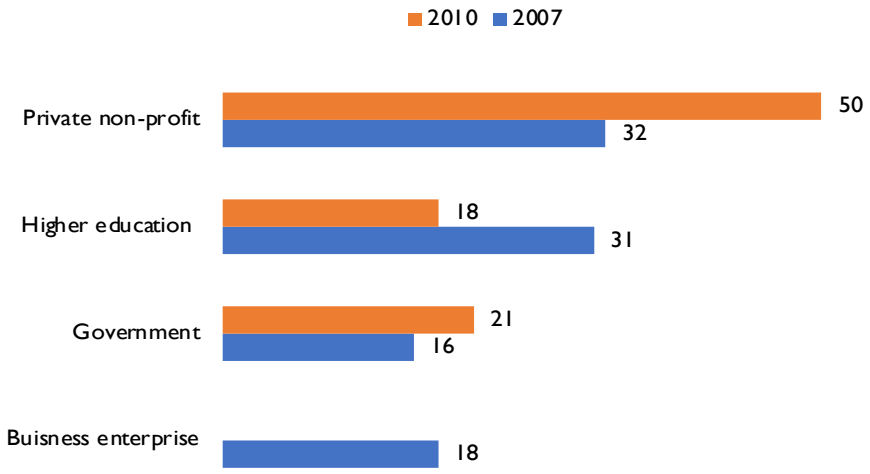
- Malawi's distribution of researchers by field of research in 2010 (Figure 4) illustrates gender disparities in field of scientific research with men prominent across the "hard sciences" of engineering and technology (94%), agriculture and veterinary (87%) and natural sciences (78%) and women more prominent (but still, not as prominent as men) in the "soft sciences" of humanities and arts (42%) and social sciences (28%).

Figure 4 Malawi's distribution (%) of researchers (head count) by scientific field and gender, 2010



Distribution by field of employment (Figure 5) shows that in 2007 women were more concentrated in higher education (31%) and private non-profit institutions (32%), but that by 2010 this pattern changed with a 5% decrease in women researchers in Government, a 13% decrease in higher education and an 18% increase of women researchers in private non-profit institutions.

Figure 5 Proportion (%) of women in R&D by employment sector for 2007 and 2010



What factors encourage (or discourage) women's participation in national STI systems?

Policies & frameworks

- Various frameworks and policy instruments, flowing from sections 20 and 41 of the **1995 Constitution of Malawi**, emphasize equal rights for men and women and prohibit discrimination based on gender or marital status.
- Both national development plans, **Vision 2020 and 2063**, emphasised the importance of reducing gender inequalities and improving opportunities for people with disability.
- **Vision 2063 regards gender equality** as one of the key human capital development enablers driving economic growth and a vibrant knowledge-based digital economy. It recognises the impact of gender inequality on all sectors of the economy and social life and aims to end all gender-based discrimination and harmful practices way before 2063. The plan commits to reducing the Gender Gap Index from 0,671 in 2020 to 0,832 in 2030, 0,9 in 2010, 0,916 in 20 42 and 1 in 2050.

Figure 6 Gender and the national STI Policy

The national STI policy of 2002 recognizes the limited participation of women in STI and the social drivers for this loss in potential human development talent. One of the seventeen cross-cutting strategies of this policy is "*Women Participation in the development and Utilization of Science and Technology*", which commits STI sectors to five gender and inclusivity actions:

- Encourage research into all gender differentiation in science and technology education and employment.
- Promote access of women to S&T education at all levels.
- Foster gender equity in science and technology in education and the workplace.
- Facilitate the entry of women into employment in the fields of science and technology and their progress within such employment.
- Foster socially responsible and gender inclusive science and technology.

