Science-Policy Brief for the UN Multistakeholder Forum on Science, Technology and Innovation for the SDGs, 7 May 2025

STI for Gender Equality in Africa towards SDG 5: Challenges and Achievement

Jane Catherine Ngila[1,2], jcngila2015@gmail.com

[1]African Foundation for Women and Youth in Education and STI, Kenya

[2]University of Johannesburg, South Africa

Abstract

Science, technology, and innovation (STI) skills are enablers for addressing many challenges that the African continent faces, such as poverty and inequalities, health and well-being, unemployment and unfair labour practices, climate change impact on food and nutrition security, and digital infrastructure and connectivity. The gender gap in science, technology, engineering and mathematics (STEM) fields is a major issue, with women often underrepresented in STEM careers owing to barriers such as societal and cultural; access to education and resources; and systemic issues. In addition, the gender disparities in accessing digital technologies in Sub-Saharan Africa, hinder women's economic, social, and political empowerment. This paper discusses policy frameworks and case studies of African women in STI and digital spaces, and how these impact the implementation of sustainable development goals (SDGs) in the continent, within the context of the 2025 STI forum for SDGs.

Introduction

African Governments have recognized the critical role that science, technology, engineering, mathematics and innovation (STEMI) can play as enablers for addressing many challenges that the continent faces, such as poverty and inequalities, diseases, climate change impact, food and nutrition security, and digitization, among others (AUC, 2023).

The gender gap in STEMI in Africa hinders sustainable development by limiting the continent's innovation potential and diverse perspectives, impacting economic growth and societal progress. The Constitutive Act of the African Union (AU, 2016) recognises the critical role of women in promoting inclusive development and calls for the AU "to ensure the effective participation of women in decision-making, particularly in the political, economic and socio-cultural areas."

According to International Finance Corporation (IFC) of the World Bank Group, Africa leads the world regarding female representation on company boards at 25% compared to 17% globally. In sub-Saharan Africa, the gender gap currently stands at 32% across four key areas: *political participation*, *economic opportunity*, *education*, and *health* (Kabugi, 2024). The high rate of female representation on company boards in Africa, could be attributed to new tools and technologies that are helping bridge the gender gap, including digital and online platforms that are providing African women better access to jobs, markets, and education opportunities.

Access to information and communication technology (ICT) is important in driving economic and social development by enabling automation, enhancing efficiency, and fostering innovation in various sectors including healthcare, education, productive employment and decent work for all, as well as promoting aquatic ecosystems all of which are achievable through global partnerships. Thus, skills development in STI sectors can be leveraged by addressing digital divide (Bhattacharya, et al., 2024)

The *UNESCO Call to Action to close the Gender Gap in Science* initiative (UNESCO, 2024), has identified three key action areas that need to be addressed to close the gap namely; (i) dismantling gender stereotypes; (ii) opening educational pathways for girls in science; and (iii) creating safe workplace environments to attract, retain and advance women scientists. Case studies highlighting challenges and achievements in gender equality in Africa are presented in the next sections.

Policy Framework and Women Socio-Economic Empowerment and Representation

Women's empowerment in Africa has seen progress in the recent decades but there are still challenges to overcome. Global and continental instruments and frameworks such as the *Convention on the Elimination of All Forms of Discrimination against Women* (UN Women, 2007), SDG#5, the *Maputo Protocol*, *African Union's Protocol on the Rights of Women* in Africa *(AU, 2016)*, as well as the *Beijing Declaration and Platform for Action (*UN Women, 2016), have all been instrumental in advancing women rights and the socio-economic

empowerment agenda. The Africa Gender Index (AGI) 2023 Analytical Report (AfDB and UNECA, 2024) provides authoritative data insights with a comprehensive assessment of gender equality across the continent, examining progress in *economic, social*, and *empowerment & representation* dimensions. The report showed that the Africa's gender equality score across the three dimensions stood at 50.3% in 2023, a slight improvement from 48.6% in 2019. However, when each dimension is evaluated on its own, the report showed that the gender index score in the **economic dimension** had decreased to 58.2% in 2023 from 61.0% in 2019 owing to persistent economic crises such as COVID-19 pandemic (AfDB and UNECA, 2024). In the private sector women make up only 20% of corporate board seats, 7% of board chairs, 5% of chief executive officers, and 16% of chief financial officers (Horne and Breeze, 2024).

