Global Center on AI Governance

AI in Africa: A Landscape Study

April 2025

Acknowledgment

This report was developed by the Global Center on AI Governance through its African Observatory on Responsible AI project. We would like to thank the following for authoring the report: Rachel Adams, Fola Adeleke, Leah Junck, Samuel Segun, Ayantola Alayande, Selamawit Abdella, Mark Gaffley, Fabio Andres Diaz Pabon, and Funbi Salami.

This report was made possible with funding from Meta.

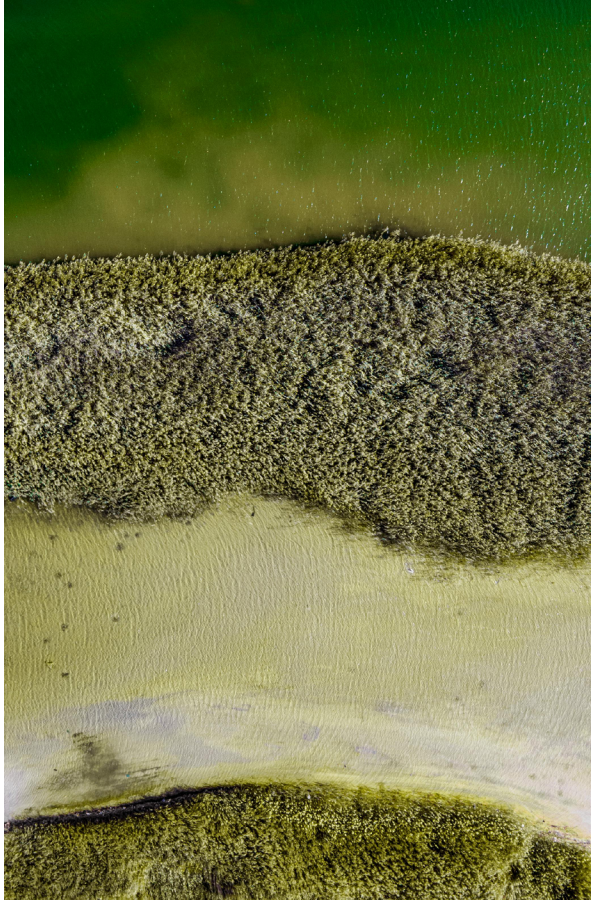
Executive Summary

This report analyses the current state of AI in Africa, including opportunities, challenges, governance, economic trends, and stakeholder roles. It highlights best practices for building sustainable and ethical AI systems to achieve sustainable and ethical AI systems through governance, implementation, and leveraging opportunities for collaborations.

Africa has a young, linguistically diverse and increasingly digitally literate population, which presents opportunities for Africans to be AI active innovators and informed contributors rather than mere consumers of technologies. Achieving this requires investment in adequate resources to strengthen local and regional agency, and enhancing digital skills. It also requires addressing the continent's dependency on other countries, extraction of material and human expertise and training data biases that misrepresent African contexts and perspectives.

Though comprehensive AI regulation is still nascent in Africa, there is an increased focus on national AI strategies, ethical guidelines and international collaborations. Over 40 countries have already established data protection and privacy laws, creating opportunities for harmonised regulations and a supportive environment for AI innovation. Key continental governance instruments and initiatives also include the African Union's AI Strategy, the African Continental Free Trade Area and the African Commission on Human and Peoples' Rights.

This report found that the increasing application of AI in key sectors across Africa, such as health, education, finance, agriculture, public services and the environment, necessitates a collaborative approach to ethical AI development and use. This requires addressing persistent infrastructural gaps, developing regional regulatory frameworks, investments in AI research and capacity building efforts as well as promoting multi-stakeholder AI governance initiatives. Key strategies identified include joint investment and funding, pooling resources and supporting sustainable and fair open-source projects, which will help direct efforts toward innovation and regional independence. Open Source AI models are particularly important in Africa where local tech startups can leverage global open-source initiatives to build context-specific solutions. However, concerns regarding data ownership, privacy and ethical AI deployment call for more robust policies for open source AI on the continent. To foster responsible AI innovation, African countries should establish comprehensive AI governance frameworks while adhering to existing laws as well as strengthen regulatory institutions to provide oversight over AI technologies. Regulatory sandboxing also offers a viable approach to enable sage experimentation with appropriate oversight. Regional and international cooperation as well as



leveraging public-private partnerships can promote funding for expanding AI research and development initiatives, resolve talent shortages and promote infrastructure development.

Africa has a unique opportunity to leverage AI, along with its resources and local young talent, for socioeconomic development. However, to ensure inclusivity and sustainable innovation, it is essential to address infrastructure challenges and establish regulatory frameworks that protect societal wellbeing. Embracing collaborative efforts, including open source initiatives, regional and international partnerships are critical for achieving the continent's ambitious goals without leaving anyone behind.

Table of Contents

List of Tables

List of Figures

Introduction

The development and use of artificial intelligence (AI)-based systems presents significant opportunities for African countries to enhance their economies and address long-standing socio-economic challenges. Across the continent, tech startups are increasingly leveraging AI to drive development. However, despite the promise, significant hurdles hinder widespread and effective adoption of AI on the continent. A major concern is the adequacy of governance frameworks, which are critical to creating an innovation-friendly environment and mitigating risks associated with AI, as well as ensuring effective integration into various sectors. Other barriers include infrastructure deficits, lack of skilled professionals and financial constraints.

This landscape study aims to analyse the current state of AI in Africa, focusing on both opportunities for and barriers to AI adoption on the continent. It provides a comprehensive examination of policy and regulatory frameworks, economic trends and the roles of different stakeholders in shaping the future of AI across the continent. The goal of this report is to support the growth of AI in Africa by identifying gaps in governance and investments and by providing strategic recommendations to address these challenges, setting out the building blocks for sustainable and ethical adoption of AI across Africa.

Structure of the Report

The report is structured into five chapters and contains comprehensive analyses of strengths, weaknesses, opportunities and threats within Africa's AI landscape to determine critical paths forward.

- **Chapter 1: AI Economy, Infrastructure and Skills in Africa** – this chapter offers a market analysis of AI in Africa and reviews its economic impact on various sectors, including trends in foreign direct investment. It scopes the state of Africa's AI infrastructure and skills landscape, identifying trends, opportunities and barriers.

- **Chapter 2: Open-Source Technology, Principles and AI Innovation in Africa** – this chapter explores the significance and value of open-source AI to accelerate responsible and inclusive AI innovation. It discusses critical open-source principles, including human oversight, accountability, transparency and fairness, and highlights several case studies where open-source AI has been deployed in service of the realisation of socio-economic goals in Africa.

- **Chapter 3: Policy and Regulatory Frameworks** - with a focus on developing a cohesive governance structure, this chapter investigates laws and policies on AI, data protection, cybersecurity, intellectual property and competition in Africa. It explores the extent to which these laws address emerging AI-related issues and recommends areas for improvement.

- **Chapter 4: Multistakeholder Governance and Financing** – This chapter highlights best practices in governance, including multistakeholder governance models, regulatory sandboxes, and public-private collaborations. It stresses national participation in regional and global structures and addresses the financing gap in advancing inclusive AI practices in Africa.

- **Chapter 5: Strategic Recommendations** – This chapter provides actionable recommendations for various stakeholders to guide development of governance frameworks that promote ethical AI development and use.

Methodology

This report uses a mixed methodological approach, conducting a comprehensive review of academic literature, industry reports and policy documents. It focuses on unique challenges and opportunities for AI with a focus on Africa's major economies where AI adoption and governance developments are strongest. Throughout, the report identifies positive use cases on how AI is being used to address economic and social challenges.

Chapter 1: AI Economy, Infrastructure and Skills in Africa

1.1. Unlocking Africa's Potential

1.1.1. Opportunities for Economic Growth

AI investment is becoming a growing portion of foreign direct investment (FDI) in Africa, particularly in key economies like South Africa, Kenya, Nigeria, and Egypt. Even though venture capital (VC) funding declined after 2022 consistent with global trends,[1] the surge between 2020 to 2022 shows an emerging development of AI across different industries and sectors.

Despite the OECD indicators that detail this trend having their limitations in capturing nuanced market trends and FDI flows, they do reflect overall growth and opportunities in Africa's digital economy. They also signal Africa's potential to become a more central player in the AI value chain, for instance in assuming a more prominent and sovereign role in supplying minerals essential for electronic components, renewable energy technologies, and digital devices that drive AI innovations.

Data labelling is worth highlighting as a key industry, offering employment opportunities alongside a growing demand for high-quality labeled and African language data. Ethical labour practices, fair wages, skill development, and measures for remedy and redress will be crucial to ensuring a stronger, more sustainable AI industry.

1.1.2. Economic Indicators

The African continent lags in AI readiness and adoption but recognition of AI's potential to address critical socio-economic issues is growing alongside urban populations and telecommunications coverage, as well as new use opportunities of AI.

Mobile technology growth is one of the foundational developments that open up more avenues for broader AI use and Africa is forecasted to have 438 million mobile internet users by 2030 (from 287 million in 2022). 4G connections are also expected to increase to 49% (compared to 22% in 2022), with penetration reaching 32% of the population (from 25% in 2022),[2] making for a much wider platform for accessing AI-powered applications and services across the continent.

Estimates foresee Africa's AI market size to grow to US$16.5 billion by 2030, mostly covering the use of machine learning, natural language processing, and robotics applications (Figure 1). Cloud technology adoption is already greater than the global average[3], with nearly 45% of workloads in African businesses stored in the cloud, outpacing other regions like North America (40%) and China (30%).[4]

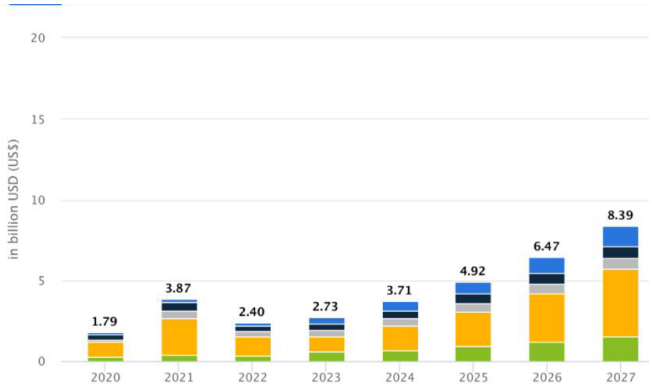


Figure 1. Market Size of AI in Africa Between 2020 and 2030 (in US$ Billion)
Source: Statista[5]

Currently, support for innovation, technological hubs and AI startups is mostly evident in Africa's biggest economies: Nigeria, South Africa, Egypt and Kenya.[6] Nonetheless, AI startups are budding in other areas and across different countries as well, illustrating the emergence of a market that is grounded in and responding to continental and local needs (Figure 2).[7]

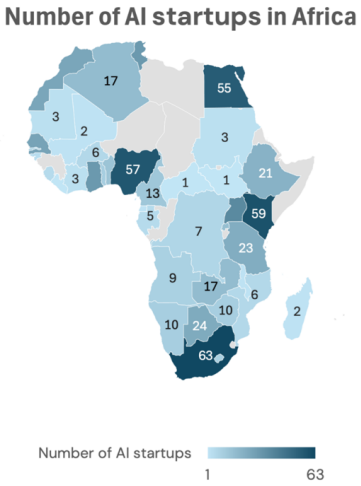


Figure 2: Number of AI Startups in Africa
Source: Elaboration of data from AfriLabs[8]

It is hoped that locally and responsibly designed technologies will lead to better financial inclusion by banking the un- or underbanked and supporting individuals and small businesses through microlending. In the face of infrastructural challenges, on-device

mobile agents may also allow governments and corporations to plug gaps in delivering essential services like education and healthcare.

Yet, for this to happen, hurdles to their successful adoption must be overcome[9] and the risks and benefits around employing AI tools, especially in precarious contexts, must be carefully weighed. This report discusses examples of just how AI applications are currently used in this developing market,[10] showcasing AI's potential to provide solutions tailored to the continent's unique needs.

The emergence of AI applications across Africa also provides insights into expanding user bases. The 2024 Stanford AI Index reports that 27% of Kenyans use ChatGPT daily and 42% weekly[11] and the Boston Consulting Group (BCG) that 38% of people in Morocco and 31% in South Africa actively use an AI-driven tool.[12] Consumers, institutions, companies and governments are increasingly integrating AI for content generation, public service delivery and business optimisation.[13]

Mapping AI applications in and for Africa shows corporate services, healthcare, education, agriculture and finance to be leading sectors.[14] In Rwanda and Ghana, AI-powered diagnostic solutions are used for improved medical imaging analysis while AI-driven educational tools are part of a young workforce development.[15] In Zambia, 60% of journalists use AI for text and multimedia analysis, chatbots, social media management, and transcription.[16] The health sector has the largest share of AI startups and research, followed by the financial, agriculture and education sectors (Figure 3).

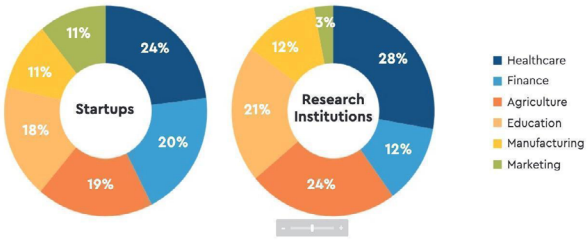


Figure 3: Sector of Focus of AI Startups and Research on AI in Africa
Source: Mapping AI Start-ups in Africa[17]

1.1.3. Demographic Dividend

The continent is not only projected to be home to one in five of the world's consumers of AI and close to 40% of the world population by 2100,[18] but to also have a stream of young and potentially more tech-savvy people entering the workforce soon. With them, the landscape of innovation and demands for AI-powered products and services are equally expected to accelerate.[19]

Connecting demographic growth of the continent to initiatives that allow for innovation and agency over how and when technology is being designed and deployed can open promising pathways to development. This necessitates sufficient job opportunities beyond the informal sector and fostering economic growth that can absorb a burgeoning workforce, as well as mechanisms that promote job creation, formalise labour, and expand educational access. Nigeria provides a good example, creating a program designed to train 3 million technical talents by 2025 and aims to build a workforce that is essential to the country's digital economy.

1.2. Addressing Infrastructure Challenges

Development and deployment of AI technology is hindered by considerable infrastructure shortcomings in much of sub-Saharan Africa. Development of AI is reliant on robust computing resources, steady electricity, high-speed internet and data storage possibilities, all areas that remain underdeveloped in the region. While this constitutes a challenge, it also makes for an opportunity to facilitate the continent's AI potential going forward.

1.2.1. Computing resources

Compute power is central to AI infrastructure, for instance in building large scale AI models. Africa is confronted with shortages of data centers as well as specialised hardware including Graphics Processing Units and Tensor Processing Units, which form an important part of large AI model training. Accounting for less than 1% of the world's data center capacity, the continent remains dependent on foreign cloud services which, in turn, increases operational costs and poses data sovereignty concerns.

Global semiconductor production is focused on competitive advantages and the underlying technology is mostly produced by large companies in North America, Europe and South-East Asia. Promisingly, data center development in sub-Saharan Africa is projected to expand and reach a value of $3 billion in 2025, which could drastically enhance Africa's computing capacity and attract investments.[20]

Affordability of hardware computer devices is still a challenge for many in sub-Saharan Africa; only 7.7% of households in Africa have a computer at home.[21] About 74% of the web traffic in Africa is still done via mobile phones according to 2024 data, which is 14% higher than the world's average.[22] Along with low internet penetration and unreliable connectivity, sub-Saharan Africa also still has some of the world's most expensive internet data prices as of 2021.[23]

Partially due to ill-informed attempts to address the inaccessibility or unavailability of these technologies by sending old computers and other devices, the e-waste problem is fuelled because many of these devices are beyond repair and end up in landfills.

