

Advisory on Building Human Capital for Science, Technology and Innovation to Position Kenya for Global Competitiveness in Research and Innovation

INTRODUCTION

Science, Technology, and Innovation (STI) is a key enabler and driver for the attainment of Government priority programs set out in the Bottom-UP Economic Transformation Agenda (BETA) and Medium-Term Plan IV (MTP IV). In alignment with the Second Edition of the Science, Technology, and Innovation Strategy for Africa (STISA-2034), strengthening Human Resource Capacity is central to the successful mainstreaming of Science, Technology, and Innovation (STI) across Ministries, Departments, and Agencies (MDAs), as it ensures the effective deployment of STI interventions in line with the Bottom-Up Economic Transformation Agenda (BETA) and the Fourth Medium-Term Plan (MTP IV). Skilled and well-equipped personnel are essential to integrate research, science, technology, and innovation into national programmes, thereby enhancing productivity, efficiency, and global competitiveness while accelerating inclusive and sustainable development.

Human capital development not only supports Kenya's transition from a factor-based to a knowledge-driven innovation economy but also underpins the achievement of global benchmarks such as the Global Innovation Index, World Competitiveness Ranking, and SDG Index. By investing in and strengthening STI human resource capacity, Kenya is better positioned to secure national prosperity, foster resilience, and safeguard public good in alignment with the provisions of the STI Act 2013 (Rev. 2014) and the Presidential commitment to advance science and technology at the core of development.

Global Lessons on STI and Human Capacity Development

Across the world, Science, Technology, and Innovation (STI) has emerged as the engine of economic transformation and global competitiveness. Countries that have invested heavily in research, innovation, and human capital have reaped remarkable dividends. The Asian Tigers -South Korea, Singapore, Taiwan, and Hong Kong -used strategic investments in STI to leapfrog from agrarian and low-income economies into advanced industrial and knowledge-based societies within a generation.

Their success was not driven by natural resources, but by deliberate policies to strengthen education, research capacity, and human resources in science and technology. Today, they stand as clear evidence that building STI systems is a prerequisite for national progress in the 21st century.

Kenya's National Commitment to STI

Kenya is no exception. Recognizing this reality, the Government has anchored STI at the heart of its national transformation agenda, including Vision 2030, the Bottom-Up Economic Transformation Agenda (BETA), and continental and global commitments such as Agenda 2063 and the Sustainable Development Goals (SDGs).

To operationalize this, Ministries, Departments, Agencies (MDAs), County Governments, and public institutions are required to mainstream STI into their planning, programming, and performance contracting frameworks.

KEY FINDINGS ON HUMAN RESOURCE CAPACITY

The Human Resource (HR) capacity dataset contains institution-level information submitted by Ministries, State Agencies (SAGAs), State Departments, Research Institutions, TVETs and Universities. Data collected include: total staff, technical/research staff, support staff, educational qualifications (PhD, Master's, Bachelor's, Diploma), gender, age groups (≤ 50 , > 50), positions, and staff involved in RSTI activities (research, innovation, commercialization). These HR metrics were compiled to assess the workforce readiness to deliver on national STI priorities (e.g., R&D strengthening; talent development; and next-generation workforce) as per NACOSTI guidance.

The data in table 1 shows that a total of 57362 in-post staff as observed from the MDAs that reported for FY 2024/2025.

Category	Total In-post Staff	Male ≤ 50 Years	Male > 50 Years	Female ≤ 50 Years	Female > 50 Years
Ministries	694	207	224	176	87
Research Institutes	2,723	972	609	724	418
SAGAs	25,415	10,231	3,887	7,976	3,321
State Departments	5,521	2,112	939	1,684	786
TVETs	13,747	4,685	1,337	5,243	2,482
Universities	9,262	2,736	2,316	2,595	1,615
Grand Total	57,362	20,943	9,312	18,398	8,709



Data collected by NACOSTI from 324 MDAs highlights important dynamics in Kenya's STI workforce. The total staff across all MDAs is 57,362, with slightly more male (30,255) than female (27,107). SAGAs employ the largest share, followed by TVETs and universities, while ministries have the least. Most staff are aged 50 years and below, with male dominating this age group.