The AGI report indicated that the *social dimension,* has seen progress towards gender equality, with an overall score of 98.3% in 2023, compared to 95.1% in 2019. The score reflects important progress in girls' education. Overall, more girls than boys now graduate from primary, lower secondary and upper secondary school, although they still lag at the tertiary level (AfDB and UNECA, 2024). In some African countries, the rise in gender equality in education may be driven by a decline in boys' school completion rates, which may be linked to rising economic stress and pressure to enter the workforce earlier (Baten et al., 2020).

According to the AGI report, on the *empowerment & representation dimension*, the gender index score showed slight increase from 22.9% in 2019 to 24.4% in 2023. However, the report indicated that African women are still underrepresented in both parliaments and ministerial posts. The report notes that despite the gender quotas being an important tool for redressing the representation gap, they often lack proper enforcement. Women also face entrenched gender expectations that discourage their pursuit of leadership roles. They also continue to lag behind men in business management and in skilled professional roles (AfDB and UNECA, 2024).

A close look at regional level for the five African regions, the AGI report noted that there are major variations across Africa in gender pay equality which ranges from 39.2% in North Africa to 64% in Southern Africa. The report further revealed that gender disparities are narrowest in the social dimension (health and education), but far higher in representation and empowerment regarding government and business positions (AfDB and UNECA, 2024).

At the country level, the AGI report showed that the gender index scores varied widely, ranging from 30.9% to 88.3% across the three dimensions, with two African countries, Namibia and Lesotho leading the pack with scores above 80%. Guinea-Bissau, Egypt, Algeria, Niger, Somalia, Chad, Eritrea and Ethiopia each scored below 40%. On the other hand, Angola, Kenya, Namibia, Seychelles, Gabon and Botswana were reported to have made the most progress towards gender parity in the economic and business sphere, scoring above 80% (AfDB and UNECA, 2024). Senegal was cited as the West African country with the highest number of women in parliament, at 41.8% of the total. This is partly due to a supportive legal framework, through the adoption of a gender parity law for elected bodies, and the establishment of a National Observatory for Parity. At the sub-regional level, Southern Africa was closest to gender parity, with an average score of 72.7% while North Africa was furthest at 45.9% (AfDB and UNECA, 2024).

Policy Framework and Women Advancement in STEM/STI for SDGs

Africa's STI policy focus has grown since the establishment of STI strategy for Africa (STISA-2024) and African Union Agenda 2063 (AUDA-NEPAD, 2021). The regional communities Southern African Development Community (SADC), East African Science and Technology Commission (EASTECO), and STI community in West Africa, have contributed to harmonizing national STI policies including gender equality policy development, management, and application of STI in the member countries (AUC, 2023).

In Sub-Saharan Africa, despite improvements in educational levels for women and girls, there is still some gender imbalance in both education and employment. Data from the African development bank report (AfDB and UNECA, 2024) in reviewing SDG#8, indicated that women in some African countries devote 15-20% of their time to unpaid work and domestic chores, compared to an average of 5% for men. Women-owned businesses recorded monthly profits that were on average 38% lower than those of male-owned companies. In addition, women's access to digital technology remained limited and they are 10% less likely than men to own a cell phone and 23% less likely than men to use mobile internet (AfDB, 2021) yet employment and business opportunities are linked to access to digital platforms.

A report compiled by Rose-Innes of Women in Science organization, indicated that women form 47% of STEM graduates from African universities, both

undergraduates and postgraduate levels (Rose-Innes, 2022). This implies that Africa has almost achieved gender parity in STEM education. However, on average women scientists form only 20% of the population in Africa. Women research scientists form 32%, those using Internet form 24% compared to 35% men, only 29% of women have access to mobile internet, compared to 41% of men (UNESCO, 2019).