1.2.2. Reliable electricity

AI requires consistent and reliable electricity, which is still a challenge for many sub-Saharan African countries where access is significantly lower than in other regions (Figure 4). Only about 50% of the population had access to electricity in 2021 with dependence on unreliable grids, a lack of alternative energy sources and the high energy cost impacting operations needed for computing and cooling. The intermittent nature of electricity supply in many African regions not only affects the reliability of AI systems but also increases operational costs through the need for backup power.

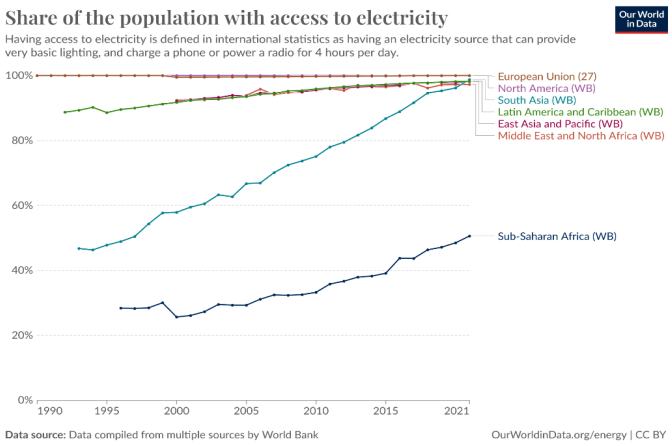


Figure 4 : Share of the Population with Access to Electricity
Source: Data from the World Bank and visualisation from Our World in Data

Renewable energy and better grid stability will be foundational for maintaining AI infrastructure and sustainability of the region for AI development. Indeed, some local AI startups are already exploring energy-efficient solutions and hybrid energy models to mitigate the impact of unreliable power.

1.2.3. Internet connectivity

High-speed internet is a similarly central element in building AI infrastructure and creating an enabling environment for AI development. Much of sub-Saharan Africa remains disconnected from the internet with East, Central and West Africa ranking at the bottom of the July 2024 global internet penetration ranking[24], averaging below 50% in internet penetration rate.

Various actors have made efforts to build Africa's infrastructure and more resources have been allocated to such initiatives.[25] New infrastructure projects, including the Equiano and 2Africa submarine cables, built in partnership with multinational corporations, are meant to increase bandwidth capacity. Further, satellite broadband initiatives are expanding connectivity in underserved areas.[26] Bridging the connectivity gap will accelerate AI adoption across the region. Nonetheless, gaps remain to date, reflected in the share of people in range of a 4G network in the continent (Figure 5).

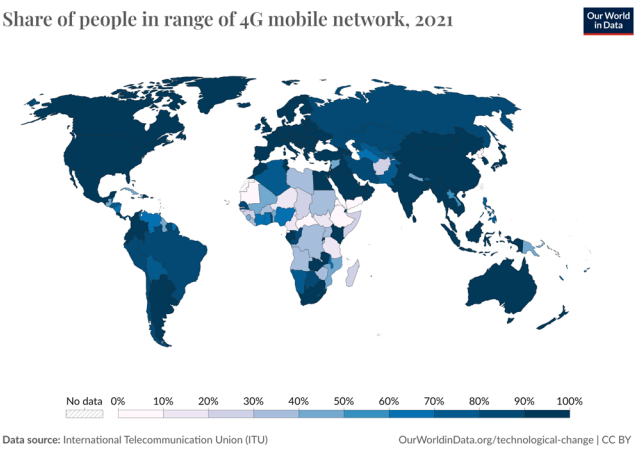


Figure 5 : Share of People in Range of 4G Mobile Network (2021)
Source: Our World in Data

1.2.4. Data Storage and management

Challenges also arise with Africa's data storage and management, impacting opportunities for AI development. The vast majority of the continent's IT content currently comes from abroad. This leads to concerns over data sovereignty and means data may become exposed to data protection breaches. Regional data centers will allow for the development of a local digital industry, lower costs, and improve the quality of services.[27]

The African Union's Data Policy Framework responds to this challenge and constitutes an effort to guide member states through complex regulatory issues and an overall promotion of intra-African digital trade, entrepreneurship, and innovation whilst ensuring data protection.[28] Meanwhile, the African Continental Free Trade Area (AfCFTA) makes provisions for data governance, data protection, cross-border data flows, and online consumer protection provisions in order to pave the way for digital trade across Africa.

Notably, the private sector has shown increasing interest in addressing these challenges as well with companies like Microsoft and AWS having launched data centre projects in Africa. Companies like Teraco and Raxio are also expanding data center infrastructure across the continent (in South Africa and Ethiopia), responding to a growing need of local and global enterprises.

1.2.5. Effects of Infrastructure on Economic Growth in AI

The infrastructure investments in the region may unblock bottlenecks for the AI market, but to what extent is yet to be determined and is contingent on how coordinated investment in computing resources, digital connectivity, and power infrastructure are - and how well they are supported by policy frameworks that encourage both public and private sector participation.

It is encouraging to see several African nations adopting innovative approaches to infrastructure development – for example edge computing solutions and mobile-first AI applications. This shows how African developers are prepared to deliver AI-powered solutions even within constrained infrastructural realities.

1.2.6. SWOT Analysis

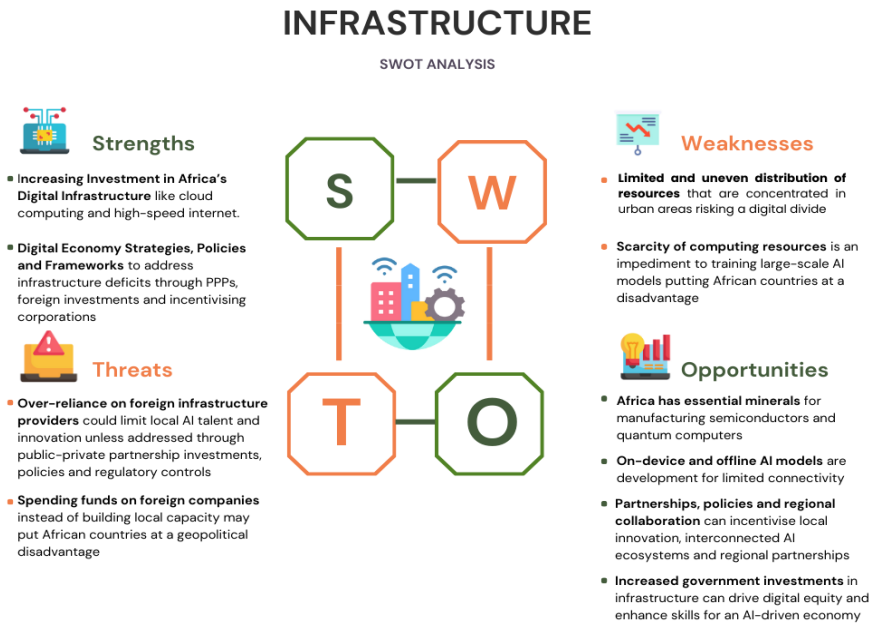


Figure 6: Infrastructure SWOT Analysis[29]

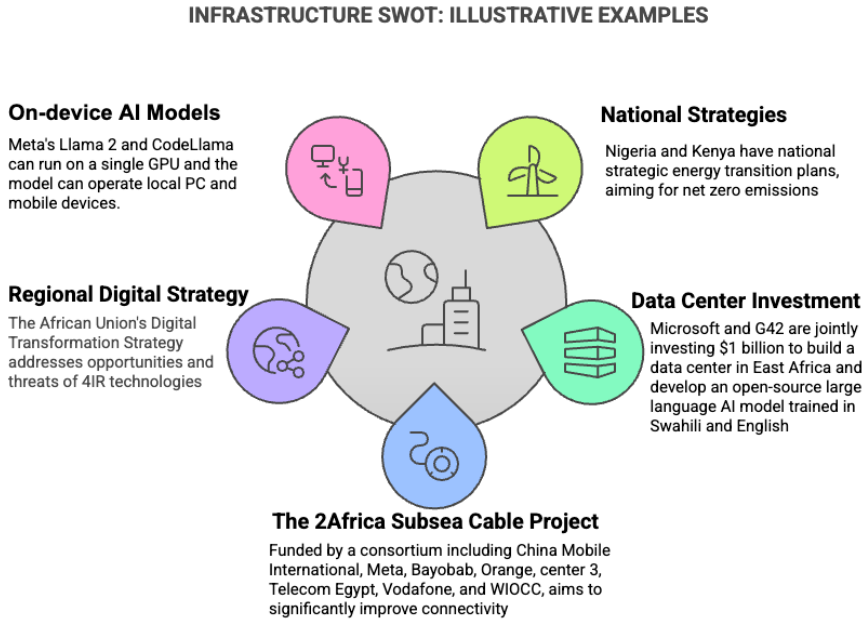


Figure 7: Infrastructure SWOT: Illustrative Examples[30]

1.3. Building a Skilled AI Workforce

An evident skills shortage within Africa's AI ecosystem limits the continent's capacity to effectively develop, deploy, and manage AI solutions. Critical gaps exist across technical, domain-specific, socio-cultural, and ethical and governance competencies.

A more obvious competency needed is technical skills and competencies, required to develop AI and apply high-tech, engineering and non-theoretical methods to solve problems. Aspiring AI professionals simply lack the basic proficiency in programming languages like Python, R, Java, or C++ and lack expertise in analysing and interpreting large datasets using tools like SQL and Excel. Also in short supply are machine learning skills, a foundational knowledge of algorithms, as well as competence in statistics and probability, all of which help inform data-driven decisions. Skills in software development, data engineering, and control systems like Git are similarly rarely spread.

Underlying these technical skills shortages - required to develop a workforce equipped to support AI infrastructure and operations - are broader educational shortcomings. A lack of education and training opportunities severely restrict the development of local talent with technical competency.[31] Sub-Saharan Africa has a critical shortage of people trained in STEM fields with an estimated 2.5 million additional engineers needed to address the region's development challenges. Infrastructural issues compound this issue. Nearly 80% of secondary schools in the region lack electricity, and most schools do not have adequate science laboratories. This means that the later pursuit of STEM careers is short-circuited very early on for a large number of pupils.[32]

Building on these foundations, there is furthermore a need to develop domain competencies - that is expert level knowledge of specific AI fields (such as healthcare, finance, education). Without people who understand the very specific challenges of their field of expertise who work in collaboration with technical teams, AI solutions that address specific local problems will not be developed.

What is more, socio-cultural competencies are perhaps less obvious but crucial in ensuring AI technologies are relevant, fair, and inclusive to people locally, taking into account cultural and contextual nuance, demanding the involvement of a variety of scholarly disciplines and participatory technology design accounting for local perspectives. A deep understanding of local norms, languages, understandings and expectations is central to limiting bias and building AI technologies based on actual rather than assumed needs. Similarly, ethical and governance competencies are necessary to navigate AI-related risks, human rights considerations, and regulatory frameworks. A lack of awareness of these issues can lead to the misuse or harmful application of AI technologies.

Africa's AI skill shortage is further reflected in low research outputs. Sub-Saharan Africa ranked last (Figures 8 and 9) in terms of AI conference and journal publications from 2010 to 2021, producing only 0.77% of AI journal publications and 0.60% of all AI conference publications.[33]

This, in turn, is linked to the limited capacity of educational institutions on the continent, funding for AI research being too scarce, and key infrastructural facilities that can produce high-level technical research not being sufficiently available.[34] Limited representation in AI research not only undermines local capacity to contribute to global AI advancements and perpetuates its reliance on external solutions that may be unsuitable for African contexts. It also means that local knowledge and insights do not become part of the wider knowledge economy.

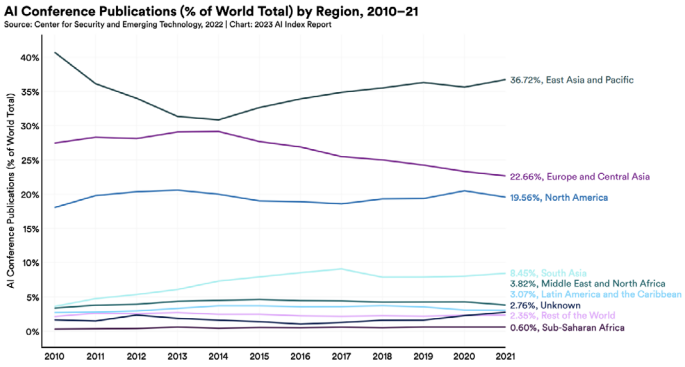


Figure 8: AI Conference Publications by Region (2010–2021)
Source: Artificial Intelligence Index Report, 2023

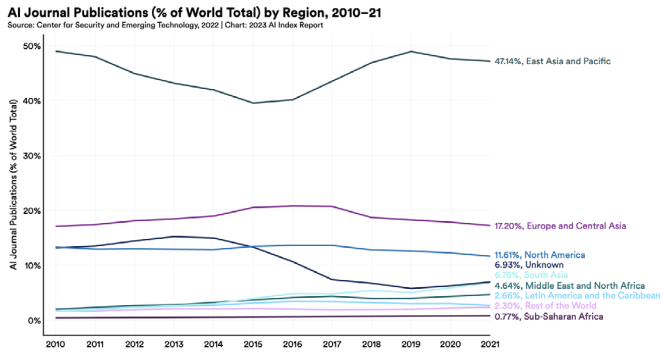


Figure 9: AI Journal Publications by Region (2010–2021)
Source: Artificial Intelligence Index Report, 2023

Despite these challenges, there are promising developments aimed at increasing the number of citizens who can benefit from and engage in the technological dividend. The African Institute for Mathematical Sciences (AIMS), for example, is Africa's first network of centers of excellence in mathematical sciences.[35] Likewise, Carnegie Mellon University (CMU) in Rwanda aims to create skilled labor cognizant of the

African context.[36] Although the number of developers are low even in the top six African countries in that regard (~94,000 in Ethiopia to ~868,000 in Nigeria), rates of annual growth are promisingly high and reach up to 45%.[37]

Notwithstanding and with global competition for global skilled labor intensifying[3839] leading to the "poaching" of skilled labour, questions persist about whether these and other initiatives will be able to produce enough trained talent to meet a growing local demand.

Foundational to addressing Africa's AI skill shortage will be a sustained investment in basic and specialised education, education infrastructure, as well as research. A skilled, self-sufficient AI workforce working towards locally-grounded goals will go a long way towards building inclusive AI and driving economic growth.

1.3.1 SWOT Analysis

Figure 10: Skills SWOT Analysis

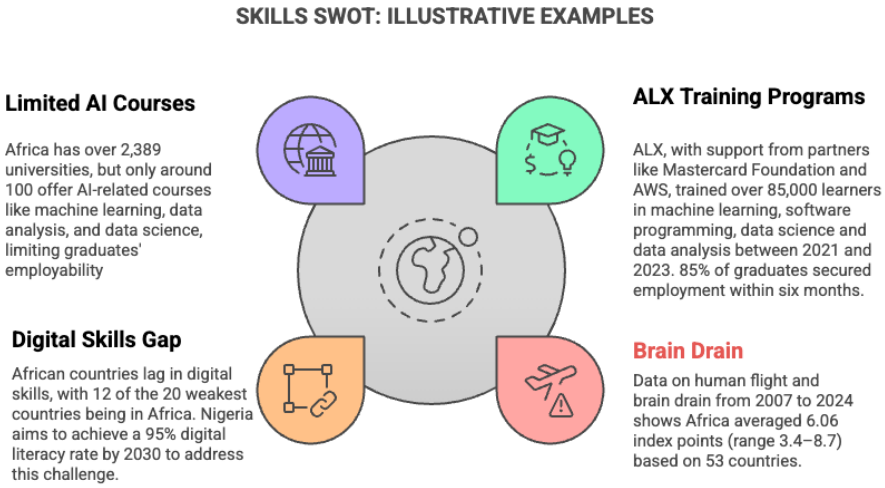


Figure 11: Skills SWOT: Illustrative Examples[40]

Key Takeaways and Future Directions:[41]

- As investments into African AI startups are growing, along with a projected market size of $16.5 billion by 2030, the AI sector becomes a promising ground upon which to build future realities and economic growth.