- The enactment of the **Gender Equality Act No. 13 of 2013** protects women's human rights to end all forms of harmful cultural and social practices. The Act limits discrimination based on sex and uses the terms sex discrimination and discrimination interchangeably. However, the Act does not consider other forms of discrimination against women based on intersecting identities such as race, ethnicity, sexual orientation, amongst others. The Act does provide women with redress for rights violations, but knowledge of laws and, therefore remedial actions, is a challenge for women in Malawi. [14]
- The revised **National Gender Policy of 2015** addresses entrenched gender inequality structural drivers that negatively impact girls and women's participation in many sectors, including the country's national STI systems. The policy provides guidelines for mainstreaming gender in various sectors of the economy – including education – with the overall goal of reducing gender inequalities and enhancing the participation of women, men, girls, and boys in socio-economic and political development. [15]
- The **2002 Science, Technology & Innovation Policy** (Figure 7) recognizes the need for science and technology human capital development and the urgent need for women, youth and other 'special interest groups' participation in the development and utilization of science and technology. [10] Unfortunately, the policy does not unpack the category 'special interest groups'. The policy does call for gender/ age and disability/ age/ gender disaggregated data across all STI activities. The policy highlights strengthening STI curricula in schools and encouraging girls to take up these subjects.
- Still the National Science, Technology, and Innovation Monitoring Evaluation Framework (2013) notes that although 69% of key research and development institutions have frameworks for tracking institutional-level R&D achievements, very little information is captured nationally with limited contributions to international data sets

for benchmarking. The framework proposes gender-disaggregated data for each point along the education and research pipeline. [16]

Gender social norms and the education pipeline

- Malawi has largely achieved parity in primary and secondary education attainment rates but as the 2019 survey shows, adult Malawians perceive access to post-secondary education for girls to be worsening.
- Only 38.4% of children transition from primary to secondary school (40.9% for boys and 35.8% for girls), and of those that do, only 8% move on to tertiary education. [17]
- The proportional percentage of women enrolled in all tertiary education programmes is low, ranging from 35% in 2005 to 39% in 2011 (latest available data). [17]
- Disparities of gender as well as other intersectional characteristics such as wealth and location disadvantage tertiary enrolments especially for women. In 2012, 81,9% of students in higher education were from the richest quintile of households compared to 1,5% from the poorest quintile. In 2016 the gross attendance ratio (GAR) for tertiary education was lower for women at 2% than men (3%). When disaggregated by rural location the GAR dropped for both women and men but more so for women (to 0,53%) than for men (0,82%). [17]
- Available data show that the gross graduation ratio from first degree programmes is 0,52% for men and women. When disaggregated the ratio drops to 0,35% for women and increases to 0,69% for men.[17]
- Data gaps for tertiary education enrolment and graduation rates disaggregated by gender, degree type and field of scientific study frustrate a nuanced understanding of the gender-based leaky pipeline in tertiary education.
- Indicators tracking gender equality on human development (Table 1) expose contributing factors for these disparities and the unfortunate loss of the country's human development potential across the life-course, including STI.

Gender-science norms and the STI career progression environment

- Under-representation of women in STI in Sub-Saharan Africa is better explained by discriminatory practices that prevent women's participation in science, than by preferences for ST1. [18] Gendered-science leaks begin emerging in women's tertiary education participation and completion rates and continue, whether as leaks or blockages, along the research career trajectory. [19]
- Gender-science stereotypes, defined as associations that connect science achievements with men more than women, populate the STI landscape. The global and African literature has mapped various factors enabling and challenging women's participation in STI summarised as individual level influences to pursue careers in STI (personal capacities, parents, education, women role models), the quality of the work environment (availability of support, mentoring, equipment and resources), and career progression (renumeration, performance assessment, research applications and funding, promotion). [20–23]
- A 2018 study involving SSA countries including Malawi reported the gender dimension of key challenges. [22]
    - Balancing work and family life was reported to be the biggest career challenge for 80% of women and 71% of men, likely explained in part by the high female to male ratio of 6.9 for household burden. Overall, male scientists' partners contributed a much higher percentage (47%) than women scientists' partners (23%) to household burden.
    - Lack of funding for research was the biggest challenge for 87% men and 80% of women. The gender distribution across equipment-heavy sciences e.g. engineering, and less equipment intensive science fields e.g. social sciences and humanities (see Figure 4) possibly accounts for some of this difference.

