

Increasing investment in STEM education can unlock industrialization in Africa

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1. Skilled workforce

Did you know

The African Union's Agenda 2063 recognizes the role a Science, Technology, Engineering, and Mathematics (STEM) skilled workforce can play in helping Africa become a global leader in emerging technologies, generative Artificial Intelligence (AI), cyber security, climate change, green economy, global health, and other areas. From 2023 to 2050, the percentage of young people in Africa within the 15 to 34 age group is expected to increase by 73 percent compared to 6 percent in the rest of the world.¹ According to the African Development Bank (AfDB), 10 to 12 million

young Africans are expected to enter the workforce, yet only about 3 million new formal wage jobs are currently created each year.²

Africa will need about 18 million new jobs annually for that growth until 2035 to accommodate the youth labour market entrants³ and industrialization is indispensable for job creation. With a growing young population and the appropriate investment in STEM education, Africa could harness a large skilled workforce to fuel unprecedented economic growth.

Given the current demographics:

Industrialization will be crucial to absorbing these growing youthful labour entrants, thus contributing to promoting economic development, peace and security in the continent.

Lack of decent jobs, the youth bulge can turn into a

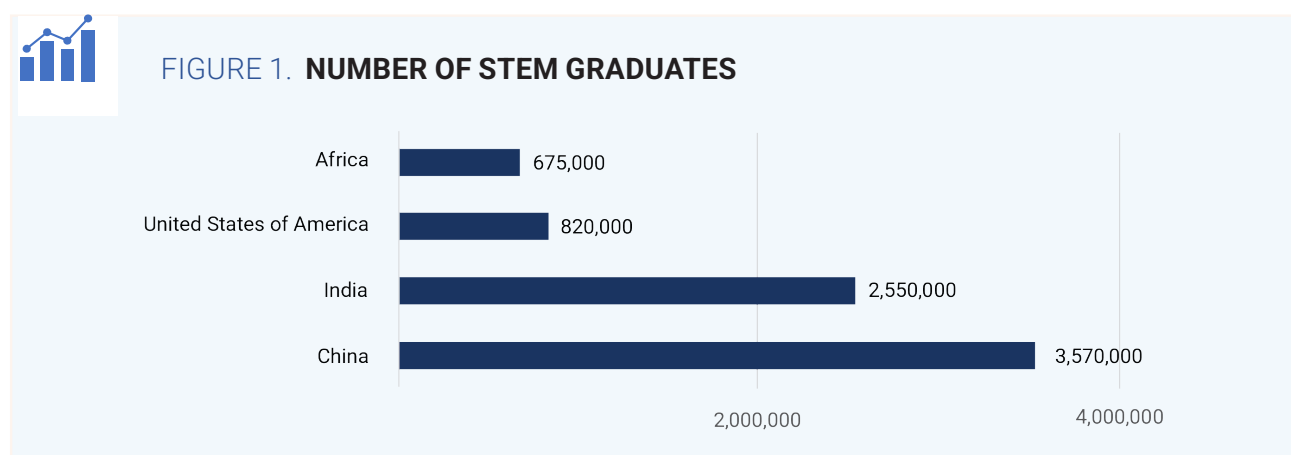
demographic time bomb. Therefore, industrialization will be necessary to harness the demographic dividend for Africa's sustainable development.

The African Continental Free Trade Area (AfCFTA) has the potential to tackle these challenges by creating

STEM graduates per country or region

Given that the number of STEM graduates per country or region may serve as an indicator of future scientific and technological capacity, Africa has the least number of

graduates compared to other countries in other regions (See Fig. 1).



Source: OCED and the statistical yearbook of Russia, India and China

African countries graduated between 14 per cent and 38 per cent of students with STEM-related degrees in 2022, with the highest rate (38 per cent) recorded in Tunisia, according to UNESCO statistics.⁵

It is estimated that 675,000 STEM graduates enter the job market every year in Africa. However, according to the World Bank, about 2.5 million additional engineers are needed in Africa (excluding North Africa) in order to address the region's development challenges.⁶

Presently in Africa, most STEM jobs are performed by or outsourced to multinationals from countries such as China. This outsourcing of jobs is hindering the ability of African governments to invest in STEM skills for the future.⁷

According to a study by the International Finance Corporation (IFC), it is estimated that over 230 million jobs in Africa (excluding North Africa) will require digital skills by 2030, resulting in almost 650 million training opportunities, mostly STEM skills.⁸

Opportunity

The ability of Africa to convert its youth dividend—with a projected 850 million young people by 2050—into a highly skilled STEM workforce can be a gamechanger⁹ as this enables countries to develop

high-growth strategic industries through fields like applied AI, quantum computing, bioengineering and electrification.