- Hubs in countries like Nigeria, South Africa, Kenya, and Egypt stand out as proactive innovators as well as other local initiatives. Emerging AI applications could become immensely useful in sectors such as finance, healthcare, agriculture, and education and, if well designed and made accessible, could be building blocks in a more concerted approach to substantiating infrastructure on the continent.

- Targeted investments and partnerships are needed to support public procurement and the current trend of growth, evidenced by startups and local AI hubs, increasing mobile and AI use, as well as local developments in health, finance and agriculture sectors, focusing on transparency, accountability and inclusive access to government contracts. Governments can help by prioritising local AI solutions while international partners should be cognisant of potential autonomy implications and power trade-offs for African countries.

- Infrastructural limitations lie at the heart of developmental hurdles for AI innovation – including scarce computing resources, insufficient data centers, unreliable electricity, and low internet connectivity. Both public-private partnerships that address this problem in a more sustained way combined with innovative approaches that make due with what is at hand in the interim (like mobile-first AI applications) will help overcome these hurdles.

- As building infrastructure and computing resources takes time, finding pathways to pooling and sharing infrastructure will support those at the beginning of their digitisation journey. Making sure knowledge sharing is facilitated and access to information is inclusive will be important.

- Public-private investments and strategic initiatives to enable affordable connectivity and develop sustainable, independent infrastructure—designed with both current and future needs in mind – can play a focal role in unlocking the continent's potential to become a critical manufacturer and exporter in its own right.

- The continent's many universities and its skilled diaspora can be leveraged as opportunities to build robust and inclusive AI knowledge ecosystems. Through targeted training initiatives, local capacity can be built and homegrown AI expertise nurtured across diverse sectors. This will require funding from international partners, advocacy from civil society for accessible training, multi-stakeholder support for programmes and national and public-private AI education initiatives.

- A human-centric, participatory AI economy requires not only individual expertise but also a widespread public understanding of AI, which is hindered by educational disparities For broader populations to engage meaningfully in discussions about the appropriate use of AI, it is crucial to promote AI literacy through public awareness campaigns emphasising both benefits and risks.

- The anticipated growth of 4G coverage and mobile internet users to 438 million by 2030 denotes a potential widening of AI adoption with improved connectivity through submarine cables and satellite internet projects providing for more access across populations.

- A reliance on data storage and management abroad comes with risks and possible repercussions in terms of sovereignty and data ethics. The African Union's Data Policy Framework and private sector investments are steps towards mitigating this.

- A critical challenge that requires a long-term vision and approach is the development of a skilled and inspired workforce. An existing shortage of AI talent continues being aggregated due to inadequate STEM education, limited access to specialized training, and efforts to include social perspectives into AI training. Initiatives like Nigeria's 3MTT Program and the Artificial Intelligence Institute of South Africa are inspired, targeted efforts to build towards sustainable local AI ecosystems and become globally competitive.

- For an AI economy to be considered sustainable, wages have to be fair, labour practices ethical, and AI development inclusive. Ensuring that emerging AI technologies are built with an awareness of local context and cultural nuance at their centre and their ability to address challenges within the region requires the integration of different perspectives – scholarly and representationally.

- Making sure all these challenges are accounted for and existing building blocks maximised, stakeholders must focus equally on providing guiding policies and taking active steps towards capacity building and strengthening. International collaboration and cross-border knowledge exchanges must be drawn on to support local innovation and responsible AI adoption geared towards long-term growth and societal impact.

Chapter 2: Open-Source Technology, Principles and AI Innovation in Africa

2.1 Introduction to Open-Source AI in Africa

Open-source AI offers a pathway to democratize AI innovation, reducing reliance on expensive proprietary technologies. This is especially crucial in low-resourced regions like Africa. With open source frontier models, African innovators have become incentivized to build context specific solutions in critical sectors[42] addressing local challenges. Similarly, open-source models have significantly reduced the cost of AI-powered solutions.

Open-source AI lowers the entry barrier for developers in low-resourced areas by providing access to highly efficient and high-performing models. These models would typically not be publicly available and would require substantial investment in research and development. With lower barriers to entry, Africa's open-source community has seen a significant boost; for example, between 2022 and 2023, Rwanda and Nigeria experienced more than 45% increase in developers[43].

Open-source AI in Africa has also received considerable support from large corporations like Orange Telecommunications, which has pledged to integrate African regional languages into LLMs to advance digital inclusion across the continent[44]. Additionally, the telco giant committed to fine-tuning OpenAI's open-source speech models and Meta's Llama 3.1 and providing the fine-tuned models in open source for non-commercial use.

2.1.1. Key Benefits of Open-Source AI

- Open-source AI has become key to the discourse on democratising AI innovation. By providing local developers with a free collaborative platform to learn, use, share, and build, open-source AI creates opportunity for a wider community to participate in the development process, increasing competition and transparency.
- Open-source AI models enhance accountability and transparency. By opening access to a broader community of technologists and researchers, AI models can be better scrutinised for bias, assessed for vulnerabilities and evaluated for safety, thereby enhancing the model's fairness and security in general. Proprietary models are more difficult to scrutinise, and even when companies make extensive efforts to obtain a breadth of perspectives, these closed systems often lack the transparency and rich input that an open-source platform attracts.
- Open sourcing AI systems promotes inclusivity and engages a diverse community of both technical and non-technical stakeholders. Open-source AI models hold significant promise for African countries in particular.[45] Given the continent's massive linguistic and cultural diversity, open-source AI is a more efficient way for developers to build contextually relevant models without needing to gather resources from scratch amidst the continent's infrastructure constraints. A practical example of this is the Masakhane community,[46] a grassroots, continent-wide community of African researchers working to strengthen NLP research in African languages through open-sourcing (more details in section 2.3.2).
- Open source AI accelerates innovation, growth and competition. By making AI models open, developers, companies and AI research communities can overcome entry barriers and build niche products without requiring extensive infrastructure; this enhances frugal innovation and competition.
- Open source AI models offer cost-effective solutions for innovators. A 2024 Harvard Business School working paper[47] on open-source software systems revealed that businesses using open-source can save a significant amount of money. The demand-side value for these businesses was estimated to be approximately US$8.8 trillion[48], demonstrating the real cost-saving effects of open sourcing AI models.

2.2 Principles and Challenges of Open-Source AI

In October 2024, the Open-Source Initiative released a set of criteria for deeming an AI model open source: its creators must permit the public to freely use, study, modify and share several components of its systems, including training data, metadata of training data, provenance mechanisms and procedures for re-obtaining training data; source docs; and model parameters.[49]

Another consideration in categorising open-source models is licensing mechanisms — including the type of usage permitted and restrictions on the number of users. In this regard, it is important to differentiate between open-source AI and other types of licensing models, such as custom licences that provide specific conditions of usage for a project or organisation or Creative Commons agreements that allow free and open sharing of AI-related papers and datasets but under varying degrees of permissions.[50] At its core, open-source AI provides licences that allow modification and distribution of a model's source code and provide a community of support for transparency

and accountability. The following section will explore the fundamental principles that underpin open source.

2.2.1. Core Principles

To navigate risks and ensure equitable distribution of benefits, clearly defined frameworks and principles for open-source governance are crucial. In addition, setting clearly-defined open-source principles that include data provenance and traceability helps to mitigate potential IP challenges relating to data usage. The following discussion highlights important principles for open-source AI.

Accountability: Accountability in open-source AI systems is complex because the process of developing open-source AI systems is collaborative and dispersed, often involving multiple contributors across different legal jurisdictions. Regional frameworks, such as the EU AI Act, take a provider accountability approach[51] In regulating AI systems generally, that is, the individual organisations developing, deploying or operating AI systems are held accountable for the outcome of the systems. As Africa does not have a unanimous and continentally binding legislation on governing AI, individual country AI frameworks must spell out approaches for holding open-source AI systems operators and developers responsible for the outcomes, especially when they are used in critical public infrastructure or critical sectors like health or security.

Transparency, Fairness and Explainability: Open-source AI systems naturally lend themselves to transparency due to the public availability of their code, but challenges remain in ensuring that these systems are also fair and explainable. The EU AI Act and the OECD AI Principles require AI systems to be transparent and explainable. Africa can adopt similar frameworks, perhaps within the context of the AU AI Strategy, to ensure that open-source AI systems are not only open but also explainable and free of bias, thus supporting equitable development across the continent.

Community: Community stands as a core principle of open-source, fostering collaborative development and knowledge sharing[52]. It's the collective effort of diverse individuals, from developers and researchers to users, that drives innovation and ensures the sustainability of projects. This collaborative spirit promotes transparency, peer review, and the rapid iteration of ideas, ultimately leading to more robust and adaptable AI solutions. The strength of an open-source project is often directly tied to the engagement of its community, making it an essential element for democratizing AI.

Impact and Risk Assessments: Risk and impact assessments are critical in identifying and mitigating potential harms from AI systems before they are deployed. Open-source AI allows greater scrutiny of models but requires comprehensive frameworks to assess risks to society, privacy and fairness. The EU AI Act requires such assessments, and in Africa, emerging national AI strategies can integrate mandatory impact assessments,[53] ensuring that open-source AI applications are responsibly tested and evaluated before large-scale use.

Data Governance: Effective data governance is critical for successful deployment of open-source AI systems. Although many African countries have data exchange restriction policies (e.g., Nigeria restricts access to subscriber data and Kenya prohibits unauthorised transfers of public data),[54] initiatives like SMART Africa and the African Union's Data Policy Framework are beginning to focus on creating a harmonised approach to data exchange[55] across African countries, which is crucial for AI systems that rely on diverse datasets.

Public Procurement: Government Open Data Initiatives: Open-source AI systems thrive on the availability of high-quality, open datasets. The availability of public data through open data initiatives reduces key intellectual property controversies that arrive from private data use. The Open Government Partnership (OGP) is a global initiative with active buy-in and participation in many African countries. By encouraging national open data policies and facilitating multistakeholder exchange of data between governments, civil society, private sector and the media,, the initiative aims to foster transparency and innovation in governance. Concrete data projects that have come out of this initiative in Africa include the OGP Multi-Donor Trust Fund (MDTF) partnership with the World Bank,[56] whose key components include making public contract data (and metadata) available in receiving countries. Accessibility to this kind of resource provides fertile ground for developers and researchers to build tailored AI solutions for public service delivery.

Awareness and Literacy: Awareness and literacy are essential for enabling stakeholders across Africa to understand and leverage the potential of open-source AI. To ensure widespread adoption and responsible use of open-source AI systems, public education must be driven by multiple stakeholders. A few non-governmental initiatives already carry out this function, but government-led open-source frameworks are limited on the continent.

Foundational AI-related policy frameworks such as the AU Continental AI Strategy[57] and the African Digital Transformation Strategy (DTS)[58] emphasise digital literacy as key pillars of Africa's digital transformation ambitions. Open-source AI solutions developed by the private sector should be strengthened by publicly owned documentation and resources as well as government investment in open-source AI research

and data exchange initiatives.

Human Oversight and Algorithmic Decision-Making: Human oversight is a key requirement to ensure that algorithmic decisions do not cause harm, particularly when AI systems are used in critical areas like healthcare or justice. Frameworks for model auditing are the major vehicle by which human oversight is carried out on AI systems. Open-source AI has a unique transparency advantage as training codes and data can be audited by anyone for bias and errors. As many African governments do not yet have AI legislation, policymakers have a unique opportunity to work with grassroots open-source communities and initiatives (see section 2.3.2) in developing algorithmic auditing frameworks that do not stifle innovation.

Harm Avoidance, Safety, Security and Reliability: Open-source projects allow broader peer review, which can lead to more robust and secure AI systems. However, they are also vulnerable to manipulation or misuse. Ensuring that open-source AI – and all AI systems in general – are safe, secure and ethical is central to any governance framework – including the AU Continental AI Strategy. Minimising AI risks is one of the core pillars/dimensions of the AU AI Strategy, although the strategy overall takes a risk-conscious approach, highlighting key areas that require attention such as risks of exclusion, bias, discrimination, data misuse, and surveillance risks. Although there is no particular focus on open-source AI systems, the Strategy incorporates ethical guidelines that address how to minimise risks listed above. Individual countries implementing the AU AI Strategy would need to include security standards for open-source AI applications, especially in sectors of national importance.

Access to Remedy and Redress: First contextualised by many as a proposed component of the EU's AI Act, access to remedy and redress is a right-based AI principle that allows individuals or groups to seek justice when they are negatively impacted by AI systems. This approach calls for both governments and private sector players to develop mechanisms for reparation, accountability and prevention for both individuals and collectives who are at high risk.[59] While many government frameworks make provision for algorithmic audit and oversight, these mostly do not address issues of remedy and redress. Even well developed regulatory frameworks such as the EU AI Act make very sparing reference to remedy and redress as a form of consumer protection policy. At present, this principle has been championed mostly by civil society organisations.

2.2.2. Challenges and Mitigation

- Despite its benefits, open-source AI is not without drawbacks,[60] such as its susceptibility to misuse by malicious actors who may be able to remove its safety features, fine-tune it for abuse or deploy it for surveillance purposes[61]. The lack of rate limits and mechanisms for monitoring misuse and bias is another commonly cited concern.
- Risks of cyberattacks increase with widened access, where control and modification powers to codes are decentralised and dispersed. These risks are particularly heightened in the African context, where many tech startups lack the technical resources required to mitigate large scale AI-powered or AI systems-targeted cyber attacks.
- Strategies addressing the challenges of open-source AI models discussed above could include red teaming & vulnerability research, implementing watermark methods to track models provenance, enforcing differential privacy and federated learning practices, as well as community-driven security audits. Additionally, capacity building, bias detection and mitigation, rate limit implementation and establishing an ethical guideline and framework could also serve a viable strategy to ensure that open source AI models maintain robust security.
- Open-source systems pose challenges to accessing remedy and redress because accountability within open models can be diffused across multiple contributors. Policy frameworks like the Access to Remedy and the Technology Sector[62] framework by the UN Human Rights Office is a good starting point. In Africa, updating both the African Union's Data Policy Framework and the Continental AI Strategy could help establish clearer lines of responsibility in the use of open-source AI, especially when these systems are developed and owned by companies based outside of the continent who largely operate under different legal jurisdictions.

2.3 Global and Local Initiatives

Open-source AI has the potential to empower individuals and communities across Africa by providing access to cutting-edge technology at low cost. Ensuring agency and inclusion means that AI tools must be accessible to a diverse range of people, from marginalised communities to small businesses. Open-source AI systems can play a key role by offering customisable and locally relevant solutions, such as the development of NLP resources for African languages. However, these initiatives must be supported by policies that ensure equal access and encourage diverse participation.

Despite the resource and technical constraints limiting the development of homegrown AI models on the continent, the number of tech and AI research communities championing open-source AI in Africa has increased. Many of these are indigenous – such as the well-known Masakhane community, while others are

well-tailored domestication of open-source initiatives from elsewhere.