A case study on SDG#8 carried out by Enfield (2019) at the institute of development studies, on gender roles and inequalities in the Nigerian labour market, highlighted barriers to entry into the labour market for women, and to their participation within the labour market. It indicated that girls' entry into the workforce was conditioned by early marriage and starting a family. The study also noted that gender gap in education, limited the choice of occupation for women (completion rates of primary education for boys was about 80% while only 66% for girls). High levels of inequity in human development indicators between northern and southern states of Nigeria, accentuated educational barriers to employment (42% of adults in the north had no education compared to 13% in the south). Lack of education and marginalisation from schools and skills acquisition programmes made it difficult especially for women with disabilities to gain employment. Muslim women were less able to participate in a visible work force when compared with women in other religions (Enfield, 2019). The Nigerian study gives an example of social, economic and structural barriers that women in most African countries face in advancing their education levels which affect their full participation in STEM/STI fields limiting their opportunities to decent work.

Women in Scientific Research

According to the UNESCO Science Report (UNESCO, 2021), some countries in Africa including South Africa and Mauritius had attained gender parity, in terms of the number of women in scientific research. The report indicated that Senegal had significantly increased her share of women researchers. The report indicated that several countries in Africa face serious data gaps as sex-disaggregated data on researchers was not collected regularly by most countries in Africa.

Africa Science Granting Councils (SGCs), also known as funding agencies or research councils, are national-level public or semi-public organizations that act as intermediaries between the state and the research community, play a significant role in funding research and developing science policies in their respective countries (Mouton et al., 2015). There are currently 17 SGCs operating in sub-Saharan Africa. A study conducted by Jackson et al. (2022), on the Perspectives on Gender in STI, explored the role and activities of SGCs as potential change agents or catalysts in supporting advancement of women in STI. The study focused on evaluating the gender mainstreaming efforts and initiatives across the SGCs, the status of gender research, and research collaboration. It also examined the role that the political-economic context had on gender and inclusive practices in STI as well as the role gender-inclusive STI systems can play in transforming the country's research. The study involved 15 African countries (Botswana, Namibia, Malawi, Mozambique, Zimbabwe and Zambia in Southern Africa region; Uganda, Kenya, Tanzania, Ethiopia, Rwanda in Eastern Africa; Senegal, Burkina Faso, Côte d'Ivoire and Ghana in Western Africa) (Jackson, et al. 2022). The Southern African countries had higher overall gender equality scores (average of 67) compared with those in East Africa (average of 63) and those in West Africa (average of 54). Malawi had the highest gender equality in economic opportunities (88), Botswana the highest in human development (92) and Rwanda in laws and institutions (67). The scoring of gender equality was based on a scale from 0 to 100, where 0 represented the least gender-equal and 100 represented the most gender-equal.

The SGCs study highlighted a number of issues affecting gender gaps in research including (i) Lack of confidence by women to apply for research grants and awards, a case of imposter syndrome, resulting in low numbers of applications from women; (ii) Marriage and children as cultural issues that impact women's decisions and career advancement; (iii) lack of opportunities in the sciences for women and restrictive policies by funders for women; (iv) delays in women's professional careers due to family commitments (Chataway, 2019). The results of the SGCs study showed a steady upward trend on gender-related research outputs for the 15 SGCs where Ethiopia, Kenya, Ghana, Uganda, and Tanzania were the top five contributors of gender-related papers published during the 2008–2017 period, while Namibia contributed the fewest. The top five gender-equal countries, according to the African development bank gender equality index (AfDB, 2021) that were part of the science granting council initiative (SGCI), included Rwanda, Namibia, Malawi, Botswana, and Zimbabwe. A comparison across the institutions representing the countries of the SGCs, three common issues for gender mainstreaming emerged, (i) to increase the number of women in STI by implementing gender policies, (ii) the importance of women leadership positions, and (iii) to

ensure gender-responsive curriculum development (Chataway, 2019).

Women in Digital Platforms in Africa

Digital transformation represents significant opportunities for economies globally, particularly in Africa. However, without a well-defined gender strategy, such transformation can exacerbate existing digital divides (AUDA-NEPAD, 2021). In Sub-Saharan Africa, women face multiple barriers in accessing and utilising digital technologies, including limited educational opportunities, restrictive cultural practices, and insufficient financial resources. The challenges are more pronounced in rural areas, where women's engagement in the digital economy is more constrained. Despite these barriers, digital technologies hold promises for improving economic opportunities for women by enhancing job opportunities and reducing poverty (Bhattacharya et.al., 2024).