2. Increased investment in Research and Development (GERD) required

STEM skilled workforce such as scientists and researchers advance innovation and promote research and development (R&D) activities, which leads to the formation of new products, processes, and services that can drive industrial growth and competitiveness.

Africa is the region with the lowest domestic spending on Gross Expenditure on Research and Development (GERD) worldwide¹⁰ (See Fig 2).

Africa's spending on research and development (0.54%) is below the 1% recommended by the African Union.

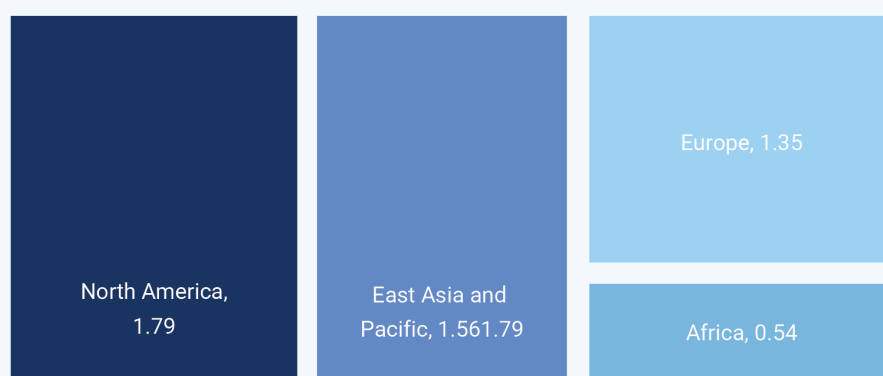
Currently, Africa only contributes 2 per cent of world research output, and accounts for barely 1.3 per cent of research spending¹¹, and produces 0.9 percent of all patents, the global share of which has not increased since 2012¹².

Africa has approximately 198 scientists per million people, compared to the 4,500 per million people in the United States.¹³

In 2020, Africa had 336.01 researchers per million habitants compared to 2888.22 for Europe and Central Asia, which has the largest number of researchers (See Fig 3).



FIGURE 2. R&D EXPENDITURE AS PER CENT OF GDP BY REGION



Source: UN DESA Global SDG Indicators Data Platform

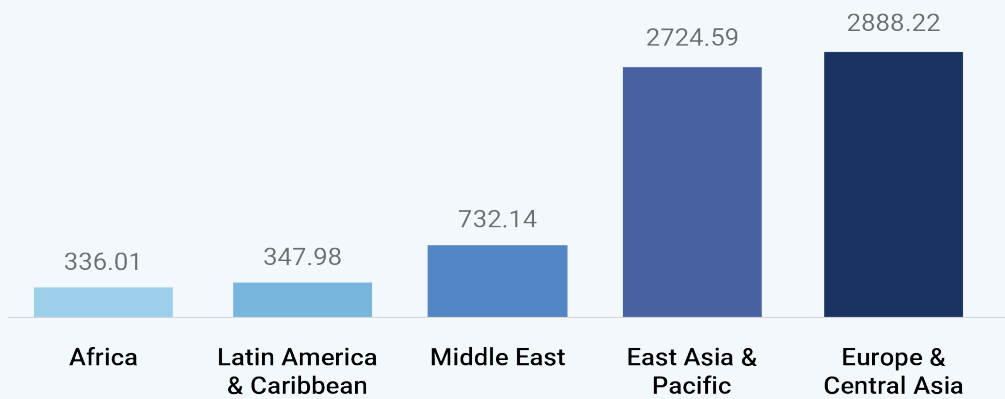
¹⁰ Statista, 2023 - <https://www.statista.com/>

¹¹ Brookings Institution (2022). Foresight Africa: Top Priorities of the Continent 2022. Washington, D.C. - <https://www.brookings.edu/articles/foresight-africa-2022/>