2.3.1 Global Initiatives with African Impact

Several global open-source AI initiatives have been domesticated in Africa or have applicability for the continent, a few of which are discussed below.

The Principles for Digital Development: The Principles for Digital Development encourages policymakers, practitioners, and technologists to share and improve upon existing initiatives for resource-efficient and streamlined approaches to technology development, research and policies. This requires a systematic approach, which is facilitated by open standards, using open-source software and contributing to open-source communities.[63] Big Data applications often require large amounts of data that is not always available for companies, and a standardised data sharing mechanism, alongside data sovereignty is critical.[64] Shared governance mechanisms for digital public resources provide a set of common principles and interoperable policy tools for a multi-stakeholder approach enabling global South countries to access skills and resources while protecting vulnerable communities from data misuse. Human-centered data policies ensure regulatory parity for data justice, enhancing international cooperation, reducing information and power inequities and reducing harms by upholding data as a public good.[65]

Global Open Data for Agriculture and Nutrition (GODAN): The Global Open Data for Agriculture and Nutrition (GODAN) initiative is a framework that has increased organisations' commitment to open data principles and generating political will via policy commitments, enhancing accessibility and usability. GODAN has contributed to a variety of tools, policymaking and research outputs but is limited by its inattention to marginalised communities, which may have the inadvertent impact of disproportionately benefitting multinational agribusiness corporations.[66]

TensorFlow's African User Groups: TensorFlow User Groups (TFUGs)[67] are a community of ML engineers, data scientists, researchers and AI enthusiasts who use and contribute to TensorFlow and are passionate about open-source AI frameworks. TensorFlow itself is one of the most popular open-source AI libraries. TFUGs have been formed in 9 African countries, namely Côte d'Ivoire, Egypt, Kenya, Lesotho, Morocco, Nigeria, Rwanda, and Tunisia.

Open for Good: Launched in 2021, Open for Good is a consortium of organisations and university research centres in Africa and Asia working to improve open access to quality localised AI training data. The consortium works in 3 key areas to advance open-source AI: making their training data openly accessible; facilitating shared best practices in the development of open-source AI systems with focus on training data and open AI development; and promoting public awareness on the benefits and risks of open-source AI. African members of the alliance include universities such as the American University in Cairo; Makerere University, Uganda, University of Cape Coast and Kwame Nkrumah University of Science and Technology, Ghana; the African Institute for Mathematical Sciences, South Africa and the Centre for Intellectual Property and Information Technology (CIPT) Law at Strathmore University, Kenya.

Meta's Llama Impact Awards: Meta is one of the few big AI companies that has made their AI model open-source[68] , encouraging AI practitioners and developers to build innovative solutions to the unique challenges facing the continent. Meta's Llama AI models have also expedited the growth in use of on-device AI models, which is particularly useful in low-resourced regions. In September 2024, it announced the inaugural recipients of the Llama Impact Grants and the Llama Impact Innovation Awards.[69] Both are given to AI companies using Meta's open-source model, Llama, to develop innovative solutions around societal challenges. These recipients include several African-based organisations (discussed in section 2.4). One well-discussed challenge with major LLMs around the world is the lack of representation of African and other non-Western languages in the training data. Meta's No Language Left Behind[70] is addressing this challenge by open-sourcing AI models that offer direct translations between languages and allow users to share information in their local language. While the benefits of this partnership to African countries are numerous, there are concerns around helping domestic innovators navigate data privacy challenges and the "tension between openness and agency"[71] as well as ensuring scalability and sustainability beyond Llama.

FAIR Forward AI for All: The FAIR Forward AI for All[72] project is the German Development Corporation's flagship initiative on AI for development. The project aims to advance inclusive and open application of AI for sustainable development. Several aspects of the project champion open-source AI systems on the African continent: Mozilla Common Voice, the Atingi e-Learning Platform, the Lacuna Fund, and open-source satellite data for AI development.

Mozilla Common Voice[73] is a FAIR Forward AI for All collaboration with Mozilla. Launched in 2019, the initiative works to support the development of open voice data and open voice technologies in East Africa (Uganda, Rwanda and Kenya). In many ways, Common Voice projects contribute to open-source AI systems in Africa by making voice-based AI more inclusive, free to access and open. One of the initiative's success stories is the Mbaza AI Chatbot[74] in Rwanda, which used NLP to provide free-to-access public health information to Rwandans during the COVID-19 pandemic.

In collaboration with Makerere University in Uganda and the SMART Africa Initiative, FAIR Forward has developed an e-learning platform, Atingi,[75] which provides training on open and unbiased AI training

data for African developers.

The Lacuna Fund is regarded as one of the world's first funder-led collaborative efforts that provides quality machine-readable and unbiased data sets to AI developers from low-income contexts. The German Ministry for Economic Cooperation and Development (BMZ), through the FAIR Forward programme, provides support for African language data. Apart from funding several African AI initiatives, the Lacuna Fund also publishes openly accessible AI training data developed by grantees, including four new African language datasets in the domains of agriculture, health, NLP and financial services published in March 2024.[76]

Partnering with Radiant Earth - a member of Open for Good – the FAIR Forward project utilises earth observation (EO) data to develop ML training data and frameworks for climate change mitigation. The data from this project is openly accessible, and the initiative organises bootcamp hackathons on using open-source EO data to develop AI products addressing food insecurity on the continent.[77] Emerging outputs from this initiative include crop classification projects in Ghana and South Africa.[78]

2.3.2 Indigenous African Initiatives

Several indigenous initiatives are championing open-source AI development. Many focus on a subset of open-source AI – such as data curation – and most are communities of practice involving individuals and startups.

The AI startup community in Africa has networking initiatives such as the AI Expo Africa, Data Science and AI Summit for Health in Africa and the Deep Learning Indaba annual gatherings. These platforms provide a space for recognising ongoing efforts, co-learning, collaboration and developing local leadership for African-led AI.

Masakhane: Masakhane[79] is a pan-African grassroots organisation working to strengthen open-source NLP research in African languages, for Africans, by Africans. The community consists of participants from over 30 African countries from diverse backgrounds and 3 from outside the continent, addressing "low-resourceness" as a societal issue that can be tackled through participation. It aims to build helpful tools that can be applied in addressing social needs, preserving cultural diversity and ensuring Africans' representation in emerging technologies. Since its establishment in 2019, more than 35 Masakhane contributors on GitHub have provided more than 49 translation results in more than 30 African languages.

Code for Africa (CfA)'s Open Africa Platform: Launched in 2016, CfA's Open Africa Platform[80] is one of the largest open data exchange platforms on the continent. While the platform is not specifically an AI platform or community, its repository contains several kinds of data that can be used to train AI models.

Zindi: Similar to Masakhane, Zindi[81] is an indigenous community of African data scientists and ML practitioners who collaborate and share ideas on building Africa-centric AI products. While Zindi's focus is mainly on training and skills development, its members have often developed innovative solutions using open-source datasets. For example, using openly accessible historical satellite data, members of the Zindi community have built[82] an open-source model for predicting urban air quality in Africa.

Lelapa AI: Lelapa is a community-driven, Africa-focused organisation that works to advance AI solutions grounded in African values. One of its flagship products, InkubaLM,[83] is the first open-source multilingual language model on the African continent. In advancing its goal of boosting the representation of African languages in the global ML community as well as empowering the African AI community, Lelapa has made access to the models' dataset and other resources open. The model is trained on five indigenous and low-resource African languages, namely Hausa, isiXhosa, isiZulu, Swahili, and Yoruba.

Ghana NLP: Ghana Natural Language Processing (Ghana NLP)[84] is an open-source tech organisation working to advance NLP frameworks in Ghanaian languages, beginning with Twi, the most spoken language in the country. The initiative is similar to Masakhane and Zindi in outlook but with an explicit focus on Ghana. Some of its key progress so far includes a computational mapping of Ghanaian languages and developing an AI-powered app for translating Ghanaian languages.

HausaNLP Research Group: With a philosophy similar to Masakhane's, the Hausa NLP Research Group is an open-source community of ML practitioners working to promote research on HausaNLP frameworks. With Hausa language facing severe underrepresentation on the internet and in ML models despite being the most spoken language on the continent, this group works to develop Hausa resources through open research collaboration and knowledge sharing on GitHub.[85] The team is led by researchers mostly from Bayero University, Kano, Nigeria as well as other universities in Nigeria and in diaspora.

KenCorpus: Jointly established by Maseno University, the Africa Nazarene University and the University of Nairobi in Kenya in 2021, KenCorpus works to develop NLP resources for African languages. Mainly covering three indigenous Kenyan languages - Swahili, Dholuo and Luhya – the Kencorpus' dataset comprises over 4,000 text files and more than 1,000 audio files. As of 2022, the project has developed several classification tasks for more than 5 million words in these local languages. [86]

Other grassroots communities: Several other smaller locally led communities[87] are also championing open-source AI systems through training and skills development, data sharing and collaborative project

building. These include the Open Data Science Conference (ODSC) Lagos, a spinout of the popular annual ODSC conference that convenes practitioners within African open-source communities to learn through workshops, conferences and trainings on open-source language training data; PyLadies Nigeria, a similar initiative focused on Python users; and the South Africa IBM PowerAI Community. Given this background, the next section examines some AI use cases developed using open-source models and/or that are open-source systems themselves.

2.4 Open-Source AI Use Cases in Critical Sectors

A selection of use cases across various sectoral groupings are examined below.

Health: HelpMum – a social enterprise based in Lagos – has used Meta's Llama 3 to develop an AI vaccination and immunisation tracker known as Vax-Llama.[88] Vax-Llama provides up-to-date information on vaccination for its users. Both the model inputs and outputs are open-source.[89] A similar initiative called PROMPT[90] by Jacaranda Health - a Kenya-based social venture – is an automated digital health service that provides maternal healthcare information through SMS nudges and AI-powered clinical healthcare to pregnant mothers in Eswatini, Ghana and Kenya. Before PROMPT, Jacaranda Health had trained Meta's Llama2 to launch UlizaLlama, an open-source LLM that provided AI-driven maternal and newborn child health education support in multiple African languages, including Swahili, Hausa, Yoruba, isiXhosa, and isiZulu.

Education: Using Llama 3, Tanzania AI Community has developed Twiga, an AI chatbot, addressing the educational resource gap by providing teachers with contextually relevant educational content and assisting them with curriculum development and assessment. Twiga's source code and resources are openly accessible on GitHub.[91]

Built by Kwame-AI, Brilla AI is an open-source project developed to compete in the National Science and Maths Quiz (NSMQ) Ghana. The product debuted in 2023, when it performed better on a few questions than the contestants in the grand finale of the 2023 NSMQ. Brilla AI is open source in both input and output, with the training data built from a 10-year-long dataset of past NSMQ contests and then fine-tuned on Open AI's open-source model Whisper and proprietary model GPT 3.5.[92] The project's documentation – including codes and datasets – is openly and freely accessible on GitHub.[93]

Agriculture, Food Security: In Kenya, FarmDrive uses a combination of open data from a variety of sources — such as satellite data from the European Space Agency — to build up farmers' credit profiles and help them access financial services. By combining behavioural data from farmers with EO data relating to leaf area index, weather data and soil health, FarmDrive is able to build a predictive model that assesses the potential and risks of providing credit to Kenyan small scale farmers.[94]

Using deep convolutional neural networks, a team of researchers at the Consultative Group on International Agricultural Research (CGAIR),[95] developed Tumaini, a disease classification and detection system for banana crops. The model was trained on data from different farming spots in Africa and India as well as an open-source general purpose dataset from COCO (Common Objects in Context) and is publicly accessible in the TensorFlow library. While this project is not exclusive to Africa (it is also being used in Colombia, China and India), the vast majority of users are African farmers. Results from this initiative were published in the Plant Methods journal.[96] Similarly, the Local Development Research Institute, based in Kenya, has developed a WhatsApp-integrated early warning chatbot for crop disease prediction and yield estimation. The system is based on primary agricultural and household data combined with satellite data. Both the data and the output for this product are open-source.[97]

Combining Llama 3 with a vast array of agricultural data, Digital Green, an AI for agricultural extension company, is developing Farmer Chat, a multilingual chatbot that aims to provide bespoke agricultural information services to smallholder farmers in Africa using local languages such as Swahili and Kikuyu.[98] A similar product, PhosoAI in Malawi, also uses Llama 3 to provide information on agricultural services and food prices to the public using Chichewa language and through an incorporation of speech commands.[99]

M-Omulimisa in Uganda offers the AI-based yield forecasting tool "Croppie" to smallholder coffee farmers and cooperatives in the country, which integrates digital platforms and mobile money to facilitate lending for agricultural inputs and farming tools in partnership with Alliance Bioversity-CIAT and Producers Direct.[100]

Climate Change and the Environment: As part of the AI for Climate Action Innovation Research Network funded by the AI4D, a project based at the Kwame Nkrumah University of Science and Technology (KNUST),101 Ghana, is developing a web-based AI-driven open-source system for predicting groundwater availability. Based on a publicly available environmental, physiographic and geological database, this research lab is developing an AI framework that allows integration of several data sources for groundwater level assessment. The product is an open-source and web-based application.

AirQo – a recipient of the 2024 Mozilla Technology Fund[102] – has developed an open-source air quality prediction algorithm, based on EO data from seven African cities. The initial product for this project was a digital platform that allows for quick access to air quality data analytics and a mobile app for air quality

monitoring. However, the project has since scaled to include a low-cost air quality hardware sensor[103] that is now in use in several African countries. The open-source repositories for this project are freely accessible on GitHub.[104]

Key Takeaways and Future Directions:

- The bulk of AI use cases on the African continent focus on addressing challenges in critical sectors such as agriculture, health, education and the environment. This is in line with the recently published AU Continental AI Strategy,[105] which identifies these as priority sectors in AI development.

- AI applications in Africa can be classified as using AI for social good. A 2024 report by GSMA,[106] which mapped AI for development use cases in Kenya, Nigeria and South Africa, shows that 59% of AI for development platforms examined in these countries were developed by indigenous companies. Of these, 70% were products or services, 22% were projects and programmes, and 8% were at the pilot stage. An overwhelming 97% fell in the category of traditional and predictive AI, with generative AI being a recent but rapidly evolving landscape. A plausible explanation for the paucity of generative AI products is that it requires extensive compute and technical resources as well as quality training data, which many African countries lack.

- Open-source AI is particularly important in low-resources regions like sub-Saharan Africa because it reduces the financial barriers to AI adoption, enabling developers and researchers to access and utilize advanced technologies without prohibitive licensing costs. Similarly, it allows for the customization of AI solutions to address specific local challenges, such as developing AI models tailored to African languages or agricultural practices.

- The principles that undergird open-source initiatives is useful in guiding the development of open-source AI models. For instance, transparency and collaboration are fundamental, allowing for community-driven development and peer review, which enhances the quality and reliability of AI models. Also, the freedom to use, modify, and distribute these models promote innovation and ensure that AI technologies are accessible to a wider range of individuals and organizations.

- African innovators can develop context-specific solutions if they have access to relevant technological tools. For instance, several African tech startups have benefitted from global open-source initiatives such as the Llama, BLOOM, and Meditron (an open-source medical LLM) [107] and have built solutions for critical sectors. Addressing challenges within these critical sectors show potential for scaling AI use across the continent.

- Despite the many benefits, open-source AI models are fraught with challenges. In Africa, infrastructure limitations, including inadequate access to computing power and reliable internet connectivity, still pose significant obstacles to the effective use of open-source AI. Additionally, concerns regarding data sovereignty and ethical AI deployment require robust regulatory frameworks to ensure responsible and equitable use of AI technologies.