Although mobile internet access has grown substantially, Africa's overall internet coverage still falls short compared to other continents (Klonner & Nolen, 2010). Some of the benefits of digital technologies include mobile money transactions in Kenya and neighbouring East African countries, through MPESA mobile money service which has significantly impacted and changed women's lives by promoting financial inclusion. (Mbiti and Weil, 2014)

Nigeria has over 500 operational digital platforms across several sectors, including financial services, transport, logistics, e-commerce, health, agriculture, and education (Lixi et al. 2019). These digital platforms have created livelihood opportunities for the youthful population, especially women. However, despite mobile phones being the most ubiquitous platform to connect to the digital economy, mobile internet access is still inadequate, opined Lixi and coworkers.

In South Africa, a study conducted by Shiferaw (2024) showed gender digital divide where women have fewer mobile phones, computers, and access to the internet than men indicating a sizable gender difference in Internet access at home, evidenced by the 45.4 % gender gap (Shiferaw, 2024).

For Africa to empower her women economically through digital technologies, there should be initiatives to subsidise mobile phone costs, free internet hotspots, and reasonably priced data plans to ensure women can contribute meaningfully to the digital world. There should be programmes that provide women with basic digital skills training and technology-relevant applications to unlock opportunities to improve their livelihoods. Girls in schools should have access to quality education, particularly in the science, technology, engineering, and mathematics (STEM) fields, to build the next generation of women entrepreneurs who can positively contribute to Africa's economy (Eziakonwa, 2025).

Digital literacy is increasingly seen as an essential skill for employability and has been linked to higher earning potential and new economic opportunities (Elzir and Morgandi, 2024). In Kenya for example, the government has achieved milestones aimed at mitigating inequality and promoting gender equality by supporting the economic empowerment of vulnerable groups, including women, youth, and persons with disabilities. One such initiative is the Women Enterprise Fund (WEF), which provides financial support through mobile money transfers. A study by Bhattacharya, et al. (2024) found that the communication channels and media used to disseminate information about the WEF, played a crucial role in helping women access financial resources, as reported by Gatobu in her article on harnessing digital technologies for women's economic inclusion in Africa (Bhattacharya et al., 2024).

According to Ireru of Susinsight company in Nigeria (Ireju, 2025), Big Data analytics holds the potential to uncover hidden disparities in education, health, and finance, resulting in empowerment of women while challenging systemic biases. Ireju opines that Big Data can provide a clearer picture of women's lives by analyzing large amounts of data from digital interactions using Artificial Intelligence (AI). "It can uncover hidden disparities, inform targeted policies, and empower women at the grassroots level. The real value lies in its ability to provide actionable insights into areas that specifically affect women and girls, such as health issues and harmful cultural practices", says Ireju (2025).

Recommendations and Conclusions

In order to achieve gender equality in STI in Africa, towards 2030 UN Agenda and 2063 African Union Agenda, barriers such as societal and cultural, access to education and resources, and systemic issues such curriculum and teaching methods must be addressed. Responding to UNESCO's *Call to Action to Close the Gender Gap in Science*, some of the recommendations include, (i) Dismantle gender stereotypes and biases in science through enhanced visibility of female role models. This could be achieved by including women's contributions to science, in schoolbooks and other learning materials, funding outreach activities featuring female scientists, targeted research funding to women

scientists, and promoting national, regional and global network for female scientists; (ii) To open pathways for girls in science through innovative and inspiring educational strategies and initiatives such as supporting training of curriculum and textbook specialists to promote women's visibility, providing scholarships, awards and advocacy incentives, and exposure to scientific careers and job opportunities; (iii To create workplace environments that attract, retain, and advance female scientists through policies and actions that promote inclusion, diversity, and equity. The intervention should include creating evidence-based data to highlight the gender gap in leadership positions to influence policy decisions. Another intervention is to create formal mentorship and sponsorship networking programmes to enhance women's confidence levels and eliminate impostor syndrome challenges. To eliminate gender-based violence, institutions at grassroot and national, regional and global levels, must implement effective anti-harassment policies using well tested strategic approaches.

In addition to recommendations from UNESCO's Call to Action initiative, governments should equip girls with digital skills through prioritizing education in ICT subjects, to help girls thrive in economies based on digital platforms. Thus, STEM education is essential for creating a skilled workforce capable of driving innovation and economic growth in Africa.