¹² World Intellectual Property Organization (2023). World Intellectual Property Indicators 2023. Geneva - <https://www.wipo.int/edocs/pubdocs/en/wipo-pub-941-2023-en-world-intellectual-property-indicators-2023.pdf>



FIGURE 3. RESEARCHERS PER MILLION HABITANTS BY REGION -2020



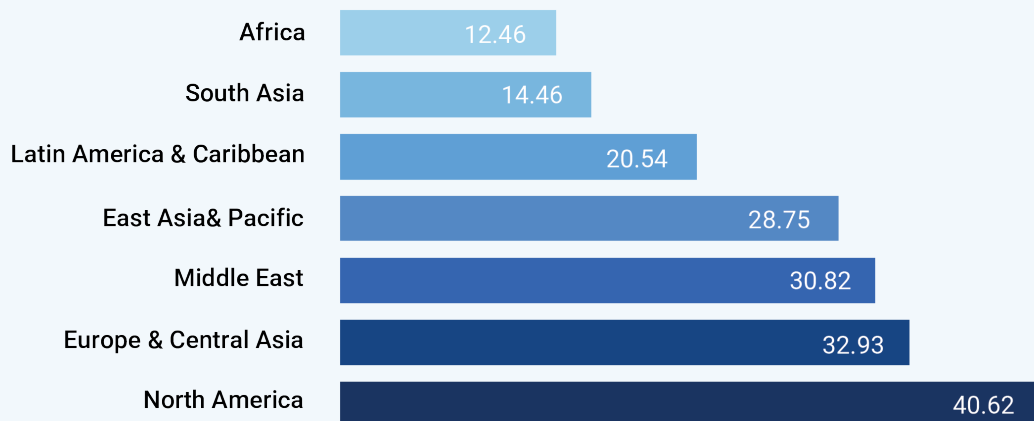
Source: SDG Global Database

The medium and high-tech manufacturing value added (MVA) in Africa is lower than in other regions (see Fig. 4).

This can partly be attributed to a lack of investment in Research and Development.



FIGURE 4. MEDIUM & HIGH-TECH MANUFACTURING VALUE ADDED (% MANUFACTURING VALUE ADDED) BY REGION IN 2019



Source: UN DESA Global SDG Indicators Data Platform

Opportunity

African countries need to invest financially in enhancing existing STEM Centres of Excellence to improve their

Research, Development and Innovation (RD&I)

13 World Economic Forum (2020). Article on "Here's why Africa needs to invest in home-grown science". 13 August 2020 - <https://www.weforum.org/agenda/2020/08/here-s-why-africa-needs-to-invest-in-home-grown-science/>

3. Closing the Gender Gap in STEM Education

Women globally constitute only one-third of STEM graduates in higher education, whereas, in Africa, it is estimated at 25 per cent or less.¹⁴

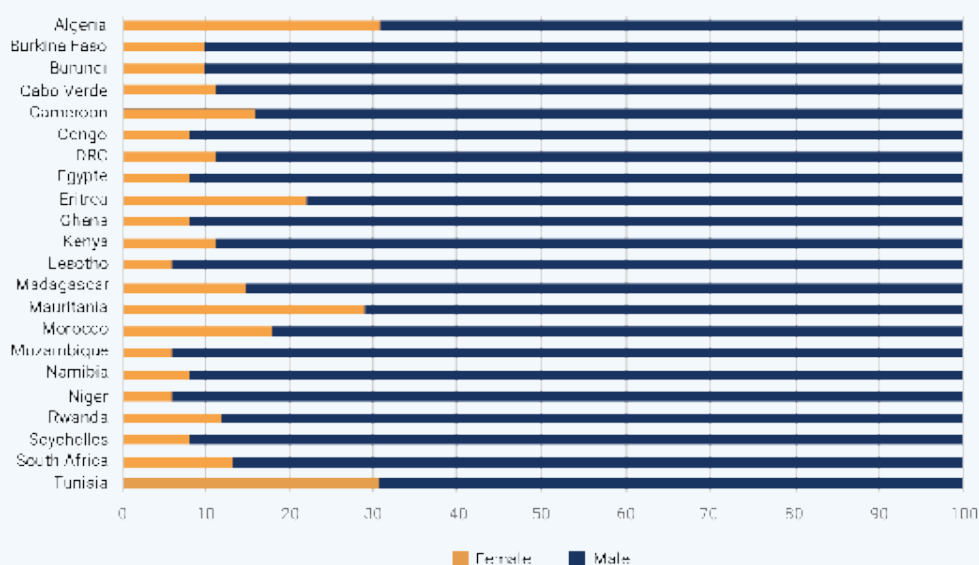
According to UNESCO, in 17 of 21 African countries with sex-disaggregated data for 2016-2018, women only represented 16% or less of graduates in STEM fields.¹⁵ Tunisia (36.5%) and Algeria (31%) in North Africa