- The future direction of open-source AI on the continent requires policy development for data sovereignty and ethical use. This requires governments to prioritize developing clear and robust policies regarding data ownership, privacy, and ethical AI deployment.

- More capacity building and infrastructure investment is required to strengthen international collaboration and knowledge transfer. African governments have to invest in education and training programs vital to building local AI expertise. This includes strengthening STEM education, providing access to computational resources, facilitating partnerships among African institutions and international open-source AI communities to accelerate knowledge transfer and resource sharing.

Chapter 3: Policy and Regulatory Frameworks

3.1 Introduction to AI Regulation in Africa

Even though the governance of AI is an emerging area globally, Africa still lags behind its counterparts. Data from the 2024 GIRAI[108] (Figure 12) indicating the percentage of African countries with mechanisms for safety, accuracy and reliability of AI – across government frameworks (5%), government actions (7%), and non-state actors (24%) – reflects the beginning of involvement from governments and a persistent multistakeholder effort to build ethical and responsible AI ecosystem.

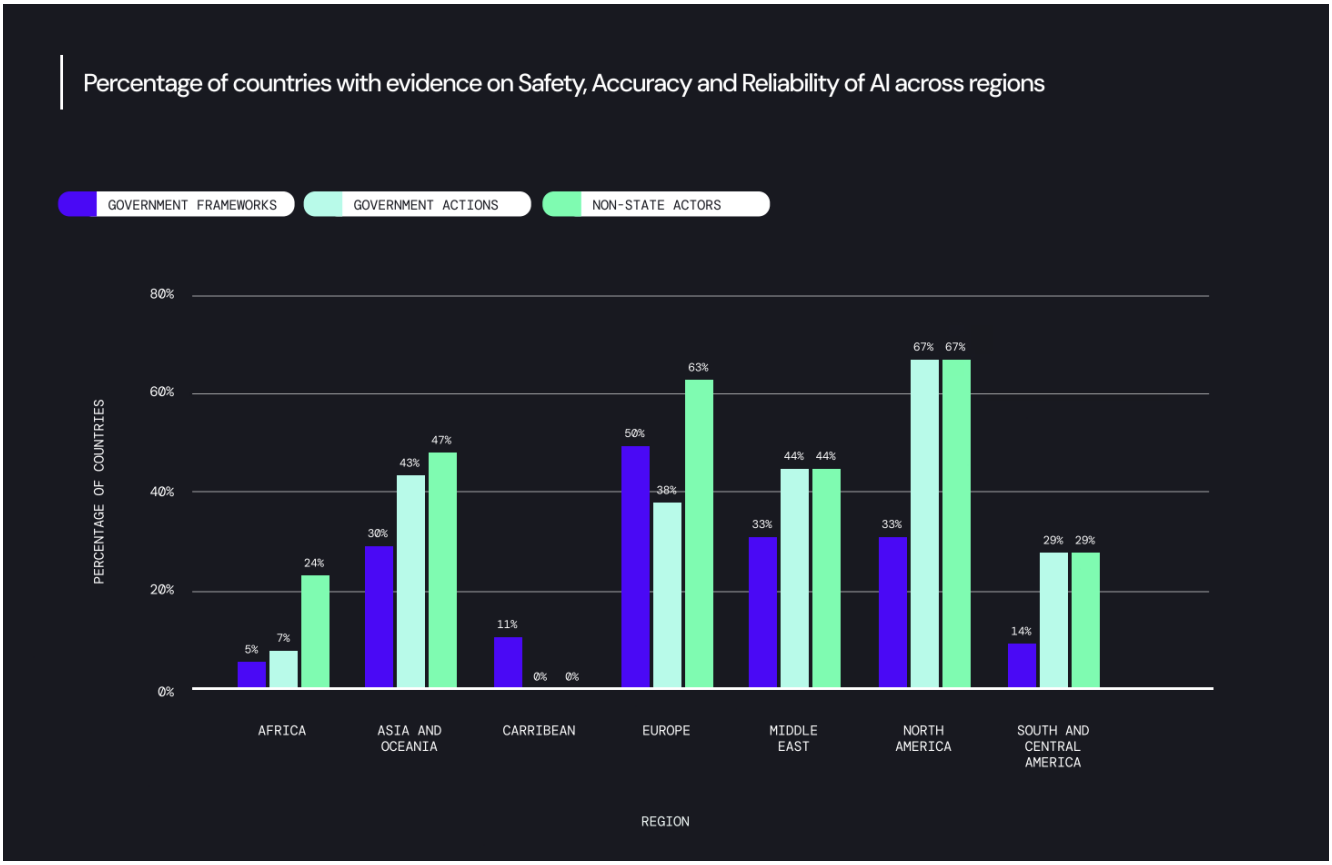


Figure 12: Percentage of Countries with Evidence on Safety, Accuracy, and Reliability of AI Across Regions
Source: Global Index on Responsible AI 2024.

On average, government AI-relevant frameworks are concentrated on data protection and international cooperation, but evidence of government involvement — alongside non-state actors — in other thematic areas of responsible AI abound. Apart from data protection regulations, emerging national AI strategies, though less regulatory in focus, also provide crucial directions for AI governance on the continent. Key priority areas that have gathered attention in line with the continent's unique needs include public sector skills development, competition authorities, AI impact assessments, access to redress and remedy, safety and security, cultural and linguistic diversity, gender equity, and children's rights.

Alongside government frameworks and actions, African countries have shown evidence of academic and civil society groups working on responsible AI (Figure 13). These non-state actors play a crucial role, particularly in promoting cultural and linguistic diversity, developing national AI policies and promoting public participation and awareness around AI.

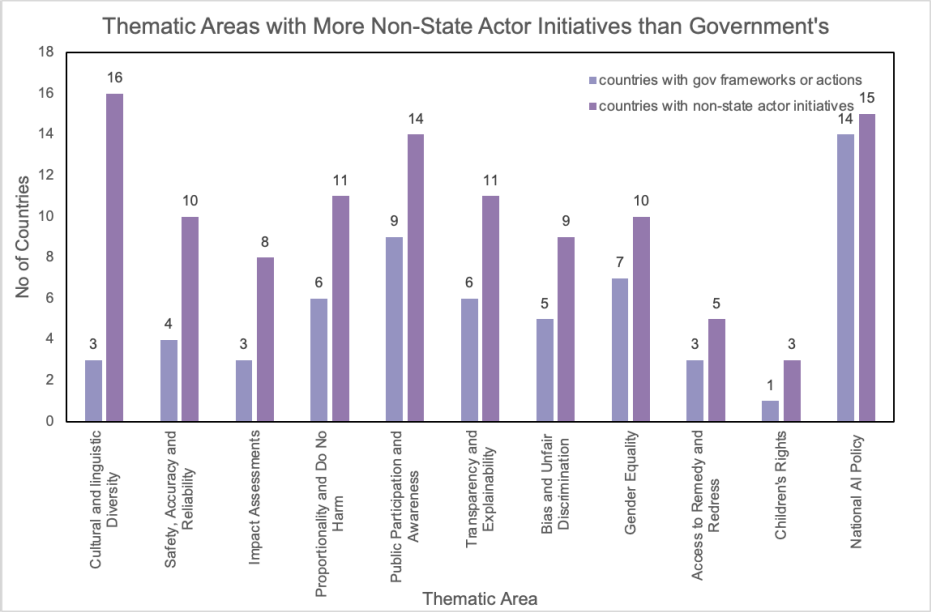


Figure 13: Thematic Areas with Active Non-State Actor Engagement
Source: Global Index on Responsible AI.

Despite these progress, a few challenges persist. First, the overall regulatory landscape remains in its early stages.[109] Regulatory fragmentation also presents a challenge, as seen, for example, in the multiple and divergent versions of AI strategies that have emerged at the continental level. More so, the AU Continental AI Strategy is not binding at the national level, and efforts to domesticate the strategy by implementing its action recommendations have been slow. This lack of clear governance guidelines and frameworks creates an environment where AI deployment is largely ungoverned, leaving room for potential misuse and unintended consequences.[110] As a result, vulnerabilities related to data privacy, security and misuse of personal information are heightened.[111] In the absence of clear government policies, companies may undertake AI development and/or deployment without considering the risks of retrospective liability or product liability.

At the same time, regulatory gaps present an opportunity for African countries to frame AI governance in a way that encourages innovation — while taking risks seriously. By taking a regulatory approach that carefully protects the public while also allowing the exploration of new technology developments, African nations can drive ethical and forward-thinking AI development. Additionally, rather than approaching regulation using blanket governance mechanisms that limit innovation and adoption, they can adopt a risk-based approach that differentiates between high-risk applications, as in finance, healthcare and law enforcement, and (comparably) low-impact sectors such as logistics and agriculture. This means African countries can construct their AI governance in a way that is sector-specific, and based on unique local needs and values.[112]

3.2 Emerging Regulatory Frameworks

3.2.1 Regulation at the Continental Level

The African Union (AU) is playing a crucial role in shaping AI governance at the continental level. Its Continental AI Strategy[113], adopted in July 2024, lays out an overarching goal of harnessing AI for Africa's development, focusing on four critical sectors: agriculture, health, education, and the environment. The Strategy proposes fifteen (15) action recommendations, across five 'pillars' of minimising risks, maximising benefits in development and adoption, developing talent and capabilities, driving public-private sector investment, and fostering regional and international collaboration. Responsibility for implementing key provisions in the five-year Strategy lies with the AU and related bodies, the regional economic commissions, the AI centres of excellence, and the member states.

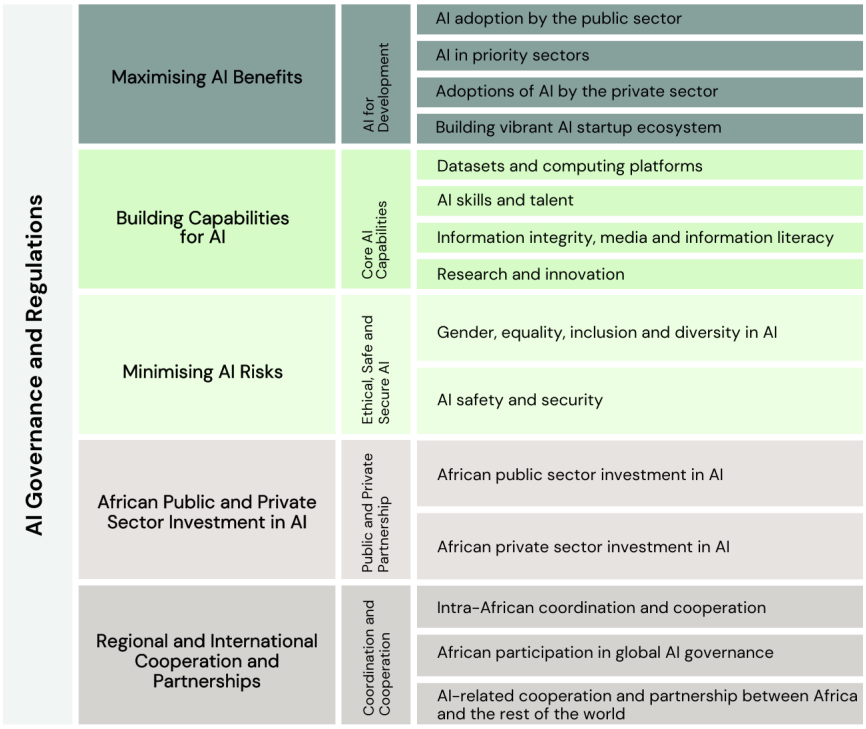


Figure 14: AU 15 Action Areas for AI Governance and Regulation
Source: African Union (2024).

Before adoption of the 2024 Continental AI Strategy, other continental initiatives have contributed to the emerging AI regulatory landscape in Africa. This includes the SMART Africa AI Blueprint[114], which offers a strategic framework to promote collaboration between governments, civil society, academia and the private sector in guiding AI governance on the continent. There was also the multistakeholder AI white Paper[115] led by the African Union Development Agency (AUDA-NEPAD)'s High-level Panel on Emerging Technologies (APET). Similar to the Continental AI Strategy, the White Paper is anchored on harnessing AI for Africa's Agenda 2063, focusing on five core pillars, namely: talent development and skills, AI infrastructure and data, enabling ecosystem for development and deployment, investment and funding, and partnerships. Additionally, the African Commission on Human and People's Rights (ACHPR) is actively advocating for legal and regulatory frameworks to ensure AI development and implementation are human-centric and respect human rights.[116] In addition, the Digital Transformation Strategy (2020-2030)[117] which includes provisions for harnessing emerging technologies, helps inform continental frameworks that can promote the development of AI ecosystems.

International collaborations and lessons from other contexts are also helping inform AI governance in Africa. For example, the UNESCO Recommendation on the Ethics of AI, adopted by 46 African countries, marks a critical step towards fostering ethical AI practices across the continent.

3.2.2 Regulation at the National Level

Although there has been slow uptake of AI on the continent, a growing number of African countries are making strides in setting out AI strategies and policies to drive its development.[118] According to the 2021 UNESCO AI Needs Assessment Survey on the continent, 18 of the 32 surveyed countries had national AI initiatives under development, with 13 having either an AI strategy, policies or legislations, and 12 having established Centers of Excellence.[119] As of March 2025, a total of 13 countries have either finalised a national AI strategy or published a draft (Table 1).

Status	2018	2020	2021	2022	2023	2024	2025
Finalised/ Adopted	Mauritius	-	Egypt, 1st Edition	-	Benin Rwanda Senegal	Zambia	Egypt, 2nd Edition Kenya Lesotho
Draft Published	Tunisia	Ethiopia	-	Ghana	-	South Africa Nigeria	

Table 1: African countries with AI strategies and year of adoption
Source: Authors

In 2018, Mauritius was the first African country to publish a National AI Strategy, aiming to make AI a cornerstone of its development model. Egypt launched its first National AI Strategy in 2021, endorsed the Egyptian Charter for Responsible AI in 2023, and has recently (January 2025) released a revised National AI Strategy. Rwanda released its National AI Policy in 2023, providing a roadmap for leveraging AI for sustainable development and establishing itself as a global hub for AI research and innovation. Nigeria has developed a draft national AI strategy to steer AI development towards achieving national goals, and has established the National Center for AI and Robotics to promote AI research and development. South Africa is in the process of finalising its national AI strategy building on its recently published AI policy framework. The country's Presidential Commission on the Fourth Industrial Revolution (4IA) has also recommended policy and legislative reviews to empower stakeholders around responsible AI use[120]. Kenya and Zambia have also recently released their national AI Strategies.

Other countries such as Morocco, Republic of the Congo, Sao Tome and Principe, among others, while not having standalone AI policies, are integrating AI considerations into broader digital transformation strategies. These developments reflect a growing trend across Africa to incorporate AI into national policy and developmental agendas.

While comprehensive AI-specific legislation is still nascent, the increasing development of national AI strategies, continental frameworks, and ethical guidelines, along with the influence of international collaborations, indicate a clear movement towards comprehensive AI governance policies. But there is a need to ensure that these do not overregulate the sector to the detriment of innovations emerging.

3.3 Other Key Regulatory Trends

AI technologies build on a stack of digital inputs such as data, cloud services, and physical digital infrastructure. Most countries on the continent have foundational technology policies and legislation that both address these AI-relevant components and set the stage for developing AI policies. A few are discussed below:

3.3.1 Competition Policy and Digital Markets

The role played by data in the competitive dynamics of the AI and digital ecosystems has brought competition policy and data protection regulation closer and sparked discussions about the substantive relationship between these two. Traditional competition law is often inadequate in dealing with competition issues in digital markets. From the lack of appropriate tools to identify power and dominance in digital ecosystems, to the limitations of ex post competition frameworks to address issues related to dynamic competition and the emergence of data issues in connection with competition law, the functioning of digital markets has raised profound questions about the adequacy of competition law and its underpinning theories in the digital arena.