Recommendations to close the research gender disparity include collecting data, monitoring and evaluation of outputs and impact of gender-related research, which are necessary to inform policy at different levels. In addition, increased gender-related scholarly activities and their contribution to STI advancement and economic transformation, are crucial. Collaborations at institutional, national, regional and global levels, are important enablers to advancing gender-related research goals and sharing knowledge with the scientific community.

In conclusion, advancing women in STEM/STI will have a ripple effect in empowering more women and girls, and accelerating economic and social development not just for the African countries but globally. By providing women with financial resources, skills, and infrastructure, they can participate more fully in the economy, leading to greater overall economic growth and increased gender equality, hence promoting the implementation of the SDGs.

Acknowledgments

I wish to acknowledge, the African Foundation for Women & Youth in Education & Science Technology and Innovation (STI), University of Johannesburg (UJ), African Union Development Agency- New Partnership for Development (AUDA-NEPAD), African Group on Gender statistics (AGGES); African Development Bank (AfDB), African Union Commission (AUC), United Nations Economic Community for Africa (UNECA), United Nations Educational, Scientific and Cultural Organization (UNESCO), UN Women, and United Nations Department of Economic and Social Affairs (UN DESA).

References

AfDB (2021). Investing in Africa's women to accelerate inclusive growth. The African Development Bank Group Gender Strategy 2021-2025: https://www.afdb.org/en/documents/african-development-bank-group-gender-strategy-2021-2025 , Accessed 2025 April 01

AfDB & UNECA (2024). Africa Gender Index- African women in times of crisis. 2023 Analytical Report (pp 21-48). African Development Bank & United Nations Economic Commission for Africa, Addis Ababa, 2024, November. https://www.afdb.org/en/documents/africa-gender-index-2023-analytical-report , Accessed 2025 April 01

AU (2016). Constitutive Act of the African Union. https://au.int/constitutive-act) Accessed 2025 April 03

AUC (2016). African Year of Human Rights with a focus on the Rights of Women. Women, Gender and Development Directorate (WGDD) of the African Union Commission. https://au.int/en/newsevents/20201117/maputo-protocol-womens-rights-africa Accessed 2025 April 03

AUC (2023). Review of the Science, Technology & Innovation Strategy for Africa (STISA-2024), African Union Commission, December 2023, pp19. Addis Ababa.

AUDA-NEPAD (2021). African Union Development Agency-New Partnership for Africa's Development (AUDA-NEPAD) White Paper: Regulation and Responsible Adoption of AI in Africa Towards Achievement of AU Agenda 2063.

Baten, J., Haas, M., Kempter, E., Selhausen, F.M. (2020). Educational Gender Inequality in Sub-Saharan Africa- A Long-term Perspective, African Economic History Network No. 54/2020 (pp 11). 2020, August https://doi.org/10.1111/padr.12430 . Accessed on 9th April 2025

Bhattacharya, R., Gatobu, C.K, Onuoha, R. (2024). Bridging the Gender Digital Divide: Africa's Imperatives. https://www.orfonline.org/research/bridging-the-gender-digital-divide-africa-s-imperatives

Chataway J., Dobson C., Daniels C., Byrne R., Hanlin R., Tigabu A. (2019). Science granting councils in Sub-Saharan Africa: trends and tensions. Science and Public Policy, 46

(4) 620–631. DOI.10.1093/scipol/scz007. https://doi.org/10.1093/scipol/scz007

Elzir, A., & Morgandi, M. (2024). Building Digital Literacy and Skills to Reflect the Needs of the Job Market. World Bank Group. Issue 10, April 2024

https://documents1.worldbank.org/curated/en/099714205022428058/txt/IDU18de6d0dd130d5146e2181b51803ab8411275.txt Accessed 2025, April 10

Enfield, S. (2019). Gender Roles and Inequalities in the Nigerian Labour Market, Institute of Development Studies, K4D Helpdesk Report, Brighton, UK. 2021, May 21. https://assets.publishing.service.gov.uk/media/5d9b5c88e5274a5a148b40e5/597_Gender_Roles_in_Nigerian_Labour_Market.pdf. Accessed 2025, April 12