have the highest proportions of women among STEM graduates. However, this remains far from gender parity (see Figure 5).

According to UNESCO, the greatest gender gaps are in engineering and Information, Communication, and Technology (ICT) studies, which are key to harnessing the potential of the fourth industrial revolution (4IR).



FIGURE 5. CLOSING THE GENDER GAP IS CRUCIAL: WOMEN MAKE UP A SMALL PROPORTION OF STEM GRADUATES IN AFRICAN COUNTRIES



Source: UN DESA Global SDG Indicators Data Platform

Closing the gender gap in STEM education is crucial, as women account for 60% per cent of the farmers

in Africa¹⁶ and 70% of the informal economy and yet constitute only 38% of the manufacturing workforce¹⁷

14 UNESCO (2024). Article on Unlocking Africa's potential by investing in STEM education - <https://www.unesco.org/en/articles/unlocking-africas-potential-investing-stem-education#>

15 UNESCO (2024), Africa Dialogue Series 2024 Policy brief on the theme "STEM Education for the Fourth Industrial Revolution (4IR) in Africa with a focus on generating decent jobs for Africa's Youth", 22 April 2024 - https://www.un.org/osaa/sites/www.un.org.osaa/files/files/documents/2024/publications/ads2024_policybrief1.pdf

16 Ruth Kagia (2023). Commentary on STEM education in Africa: Risk and opportunity, 10 February 2023 - <https://www.brookings.edu/articles/stem-education-in-africa-risk-and-opportunity/#>

17 African Union (2023), Joint Statement on "Accelerating Africa's Industrialization through the Empowerment of African Women in Processing for an Integrated Market," Africa Industrialization Day, 20 November 2023- <https://au.int/en/pressreleases/20231120/africa-industrialization-day-20-november-2023-accelerating-africas#>

Opportunity

industrial processing have the potential to contribute to the implementation of the Agreement and Protocols of the African Continental Free Trade Area (AfCFTA) as they will contribute not only to trade but also to product diversification, spatial development, job creation, inclusive growth, and cross-border industrial clustering, among other things.¹⁸

Recommendations

Education and training policies and frameworks implemented by African countries must aim to expand opportunities for African youth to gain the STEM skills to deal with and contribute to scientific, technological and innovative progress.

Investment in education and Technical and Vocational Education and Training should be directed towards ensuring relevance to enhance employability in STEM careers in industry, given that the number of young people in Africa's workforce is set to increase to 375 million by 2030.¹⁹

To close the gender gap, quality STEM education must be prioritised. This can be attained by prioritizing Universal Quality Basic Education through curriculum reforms, STEM teacher training programmes, and more, including gender and peer learning, as well as promoting quality higher education.

There is also a need to strengthen existing STEM Centres of Excellence to boost their capacity and impact.

¹⁸ African Union (2023). Press Release on Africa Industrialization Day "Accelerating Africa's Industrialization through the Empowerment of African Women in Processing for an Integrated Market," Joint Statement, 20 November 2023 - <https://au.int/en/pressreleases/20231120/africa-industrialization-day-20-november-2023-accelerating-africas#>

¹⁹ Mastercard Foundation (2024), Article on 'Young Africa Works Strategy – Creating opportunities for African youth' - <https://mastercardfdn.org/our-strategy/young-africa-works/#>



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and Innovation;

Industrialization,
Demographic Dividend,
and the African
Continental Free Trade
Area (AfCFTA); and

Energy and Climate
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