Therefore, while data protection and competition laws originate from different public policy concerns, the emergence of digital markets and the role of data in driving business models of technology firms has brought the two closer together.[121]

As a result, competition policy in African countries are being revamped[122] to meet the challenges of digital platforms. These changes are characterised by the amendment of existing competition laws, or the passage of new laws to account for a variety of sectors such as digital markets — as is the case of Uganda's Competition Act, which was signed into law in February 2024 and is aimed at minimising market distortions, promoting sustainable development, and enforcing a framework that is aligned with regional policies and strategies. The policy commits the government to implementing obligations and commitments of the East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA) and the World Trade Organisation (WTO) on consumer protection and competition. Zambia's Competition and Consumer Protection (Amendment) Act will also notably apply COMESA Competition Regulations to domestic law.[123] COMESA[124] has equally proposed changes to its 2004 consumer protection regulations[125] that could greatly expand the enforcement powers of the COMESA Competition Commission. Under these new provisions, mergers involving digital markets would be subject to special treatment. These include a transactional value threshold that accounts for considerations of data, accessibility and control and network effects. The draft regulations also prohibit the abuse of economic dependence by designated gatekeepers. While the new regulations do not define "gatekeeper," these provisions appear to target digital platforms and mirror similar provisions in the EU.[126]

Other competition policy changes include shifting of focus from traditional consumer welfare toward a transaction costs framework that accounts for the dependency generated by ecosystems that lock in both consumers and suppliers. For example, the central aim of South Africa's competition law is 'advancing the social and economic welfare of South Africans, and ensuring that small-and medium-sized enterprises have an equitable opportunity to participate in the economy'. This creates a clear possibility of broadening the scope of regulatory goals to incorporate digital market concerns.[127]

3.3.2 Data Policies

Data Protection and Data Governance: Data protection in Africa is multifaceted, influenced by factors such as legal frameworks, technological advancements, and socio-cultural norms.

Regional efforts to shape Africa's data governance include the Malabo Convention, the AU Data Policy Framework, the Supplemental Act A/SA.1/01/10 on Personal Data Protection within ECOWAS,[128] the SADC Harmonization of ICT Policies in Sub-Saharan Africa (HIPSSA) - Data Protection Model Law[129,] and the East African Community (EAC) Legal Framework for Cyber Laws.[130] In various ways, these regional frameworks require Member States to establish legal frameworks aimed at strengthening fundamental rights and public freedoms and to establish independent national data protection authority with parameters guaranteeing their impartiality and fair data processing. However, as further explained in the 'Data Localisation' sub-section, only the ECOWAS Supplementary Act on Data Protection has a binding effect.[131]

There are also exemptions for entities accessing public data that may contain personally identifiable information. The Malabo Convention requires countries to implement a regulatory framework on cybersecurity and personal data protection that takes into account the requirements of respect for the rights of citizens. However, governments seem to be wary of codifying civil liberties protections in the Convention out of concern of diminishing the power of their domestic security and intelligence services.[132]

At the national level, the paucity of AI-focused laws does not translate to an absolute lack of regulation of AI, as AI's reliance on data necessarily brings it within the purview of data governance and protection regulations. In fact, data protection laws have become the default regulation in Africa, and they provide a foundation for AI regulatory frameworks, as many include provisions on data access and control. At least 40 African countries have enacted data protection and privacy laws that regulate the collection and processing of personal data.[133] These efforts are driven by the need to balance the benefits of digital innovation with protection of individuals' privacy rights. However, the implementation and enforcement of these laws vary widely across the continent, influenced by factors such as resource constraints, varying levels of digital literacy, and differing cultural attitudes towards privacy.[134]

Table 2 shows some of the rights of data subjects identified and defined in national data protection laws.

Rights of data subjects	Description of rights	Examples of countries that have these rights
Right to be informed	Data subjects have the right to be informed about how their personal information will be used.	Algeria, Benin, Burkina Faso, Chad, Egypt, Eswatini, Kenya, Gabon, Ghana, Guinea, Lesotho, Mali, Mauritania, Mauritius, Morocco, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda, Zambia, Zimbabwe.
Right of access	Data subjects can request a copy of their personal data held by data controllers, processors, or third parties.	Algeria, Benin, Burkina Faso, Chad, Egypt, Eswatini, Kenya, Gabon, Ghana, Gambia, Guinea, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Morocco, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda, Zambia, Zimbabwe.
Right to rectification	Data subjects have the right to have inaccurate personal data corrected and incomplete data completed.	Algeria, Benin, Burkina Faso, Chad, Gabon, Egypt, Eswatini, Ghana, Guinea, Kenya, Lesotho, Madagascar, Mali, Mauritania, Mauritius, Morocco, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda, Zambia, Zimbabwe.
Right to erasure/ deletion of data	Data subjects can request the deletion or removal of their data.	Benin, Chad, Ghana, Guinea, Egypt, Eswatini, Kenya, Ivory Coast, Lesotho, Madagascar, Mali, Mauritius, Morocco, Niger, Nigeria, Rwanda, Senegal, Seychelles, South Africa, Tunisia, Uganda, Zambia, Zimbabwe.
Right to restrict processing	Data subjects have the right to limit data processing by the data controller for a specific duration.	Algeria, Benin, Burkina Faso, Chad, Kenya, Egypt, Gabon, Gambia, Ghana, Guinea, Lesotho, Madagascar, Mauritania, Mauritius, Morocco, Niger, Nigeria, Republic of Congo, Rwanda, Senegal, South Africa, Tunisia, Uganda, Zambia, Zimbabwe

Right to data portability	Data subjects can request their personal data to be transferred to another data controller.	Benin, Kenya, Mali, Niger, Nigeria, Rwanda, Zambia, Zimbabwe.
Right to seek compensation	If data subjects suffer serious damage or loss due to violations of data protection laws, they may seek compensation.	Ghana, Rwanda, Seychelles

Table 2: Rights of Data Subjects as Defined in African National Data Protection Laws
Source: Munung et al (2024)[214]

Some laws contain strict provisions on access to and control of data. For example, Morocco's Data Protection Law No. 09-08,[135] passed in 2009, requires an organisation to implement all technical and organisational measures to protect personal data to prevent it from being damaged, altered or used by a third party who is not authorised to have access, as well as to protect it against any form of illicit processing.[136]

Other laws address the principle of explainability[137] that confers on data subjects the right to understand the nature of usage of their personal information. For example, Cape Verde's Law 133/V/2001 art 12(1)(c) provides that data subjects have the right to know the logic involved in any automatic processing of data concerning them. Similarly, Madagascar's Law 2014-038 on the Protection of Personal Information provides that data subjects have the right to receive information that enables them to know and contest the logic underlying any automatic processing that is used to make a decision about them that produces legal effects.

On the preservation of the safety of personal data, South Africa's Protection of Personal Information Act 4 of 2013 places the obligation on a responsible party to secure the integrity and confidentiality of personal information in its possession or under its control by taking appropriate, reasonable technical and organisational measures to prevent loss, damage to, or unauthorised destruction of and unlawful access to personal information. Where there are reasonable grounds to believe that the personal information of a data subject has been accessed or acquired by any unauthorised person, the responsible party must notify the Information Regulator and the data subject, unless the identity of such data subject cannot be established.[138]

However, two main issues that inhibit the stronger implementation of data protection laws across Africa, much like other jurisdictions, are the number of exemptions in countries' laws and a lack of independence among data protection authorities.[139] For example, the Kenya Miscellaneous Amendment Act of 2020, which empowers security services to access personal data from any phone or computer, highlights the overly intrusive exemptions that legal systems permit. Most of the exemptions that exist in Africa arise from concerns about national security.

However, the laws tend to be unrestricted in the breadth and nature of their application as they lack specificity in terms of when they apply, in what way they can be applied, the persons subject to the exemptions and the extent and dimensions to which authorities can utilise the provisions in the law to their advantage.

In addition, most data protection authorities are also not substantially independent,[140] particularly as they are structured within government ministries and/or inadequately financially resourced to conduct robust investigations.

Data Localisation and Cross-border Data Flows: When regulating cross-border data flows, African governments face several regulatory and institutional challenges. Perhaps the most prevalent ones are balancing competing policy goals — such as strict data localisation laws versus international trade requirements or FDI promotion — and difficulties in coordinating policies across different areas of regulation. [141]

The analogy that data is "the new oil" seeks to communicate the value of its resource and its centrality in innovation and the global economy. However, this catch phrase has also contributed to a flawed understanding that the best way to reap the economic benefits of data is to hoard it behind a country's borders. Data's value is maximised when it can flow with trust and permission across economic sectors and national borders. Optimal data policies are those that allow the flow of data in ways that ensure safety, security, and equal access.[142]

African governments implementing or contemplating data localisation requirements to boost local economies imagine that these measures will amount to enormous domestic economic benefits. Policymakers consider that the various global service providers operating in their country will build infrastructure locally. However, this is rarely the case.[143] More so, large data farms consume a large amount of energy and often burden already overtaxed energy grids.[144] Given the energy insecurity in even the most advanced African economies, creating a data processing economy is an enormous undertaking. Under these conditions, well-intentioned data localisation restrictions could force more innovative and price-competitive firms to exit the market, allowing more expensive or inferior goods and services to capture more market share.[145]

Data localisation rules are generally intended to prevent cybercrimes, promote local economies and, significantly, to address rising concerns about privacy.[146] Current and emerging regulations fall into four broad categories:

1. Geographical restrictions on data export that require data to be stored and processed within a given country or region. This requires companies to create a separate infrastructure, computing capabilities and teams for each of them.
2. Geographical restrictions that allow data to be copied outside the country of origin for processing but require a replica in the local infrastructure. These rules are often intended to develop local economies.
3. Permission-based regulations that require institutions to get consent from specific individuals to transmit data.
4. Standards-based regulations that allow institutions to move data more freely outside the originating jurisdiction but require them to ensure the security and privacy of their customers' data.[147]

Many African countries have enacted laws that require data to be stored locally and for the most part have stipulated conditions under which certain types of data may be exported or processed outside national boundaries rather than banning cross-border transfer of data. Such conditions include obtaining authorisation from data protection authorities, in the case of Niger,[148] Morocco,[149] Angola,[150] Benin,[151] Burkina Faso,[152] Cape Verde,[153] Madagascar,[154] Mauritius,[155] Lesotho,[156] Guinea Conakry,[157] Ivory Coast,[158] Congo Brazzaville,[159] Sao Tome & Principe,[160] and Togo.[161] Data protection laws in Kenya, South Africa, Tunisia and Uganda also place restrictions on cross-border data transfers. In addition, some countries use laws on financial services (e.g., Nigeria, Ethiopia, Rwanda and Uganda), cybersecurity and cybercrimes (Rwanda, Zambia and Zimbabwe) and telecommunications (Cameroon, Rwanda and Nigeria) to further restrict cross-border data transfers.

Table 3 shows relevant grounds under some national laws for the transborder transfer of personal data:

	Adequacy (supervisory authority)	Adequacy (Data Controller)	Binding Corporate Rules	Standard Contractual Clauses	Consent
Algeria					X
Benin					X
Burkina Faso		X			
Egypt		X			
Eswatini		X			X
Gabon					
Gambia		x			X
Guinea					
Kenya		X			X
Madagascar			X	X	X
Mali			X	X	
Mauritius		X			X
Nigeria					X
Republic of Congo					
South Africa		X	X	X	X
Togo					
Uganda				X	X
Zambia				X	X
Zimbabwe					X

Data protection bodies created by African countries' laws are fairly young, and in some instances, not operational. In others, there is limited evidence as to how - if at all - they enforce legal provisions relating to data localisation. As a result, there is scant information on enforcement mechanisms, including whether the respective countries are indeed authorising cross-border transfers of the relevant data, subject to data localisation requirements.

Regional instruments on data localisation and cross-border data transfer have begun to emerge. The Supplementary Act on Personal Data Protection (2010) within ECOWAS (ECOWAS Supplementary Act) is the only binding African regional agreement on data protection.[163] It stipulates what content ECOWAS member states must include in their national data privacy laws. It also requires the establishment of a data protection authority (DPA) that enforces rules in relation to data breaches.

ACHPR's 2019 Declaration of Principles of Freedom of Expression and Access to Information in Africa[164] includes provisions on privacy and the protection of personal information that states shall not adopt measures prohibiting or weakening encryption, including backdoors, key escrows, and data localisation requirements, unless such measures are justifiable and compatible with international human rights law.

The African Union (AU) Data Policy Framework, endorsed by the AU Executive Council in February 2022, sets out a shared continental vision to "ensure that data can flow across borders as freely as possible while achieving an equitable distribution of benefits and addressing risks related to human rights and national security." It also suggests developing a "Cross Border Data Flows Mechanism" that takes into account the African context, namely the different levels of digital readiness, data maturity as well as legal and regulatory environments.[165] It calls for intensification of international cooperation on cross-border data flows to ensure that data localisation requirements and other restrictions do not unduly interfere with cross-border communications and the economic and societal benefits of global data networks.

The Digital Transformation Strategy for Africa (2020-2030) (DTS)[166] aims to drive digital transformation by promoting "open standards and interoperability for cross-border trust framework, personal data protection and privacy". Further, the Strategy calls for harmonisation of policies, legislation and regulations related to digital networks and services, intra-Africa trade, intra-investment and capital flows. This framework potentially reinforces the Digital Trade Protocol of the AfCFTA[167]. Alongside its provisions on balancing cross-border transfer of data with data localisation and cloud location requirements, the DTP outlines processes for facilitating cross-country digital trade and enabling market access to digital products.

The African Union Convention on Cyber Security and Personal Data Protection (Malabo Convention)[168] is a legal framework for cybersecurity and personal data protection for AU Member States. Article 10 of the Convention provides for preliminary personal data processing formalities. Article 10(6) provides that requests for opinion, declarations and applications for authorisation shall, among others, indicate envisaged transfer of personal data to a third country that is not a member of the AU, subject to reciprocity. Article 12 on duties and powers of national protection authorities includes authorising cross-border transfer of personal data. The specific principles for the processing of sensitive data in article 14(6)(a) also prohibit transfer of personal data to a non-Member State unless such a State ensures an adequate level of protection of the privacy, freedoms and fundamental rights of persons whose data are likely to be processed. It may be premature to draw conclusions about the potential success of the Convention in harmonising data protection in Africa in view of probable implementation challenges. In addition, some larger countries have not yet signed the Convention, including Egypt, Nigeria, South Africa, Kenya and Ethiopia.

In the Southern African Development Community (SADC), the SADC Data Protection Model Law establishes principles of data processing, including data minimisation, accuracy, storage limitations, lawfulness and fairness, purpose limitation and accountability.

3.3.3 Intellectual Property and Data Ownership

Notwithstanding the fact that AI does not possess legal personality, it is able to assess and analyse existing human inventions and artistic works in order to generate new ones. Given the requirement for extensive datasets to achieve this, many LLMs source data from databases, websites, social media, user inputs, and other publicly available content. The data obtained ranges from information and images to spoken and written language. However, not all data is free to use, and available information may be subject to intellectual property rights or usage exclusions.