However, overall men received more funding than women in engineering and applied sciences, and women received more funding than men in the social and human sciences.

    - Lack of mentoring and support is equally a challenge for men and women at 71% and 72% respectively.

- Gender-based information on research applications, including women as principal investigators and team members, and funding awards for Malawi is not available at a national level. It is therefore difficult to describe the gender reach of the country's research funding model.
- If funding models were aligned with nationally agreed priorities and cross-cutting strategies, including research excellence and gender equality and inclusivity, parity in the R&D workforce, in research call applications and awards and leadership positions is more likely. Additionally, for research generated knowledge to have socio-economic impact, research processes must illuminate human development disparities associated with gender and other relevant intersectional characteristics.
- Networks of stakeholders with interest and influence in advancing gender and inclusivity in STI in Malawi (Appendix 2) exist within the NCST. The NCST hosts the Organisation for Women in Science for the Developing World (Malawi Chapter, established in 2020) and the Women in Science & Technology Network (WISTNET, established in 2006) which support explicit STI gender-related activities. Several development partners - United Kingdom, United States Agency for International Development (USAID), Irish Aid, African Development Bank, Royal Norwegian Embassy, UN Women, European Union, World Bank Group, and Millennium Development Challenge - support gender-focused activities but not explicitly focused on STI. [24]

Conclusion

Harnessing 100% of the country's human development for accelerated socio-economic development is entrenched in policy instruments across the STI pipeline. The Gender Equality Act of 2013 and The National Gender Policy of 2015 provide clear direction for gender-responsive and gender-sensitive actions in each sector of the economy but to date, budgetary and human capital resources have limited implementation.

Further, in the Malawian policy contexts, Gender and Inclusivity is conceptualised mainly as male/female, persons with disability, youth, and 'other special interest groups'. Unpacking the special interest groups and their characteristics for meaningful data collection is vital for understanding and addressing gender and inclusivity disparities and inequities in STI.

However, very few science granting councils in Sub-Saharan Africa reference and then collect data on aspects of diversity such as disability, sexual orientation, ethnicity, race, geographical location, occupation, and socio-economic status amongst others. [25] As long as social norm biases and stereotypes about many of these intersecting identities persist, the less likely research is to generate relevant knowledge for 100% of the population.

Additionally, identifying the stakeholders with interest and influence in supporting gender and inclusivity in STI, understanding how they work together to define and drive gender and inclusivity in STI and the practical activities, barriers and enablers will deepen understanding of the lived experience of the STI landscape.