Eziakonwa, A. (2025). Empowering Africa's Digital Future: Why Women Must Lead the Charge. UNDP 2025, March 7 https://www.undp.org/africa/speeches/empowering-africas-digital-future-why-women-must-lead-charge Accessed 2025, April 10

Horne, M & Breeze, S. (2024). Women in the Boardroom: A Global Perspective. Deloitte 2024, March 21
https://www.deloitte.com/nz/en/services/risk-advisory/research/women-in-the-boardroom-2024.html Accessed 2025, April 11

Ireju, J. (2025). How Big Data could solve and expose gender inequality in Africa. January 22, 2025

https://susinsight.com/how-big-data-could-solve-and-expose-gender-inequality-in-africa/ Accessed 2025, April 08

Jackson, J.C., Payumo, J.G., Jamison, A.J., Conteh, M.L., Chirawu, P. (2022). Perspectives on Gender in Science, Technology, and Innovation: A Review of Sub-Saharan Africa's Science Granting Councils and Achieving the Sustainable Development Goals. Frontiers in Research Metrics and Analytics. Vol 7, 2022 April. doi.org/10.3389/frma.2022.814600

Kabugi, A.N. (2024). Promoting Gender Equality in Africa. International Finance Corporation, World Bank Group. 2024, December.
https://www.ifc.org/en/where-we-work/africa/promoting-gender-equality-in-africa . Accessed on 9th April 2025

Klonner, S. & Nolen, P.J (2010). Cell Phones and Rural Labor Markets: Evidence from South Africa," Econstor, no. 56 (2010) https://www.econstor.eu/handle/10419/39968 Accessed 2025, April 10

Lixi, Yves, M.J., Zottel, Siegfried, Neto, Isabel, M., Boroffice, et.al. (2019).
Nigeria Digital Economy Diagnostic Report. Policy Commons.
https://policycommons.net/artifacts/1271675/nigeria-digital-economy-diagnostic-report/1855083/ Accessed 2025, April 11

Mbiti, I. and Weil, D.N.(2014). Mobile Banking: The Impact of M-Pesa in Kenya. National Bureau of Economic Research, Working Paper 17129. DOI 10.3386/w17129, June 2014. https://www.nber.org/papers/w17129 , Accessed 2025, April 08.

Mouton J., Gaillard, J., van Lill M. (2015). Functions of science granting councils in sub-Sahara Africa, in Knowledge Production and Contradictory Functions in African Higher Education, ed N. Cloete, P. Maasen, and T. Bailey (African: Minds), 148–170. https://www.researchgate.net/publication/280946268_Functions_of_Science_Granting_Councils_in_Sub_Sahara_Africa

Rose-Innes, A. (2022). Africa has highest proportion of female STEM graduates. Women in Science, 2022, August 3. Accessed 2025, April 01
https://www.womeninscience.africa/africa-has-highest-proportion-of-female-stem-graduates/

Shiferaw, Y.A (2024). A spatial analysis of the digital gender gap in South Africa: Are there any fundamental differences? *Technological Forecasting and Social Change,* 204, 123443.
https://doi.org/10.1016/j.techfore.2024.12344

UNESCO (2019). Gender-responsive STEM education (2019). Gender-responsive STEM education: empowering girls and women for the jobs of today and tomorrow. https://unesdoc.unesco.org/ark:/48223/pf0000366803 Access 2025, April 09.

UNESCO (2021). UNESCO Science Report: the Race Against Time for Smarter Development, Chapter 3 Women and the digital revolution. https://unesdoc.unesco.org/ark:/48223/pf0000377456/PDF/377456eng.pdf.multi.page=1&zoom=auto,-16,842 Accessed 2025, April 10

UNESCO (2024). UNESCO Call to Action to Close the Gender Gap in Science. Retrieved from https://www.unesco.org/en/science-technology-and-innovation/cta Accessed 2025, April 11

UN Women (2007). Convention on the Elimination of All Forms of Discrimination against Women. 2007, August
https://www.un.org/womenwatch/daw/cedaw/ Accessed 2025 April 01

UN Women (2015). Beijing Declaration and Platform for Action (REF) https://www.unwomen.org/en/digital-library/publications/2015/01/beijing-declaration Accessed 2025 April 01