Given this, the traditional bastions of patents, copyrights and trademarks are being confronted with novel scenarios, courtesy of AI and ML algorithms that have become instrumental in creating, analysing and birthing new scientific and artistic innovations and processes. As the line between human-generated and AI-generated content blurs, the question of ownership and authorship emerges, demanding a fresh examination of existing IP frameworks. The legitimacy of IP rights in addressing this challenge finds support in various national laws and multilateral agreements. Leading among these are Article 27(2) of the Universal Declaration of Human Rights (UDHR) and Article 15(1) of the International Covenant on Economic, Cultural, and Social Rights (ICESCR), which strive to strike a balance between safeguarding these rights and promoting the broader public interest.

Globally, the challenge with creating and curating datasets is primarily with data access. However, IP law – particularly, copyright law - is considered as restrictive to data access because many data sources are subjects of intellectual property rights (IPRs). As data takes on an increasingly important economic role, existing frameworks for IP ownership need to provide some form of protection for rights in data. While data is often considered to be intellectual property, it is often surprising how little traditional IP rights assist in protecting this important business asset. If an IP system is to support development, use and application of AI in Africa, it must enable data access, data curation and responsible use and application of AI.

Another area of concern is patent law. Under South Africa's Patent Regulations 1978, for example, patents are awarded for inventions that are patentable and novel, involve an inventive step and are capable of industrial application. In making patent applications, applicants must disclose their patent claims, showing technical information that is used to examine and authenticate those claims. In this regard, patent applications and patent documents generally can signal innovations in AI and other technologies. Through patent documents, interested members of the public can find technical information regarding innovation in any field. This may then lead to technology transfer transactions, technology exchange arrangements and other forms of business arrangements that permit the

acquisition of technology. On the flip side, they could also lead to the disclosure of information that may be deployed for malicious purposes. This requires thinking about how the IP system could secure, regulate and manage such disclosures.[169]

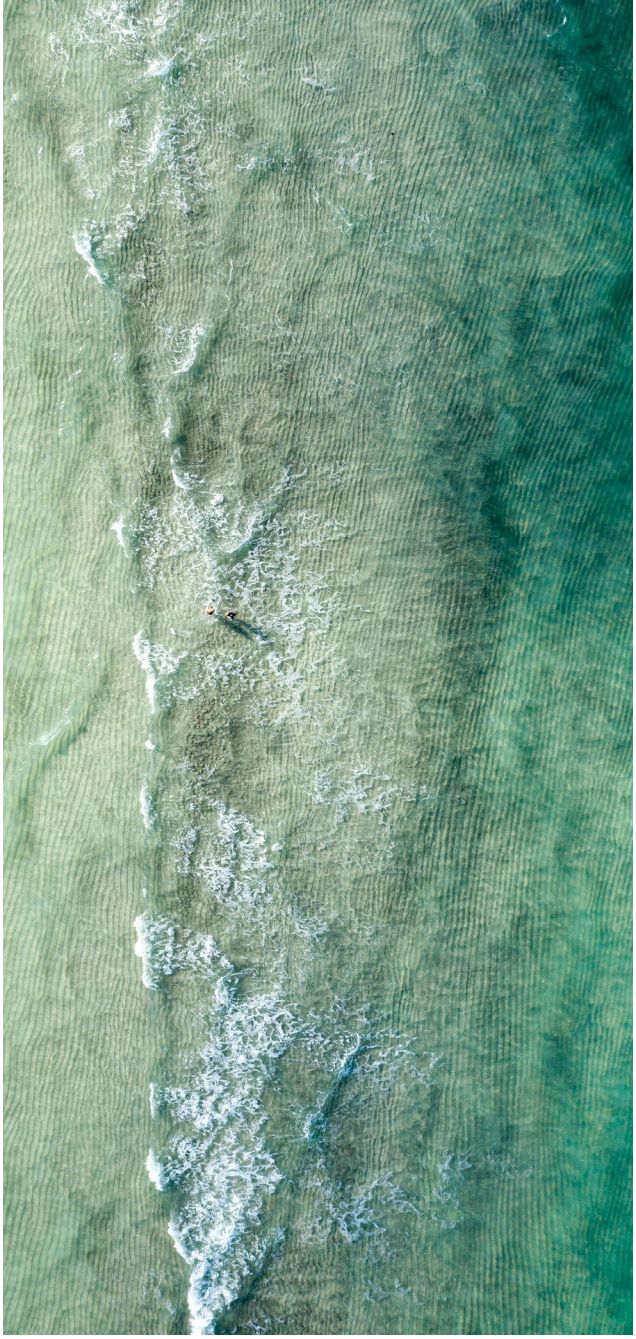
At a regional level, the African Regional Intellectual Property Organization (ARIPO) and the African Intellectual Property Organization (OAPI) are key institutions working to harmonise and strengthen IP laws across the continent. These organisations aim to provide a unified framework for IP protection, making it easier for inventors and businesses to protect their IP rights in multiple countries. Despite these efforts, many African countries still face challenges in enforcing IP rights due to limited resources and lack of awareness. However, initiatives such as AfCFTA are expected to boost economic integration and innovation by improving IP protection and enforcement.[170] This was reaffirmed In February 2023 when the AU Assembly of Heads of States and Governments adopted the Protocol on Intellectual Property Rights.[171] The objective of the Protocol is to support the realisation of the objectives of AfCFTA by establishing harmonised rules and principles for the promotion, protection and enforcement of IP rights including copyright, traditional knowledge and emerging technologies.[172] The Protocol also aims to ensure that measures to protect and enforce IP rights do not constitute barriers to trade.

Key Takeaways and Future Directions:

- The current regulatory gap presents an opportunity for African countries to frame AI governance in a way that encourages innovation, while paying maximum attention to risks.
- These frameworks must be clear and comprehensive, risk-based rather than blanket, provide a solid base for innovative exploration, and incorporate existing data protection, intellectual property, and cybersecurity laws that are applicable to AI.
- Intellectual property laws in particular should be revamped to protect data as an important business asset and to respond to growing concerns around IP rights for AI-generated innovations.
- Coordinated data policies can drive regional AI collaboration and reduce regulatory fragmentation. This includes aligning national data policies with existing continental frameworks to promote continent-wide digital innovation.
- Strengthening data protection authorities (DPAs) to be sufficiently independent and equipped to conduct robust investigations into AI-related data infringements and disputes is crucial for achieving coordinated data policies.
- It is suggested that concerned authorities begin the implementation of milestones recommended in the AU Continental AI Strategy, including, as priority, sub-national engagement of AI developers, businesses, researchers, and civil society.
- Given the rapidity in changes around AI and the fact that African countries are just beginning to innovate around it, regulatory sandboxing is proposed as a viable approach to allow for safe experimentation while refining appropriate oversight measures for responsible AI development.
- To address regulatory challenges around data and computing and allow for responsible innovation, it is crucial to strengthen institutions and adopt flexible governance mechanisms that balance innovation with the protection of African interests.
- Additionally, prioritising rights-based principles and sustainable public procurement processes is essential to ensure that technology development and regulation coexist effectively. Governments need to ensure regulatory institutions are strengthened and able to implement regulations, while academia, civil society and international partners can help establish best practices.
- Develop Regulatory sandboxes that allow AI innovations to be tested safely, ensuring adherence to ethical guidelines while fostering creativity could be crucial in ensuring safe, flexible, and innovation-focused regulation. These should incorporate a variety of social perspectives and needs.
- African governments have an opportunity to support emerging mechanisms such as data institutions, acting as stewards of responsible data sharing, protecting privacy while enabling safe data access for research and innovation and addressing risks like privacy breaches, data misuse, and bias.
- Coordinated efforts in development and resource sharing can help democratise AI access and protect African agency in technological progress. Achieving this requires harmonised, standardised data-sharing practices. Beyond local policy provisions, international partners and industry can take on a role as active supporters of cross-fertilisation while academia should scrutinise open data for bias and the extent to which it reflects local challenges.

- Multistakeholder-driven monitoring practices, prioritising safety and transparency, should be implemented in response to fragmented practices to ensure responsible AI use that is contextually relevant, accessible, and prioritises fairness and transparency becomes standard practice.

- With only three African countries—Rwanda, Benin, and Senegal—having established government frameworks addressing the public use of AI in alignment with rights-based principles, stakeholders must work collaboratively to establish ethical protocols and guidelines that address the diverse needs of populations, implement robust regulatory measures, and provide clear pathways for justice and accountability.



Chapter 4: Multistakeholder Governance and Financing

4.1 Current State of MultiStakeholder Governance and Challenges

Many African countries have yet to develop their own national AI governance frameworks, therefore multilateral forums have been crucial for establishing guidelines that respond to the continent's common needs and shared challenges. The AU has taken a leading role in advancing multistakeholder AI governance in Africa, establishing an AI working group responsible for establishing a common stance on AI, creating a continental capacity building framework and establishing a think tank to advise on collaborative projects aligned with the continent's collective socio-economic development goals, including Agenda 2063 and the UN SDGs.[173]

The African Union Development Agency-New Partnership for Africa's Development (AUDA-NEPAD) Continental AI White Paper and Roadmap, which emphasised the need for a unified AI framework served as a precursor for the AU Continental Strategy on Artificial Intelligence published in August 2024[174] The subsequent Continental AI Strategy was developed through active involvement of diverse stakeholders from government, private sector, academia, civil society as well as regional and international organisations[175]. The strategy underscores that the AU and its implementation agencies, along with regional economic communities (RECs), regional organisations and development partners must play a central role in the development, deployment and adoption of AI across Africa.[176]

Partnerships with international stakeholders were also instrumental to this foundational document. UNESCO provided financial and technical assistance for the strategy and further supported the AU to develop an implementation plan that promotes fostering intra-regional and international cooperation for African AI development.[177] Although a diverse range of actors are making a concerted effort to leverage AI for development efforts, African governments encouraging cooperation through open data initiatives could further promote participatory and transparent AI development.[178] Effective public-private partnerships could also help drive AI development and adoption on the African continent. This has been demonstrated with Singapore Economic Development Board's partnership with Nvidia.[179]

The AU High Level Panel on Emerging Technologies (APET) has been appointed by the AU Commission to advise the AU, develop strategies, policies and institutional arrangements for shared regulatory approaches for the application of emerging technologies on the continent. The APET considers AI technology the frontier for socioeconomic development and recommends that African governments explore policies and actions on open data, open storage and computing, open AI models, open AI algorithms, and open AI marketplaces in collaboration with relevant stakeholders to facilitate AI governance.[180] Given the limited availability of quality data and AI talent on the continent, such approaches can facilitate skills and capacity development, sharing of best practices for ethical AI in the African context, and foster innovation networks across the continent. Beyond addressing local challenges and mitigating shared AI-related risks, a multistakeholder approach to AI governance can amplify African countries' priorities in international dialogues and strengthen their influence on global AI policies.

Despite ongoing efforts, coordinating diverse stakeholders across the continent as well as with international collaborators remains challenging. Africa also received minimal funding from the globally growing investment in the AI ecosystem, which in part is due to investors perceiving the continent as economically unstable, and limited technical talent leading to capital flight.

4.2 Research Institutions and Capacity Building

Several organisations, universities and research institutions are conducting AI research, as well as conducting skills and capacity development programs to bridge the talent gap on the continent for growing the African AI ecosystem.

The UN Economic Commission for Africa (ECA) established an African AI research center, the African Research Centre on Artificial Intelligence (ARCAI) in Congo Brazzaville. ARCAI's mission includes promoting AI skills and knowledge, facilitating collaborations between AI researchers and experts in different sectors and strategic resource mobilisation for coordinated pan-African AI efforts. The Centre has partnered with African universities and research institutions to promote collaborative research, launched a fellowship program for African students and researchers, a hackathon series, and a research grant program.[181] Some avenues facilitating research partnerships include the Just AI Centre by Research ICT Africa, contributing to policy research, workshops and AI ethics discussions; the Centre for AI Research (CAIR), engaged in AI-related technology development across five universities in South Africa; and the Human Sciences Research Council (HSRC), which focuses on establishing an AI research programme in South Africa.[182]

Several universities across Africa have also launched AI-focused programs and research labs focusing on harnessing technology for social impact. These include AIMS, Centre for Artificial Intelligence Research at the University of Johannesburg and UCT and the Data Science Africa initiative.

The Global Center on AI Governance (GCG) is another think tank dedicated to AI governance based in South Africa. One of its research projects, the Global Index on Responsible AI includes 41 African countries and assesses the AI governance frameworks in these countries from a rights-based approach.[183] GCG also hosts the African Observatory on Responsible AI (the Observatory) initiative, which builds the capacity of African AI research and facilitates networks to produce actionable findings and recommendations for leveraging AI to address developmental issues while addressing the long-term risks in African societies. It provides a repository of research outputs and a policy map with a comprehensive overview of the status of governance frameworks on the continent.[184]

Institution	Role
AU AI Working Group	Establishing consensus on AI, designing capacity building framework and instituting advisory think tank
AUDA-NEPAD	Policy framework development, regulatory guidance and facilitating expert insights
UNESCO	Financial and technical support
APET	Advisory, strategic and institutional coordination
ARCAI	Skills and capacity building, facilitating cross-sectoral collaborations, strategic resource mobilisation and funding research
Research ICT Africa	Policy research, facilitating AI ethics dialogues
CAIR	Technology development research across universities
HSRC	Establishing AI research programmes
GCG	Think tank dedicated to AI governance

Table 4: African AI Governance and Research Institutions

These research initiatives and skills and capacity programs, coordinated by local institutions through support from international organisations, are critical for building an AI knowledge base in Africa. These initiatives' cross-disciplinary focus equips Africans for contributing to considerations of AI across diverse domains, including informing development policies, facilitating efforts to create localised regulatory frameworks, and establishing networks of experts for developing AI solutions that respond to the continent's priorities.

4.3 International Cooperation and Partnerships

In accordance with the continental AI strategy's assertion that effective implementation requires analysis into the impacts of AI alongside capacity-building initiatives, various national and international stakeholders are actively engaging in research and development of AI. This includes global partnerships supporting AI development, as well as regional economic communities' active engagement in promoting collaboration and coordination on AI-related issues in Africa.