Table 2: Total staff per field of qualification in all MDAs by gender and age.

Field	Total In-post Staff	Male ≤50 Years	Male >50 Years	Female ≤50 Years	Female >50 Years
Agriculture and Veterinary Sciences	4,023	1,226	723	1,364	710
Engineering and Technology	11,422	5,159	1,834	2,973	1,456
Humanities and Social Sciences	29,273	10,564	4,452	9,728	4,529
Medical and Health Sciences	6,799	2,022	1,000	2,613	1,164
Natural Sciences	5,845	1,972	1,303	1,720	850
Grand Total	57,362	20,943	9,312	18,398	8,709

Across all MDAs, the total staff is 57,362, comprising 52.7% male and 47.3% female. The majority are in Humanities and Social Sciences (51%), followed by Engineering and Technology (19.9%), while Agriculture and Veterinary Sciences accounts for the least at 7%. Gender distribution varies by field: female dominate in Medical and Health Sciences (55.6%) and Agriculture and Veterinary Sciences (51.6%), while male dominate in Engineering and Technology (61.2%) and Natural Sciences (56%), with a near balance in Humanities and Social Sciences.

Educational Qualifications and Expertise Gaps

The qualifications profile further underscores the challenge. Bachelor's degree holders dominate at 23,650, followed by 10,392 with diplomas, 9,728 with master's, and 4,576 with PhDs. Less than 10% of staff hold doctoral-level expertise, yet such advanced skills are crucial for research leadership and innovation. Women remain underrepresented at higher qualification levels, particularly at PhD, where male staff outnumber female counterparts.

Table 3: Staff qualifications in all MDAs by gender and age

Education Level	Total post Staff	In-Male ≤ 50 Years	In-Male > 50 Years	Female ≤ 50 Years	Female > 50 Years
CERTIFICATE	9016	3414	1796	2678	1128
HIGHER DIPLOMA AND DIPLOMA	10392	3868	1522	3472	1530
BACHELORS	23650	9446	2558	8651	2995
MASTERS	9728	2910	1809	2972	2037
PHD	4576	1305	1627	625	1019
Grand Total	57362	20943	9312	18398	8709

CHALLENGES

Despite progress, several persistent challenges continue to hinder effective mainstreaming of STI in Kenya

1. Systemic weaknesses limiting effective STI mainstreaming.
2. Staff handling STI also hold other primary duties, reducing focus and accountability
3. High turnover and weak succession planning disrupt continuity of STI programmes.
4. Inadequate data management capacity leading to incomplete and inconsistent reporting.
5. Underutilization of digital platforms, slowing the shift to real-time, evidence- based monitoring.

These challenges weaken Kenya's ability to fully leverage STI for national development priorities

RECOMMENDATIONS

In view of these findings, NACOSTI calls upon all MDAs, County Governments, Universities, TVETs, and Research Institutes to take urgent and deliberate measures to strengthen human resource capacity for effective STI mainstreaming. To achieve this, the following recommendations are proposed:

1. Align recruitment processes with priority skills such as data science, research management, intellectual property, and emerging technologies.
2. Implement targeted training and certification programmes to:
 - i. Address gender gaps in STEM fields.
 - ii. Expand postgraduate and doctoral-level expertise.

- iii. Enhance data management capabilities.
- 3. Institutionalize structured succession planning and mentorship programs to ensure smooth knowledge transfer from senior staff to younger professionals, thereby safeguarding continuity and sustainability of STI programmes.
- 4. Allocate dedicated budgets for STI capacity development.
- 5. Strengthen partnerships with the private sector, universities, and international organizations to bridge technical skills gaps and promote knowledge exchange.

By implementing these measures, institutions will not only build stronger STI human resource capacity but also ensure sustained innovation, competitiveness, and national development.

CONCLUSION

Kenya's ambition to join the league of knowledge-driven economies depends on a strong and inclusive workforce for STI. Human resource and data capacity are not peripheral concerns, they are the backbone of a resilient STI system.

NACOSTI calls on all institutions to act decisively on this advisory and to report progress through established performance contracting frameworks. By addressing existing gaps, Kenya can position itself to emulate the success of the Asian Tigers and accelerate its transformation into a competitive, knowledge-based economy.