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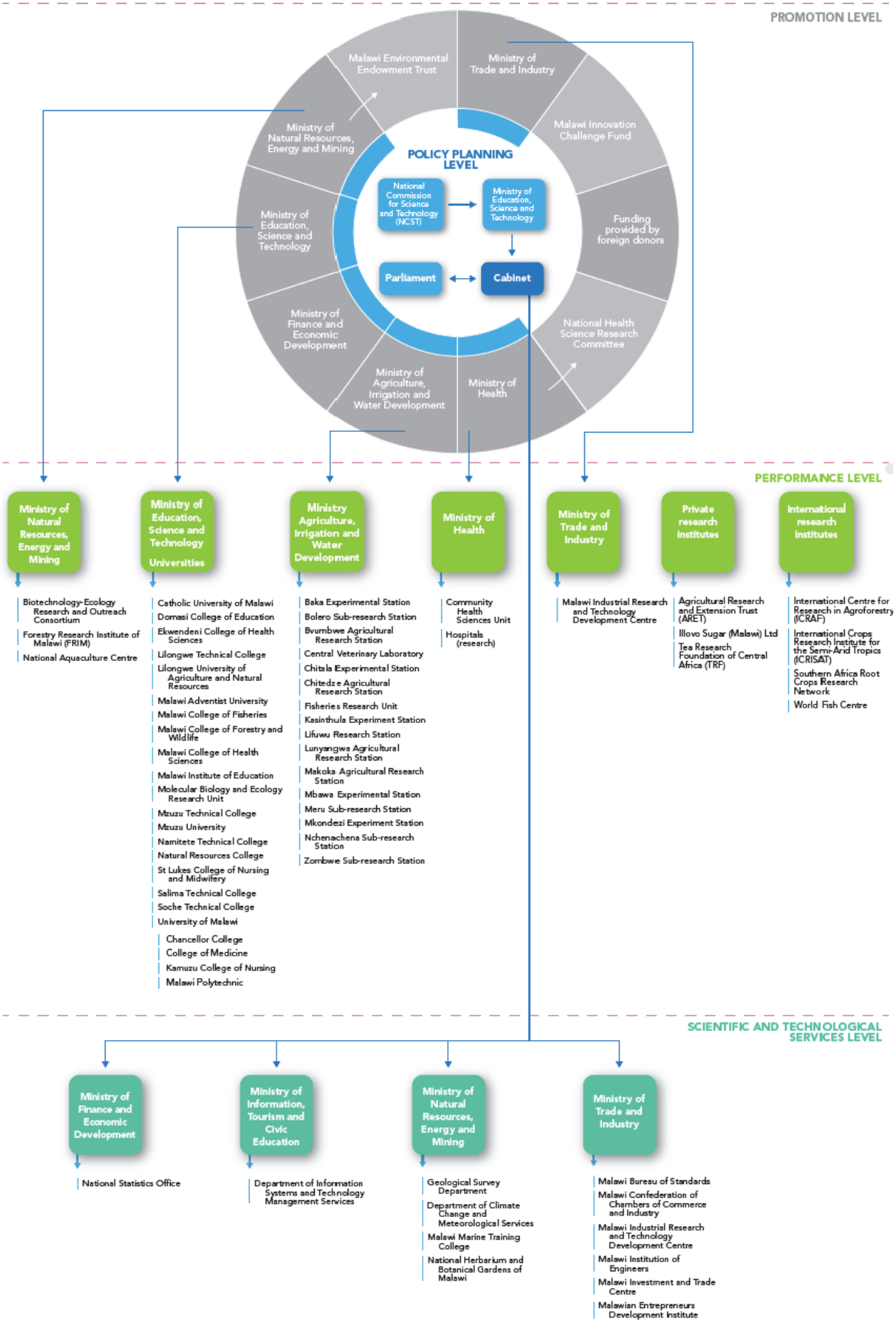
This profile and authorship will be updated in phases two, three and four (2021/2022/2023) of the project following input from Gender at Work and Malawi's SGCI participants.

Appendix 1 Organisational chart showing Malawi's research and innovation system (Page 111. UNESCO. 2014. Mapping Research and Innovations in the Republic of Malawi. Global Observation of Science, Technology & Innovation Policy Instruments.)



Appendix 2

Examples of Stakeholders in Gender in STI in Malawi

Name of organisation	Website address	Contact & email	Focal areas
OWSD Malawi Chapter, based at NCST	https://owsd.net/network/malawi	Edith Milanzi owsdmalawichapter@gmail.com	• Mentoring programme for women and girls in STEM. • Organizing science fairs to showcase scientific and technological advances in science. • Organizing conferences, training, seminars, and workshops for women in science. • Providing education to girls and young women on issues to do with nutrition, communicable and non-communicable diseases that affect women, as well as on gender-based violence.
Women in Science & Technology Network (WISTNET), based at NCST	https://www.ncst.mw/wistnet-women-in-science-and-technology-network/	Secretariat sits within the Directorate of Research and Technology Transfer. The Chief Technology Transfer Officer is the Desk Officer.directorgeneral@ncst.mw infor@ncst.mw	The overall goal of WISTNET is to contribute to the socio economic development of Malawi by promoting science and technology among women and girls through scientific and technological dialogue, capacity building and research.