International development organisations are supporting AI research and innovation across Africa by funding various projects and initiatives on the continent. The United Nations Development Program (UNDP) and the Italian G7 Presidency have collaboratively developed the AI Hub for Sustainable Development, an initiative aimed to strengthen African AI ecosystems through multistakeholder partnerships. The AI Hub aims to encourage investments to drive innovation in the private sector while actively engaging with government and civil society actors to ensure responsible governance.[185] The UN Global Pulse network, a platform promoting innovation for sustainable development, has established Pulse Lab Kampala in Uganda, which is partnering with various stakeholders to create an enabling environment for responsible AI toward socio-economic development.[186]

Canada's International Development Research Centre (IDRC) and Sweden's International Development Cooperation Agency (Sida) have partnered to initiate Artificial Intelligence for Development in Africa (AI4D). The four-year project supports Africa-led AI policy research and innovation hubs and offers capacity-building grants and scholarships to foster responsible AI to address development challenges.[187] In 2024, IDRC partnered with the UK's

International Development Agency, launching a 5-year, CA$100-million global AI4D program that builds on the success of AI4D, now extending its reach to coordinate and scale AI innovations across Africa and Asia. One of the African partners is Niyel, a public advocacy organisation based in Senegal working to establish a network of researchers in francophone countries to inform national and regional policies on responsible AI.[188]

Multinational technology companies are playing a key role in creating AI ecosystems in Africa that foster local talent and global collaborations. Google is at the forefront, launching its first AI research center on the continent in Accra, where experts are developing AI-based solutions for social impact. One notable project is in partnership with InstaDeep and the Food and Agriculture Organisation (FAO) of the UN to detect locust outbreaks for farmers to implement control measures.[189]

In Nigeria, Microsoft has partnered with UNDP to co-convene AI4Dev, a multi-stakeholder reference group to identify challenges, facilitate skills and knowledge exchange, advise on policy frameworks and provide a platform for dialogues and partnership to attract investment for AI projects that can contribute to the country's socio-economic development.[190] Microsoft's AI for Good Lab in Kenya is also working with the Ministry of Health, Amref and the University of Southern California, tracking data from community health workers to develop a predictive model for curbing malnutrition.[191]

Meta is providing its expertise in digitalisation through a memorandum of understanding with AUDA-NEPAD to promote data governance, harness AI for sustainable development and enhance skills among African youth.[192] There are also significant investments in capacity building efforts such as IBM's research labs in Kenya and South Africa, which hosted a free virtual AI seminar series to bridge the talent gap for creating technology solutions for economic challenges. Similarly, Intel is collaborating with the African Development Bank to equip 3 million Africans and 30,000 government officials with AI skills for addressing socio-economic challenges by boosting productivity in key sectors including agriculture, health and education. The partnership also aims to support regional economic communities and continental organisations in developing compatible policy and regulatory frameworks in AI and adjacent emerging technologies.[193]

4.4 Strategies for Collaborative AI Development

4.4.1 Open AI Communities of Practice

Stakeholder engagement is a critical element of coordinating responsible research and innovation of AI technologies. Communities of practice such as the AI Hub for Sustainable Development offer avenues for catalysing emergent global public goods. A key strategy highlighted by the Hub is the development of open-source communities to maintain flexible technology choices, tackle closed-loop solutions' limitations and encourage wider innovation. Open-source communities such as the Open-Source Community Africa (OSCA) organise through local events, building a robust AI ecosystem to increase the number of credible open-source contributions from the continent. Such associations create an environment where Africans are not only users but creators contributing to the development, deployment and governance of open-source technologies. For instance, the OnePlanET initiative aims to create a digital platform that leverages open technologies for data sharing and knowledge exchange around sustainability and environmental stewardship. It is building knowledge communities of experts and future users from the existing networks of EU and AU partners, particularly those linked to UNESCO to develop a toolkit for empowering African policymakers, research and academia, investors and citizens on sustainable and ethical use of resources.[194]

4.4.2 Engaging RECs

RECs such as EAC, ECCAS, COMESA, ECOWAS and SADC can play a key role in promoting collaboration by pooling resources, skills and knowledge. As regional building blocks of the AU, these organisations are conducive for promoting shared ownership and decision making, enabling their respective members to collaborate on open-source technologies that can be integrated into regional development plans. Regional open-source policies can also help tackle data privacy challenges and lower national costs of harnessing local innovations for shared objectives.

ECOWAS has advocated for regional collaboration to leverage AI, geographic information systems (GIS) and data management tools to meet emerging trends for early warning and conflict prevention in the region.[195] The integration of AI for regional disaster risk management is echoed in the horn of Africa by the Intergovernmental Authority on Development (IGAD).[196] East African government representatives have emphasised their support for open science, international cooperation and integration of indigenous knowledge and citizen science into AI development and deployment. The high officials have recommended that the media should have access to AI and open-source intelligence tools and indicated their commitment to implementing the Ethics of AI and on Open Science through continental networks including Africa Open Science Platform.[197]

Regional associations facilitate engagements about integrating AI and Open-Source approaches to existing and emerging development challenges. The dialogues in these communities identify regional goals and best practices, which are foundational for a shared governance architecture.

4.4.3 Joint Funding Mechanisms

Collaborative funding efforts enable stakeholders to consolidate resources for open-source projects, and partner with local actors to efficiently allocate resources toward developing AI technologies addressing pertinent issues. Decentralised donor models that take a long-term approach by strengthening local capacities, partnering with national and regional actors to support AI development and governance foster sustainable ecosystems for equitable AI deployments in underrepresented regions.[198]

The Lacuna Fund has expanded into a network of development, philanthropic and research institutions. The globally coordinated effort provides local data scientists, researchers, and social entrepreneurs in low to middle income countries (LMICs) with resources for ethically developing open datasets to create innovative solutions for local challenges in agriculture, health, language and climate. The multistakeholder partnership, supported by technical experts, creates replicable and open-source datasets, ensuring a resource efficient and sustainable funding model.

The UK has joined with Canada, the Gates Foundation, the United and African partners under the AI4D Programme to support local efforts using emerging technologies to solve the continent's pertinent challenges such as food security and access to healthcare. The alliance has consolidated £80 million (US$100 million), aiming to amplify Africans' voices on the global AI discourse and promote responsible, equitable and safe AI regulatory frameworks while supporting responsible AI research and private sector innovation.[199]

4.5 Financing

Globally, there has been a significant uptick in investments in AI technology and support for open-source AI models. Data from the US Bureau of Labor Statistics (Figure 15) show a steady growth in annual global corporate investments in AI from 2013, which peaked in 2021 at over US$300 billion but has since declined, with 2023 numbers sitting at a little over US$150 billion.

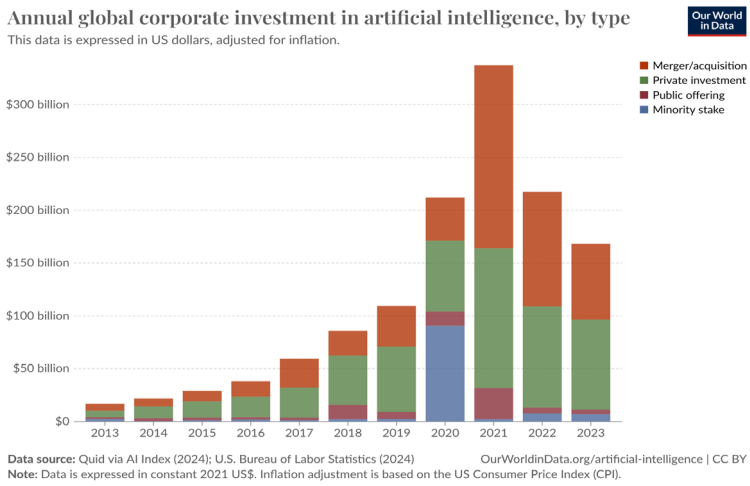


Figure 15: Annual Global Corporate Investment in AI, by Type
Source: Quid via AI Index (2024); US Bureau of Labor Statistics (2024); visualisation by Our World in Data[199]

The increased financing of AI research and development between 2017 and 2023 was significantly influenced by two groundbreaking developments – transformers and LLMs. Transformers made it possible to train AI models on large datasets without the need to label all the data, drastically reducing labour cost and time and creating the possibility for advanced algorithms to parse vast unlabelled stores of text into LLMs.

Going beyond just training models on texts, current large scale models are multimodal, integrating texts, audio, images and videos. Large-scale models are expensive to develop for several reasons: the requirement of a vast amount of training data; significant labour for labelling, annotation, and evaluating; and large amounts of compute resources (Figure 16).

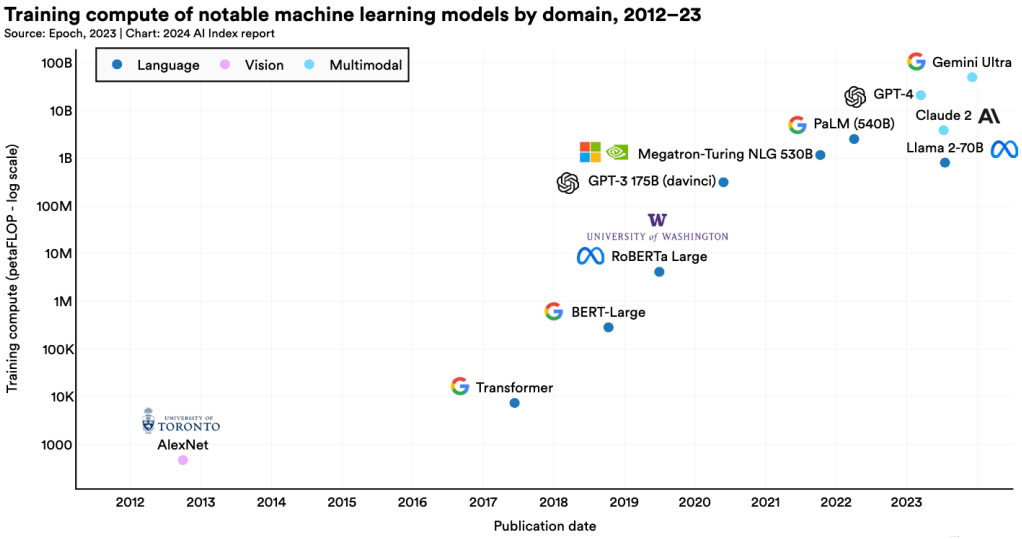


Figure 16: Training Compute of Notable ML Models by Domain (2012–2023)
Source: The AI Index 2024 Annual Report[200]

The cost of building large-scale multimodal models is likely to increase significantly, especially as current research is gearing towards the development of artificial general intelligence. Some projections put the cost of training even larger models on track to outpace growth of the US GDP by 2037 [201]. This suggests that the development of cutting-edge AI models could become increasingly resource-intensive, raising questions about the sustainability of such growth.

Africa is yet to feature significantly in any of these developments. LLMs are typically trained on supercomputers, as they generally demand massive amounts of data and computational power to train, necessitating high-performance computing systems like supercomputers to achieve efficient training times. At the moment, only one supercomputer in Africa is ranked in the world's top 500.[202] Contrasting this with other regions like North America's 181 (171 in the US and 10 in Canada), Europe's 163, Asia's 141, South America's 8, and Australia's 5, it is evident that financing is needed to provide additional supercomputers in Africa, to sustain the efficiency of the existing supercomputer and to support collaboration of the host institutions with other African research entities.

Furthermore, Africa is estimated to have received less than 1% of global AI funding – approximately US$4 million in the second quarter of 2024 – despite having about 2400 AI startups.[203] In comparison, global AI funding reached US$23.2 billion in the second quarter of 2024.[204] Measures for addressing the stark funding gap are outlined in the recommendation section below.

Despite funding challenges, African innovators continue to receive funding to carry out their projects. For example, the Gates Foundation allocated US$30 million toward advancing AI solutions in Africa, particularly in healthcare.[205] The funding is to provide African innovators and researchers with support to meet operational and technical needs to scale health solutions on the continent.[206]

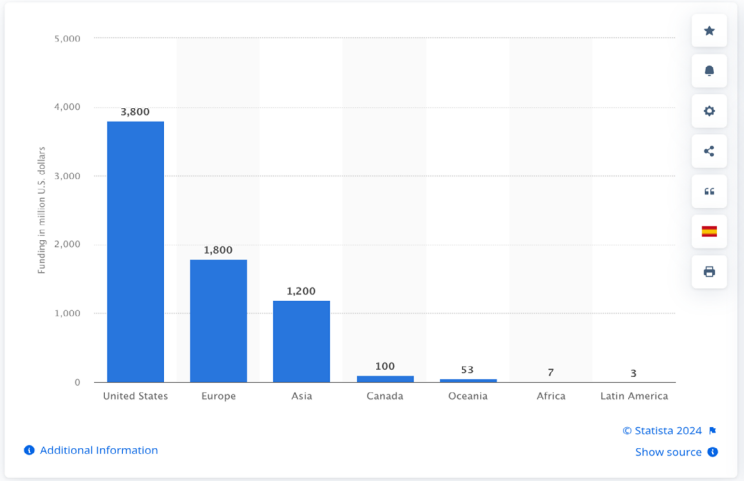


Figure 17: AI Startup Funding in 4th Quarter 2023, by Region (in US$ millions)
Source: Statista 2024[207]

AI startups have also continued to raise investments to provide context-relevant solutions for issues unique to the continent. For example, Lelapa AI raised US$2.5 million in seed funding and is leading the charge in building NLP models for African languages that are considered low-resourced.[208] Others include Nigeria-based Intron Health, which secured US$1.6 million in a pre-seed round to support its speech recognition app for healthcare workers in Africa[209]; Ghana-based Aya Data, which raised US$900,000 in seed funding[210]; and Logidoo, an African logistics startup that received CA$50,000 in funding from the IDRC to support its ongoing efforts to introduce AI to the African logistics industry.[211]

To address the lack of funding limiting Africa's AI innovation potential, RECs can help alleviate financial burdens by sharing resources, creating regional funding initiatives and seeking international financing opportunities.

4.5.1 SWOT Analysis

Figure 18: Financing SWOT Analysis

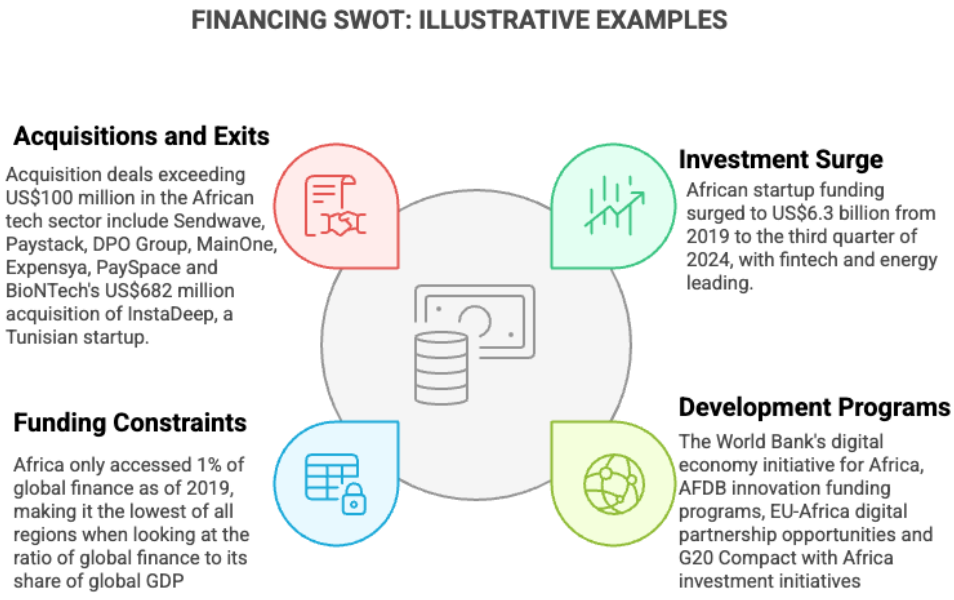


Figure 19: Financing SWOT: Illustrative Examples[212]

Key takeaways and Future Directions:[213]

- Adopting innovative and equitable financial models can contribute to the support of local tech hubs, innovation centers, and startups, attract increased funding, and better utilise and distribute talent
- Regional collaborations can help coordinate efforts for a unified AI governance framework and ease the burdens of financing AI projects through cross-border AI project collaborations, regional technology hub networks and shared investments on AI infrastructure
- To bridge the compute, skills, and capacity gaps in AI on the continent, African governments and industry leaders should leverage public-private partnerships to create joint funding programs and infrastructure development for open source AI
- The ongoing efforts to encourage AI research, capacity building, and skills development in Africa should be expanded to not only bridge the talent gap, but also promote ethical guidelines as well as encourage collaboration among technical experts, policymakers, academics and AI practitioners.
- To address the persisting funding gaps in the region, Africa should explore innovative financing models such as diaspora investment networks, AI-focused grants, venture debt, crowdfunding, community financing through tech hubs, and revenue-based financing for AI startups.
- International development finance programs and global initiatives like the African Development Bank's digital programs, can offer avenues of support for African AI projects.

Conclusion

Inadequate or ageing infrastructure, limited network coverage, reliance on mobile phones for internet access, and high internet prices are severely limiting factors to AI development in Africa. The same applies to unreliable electricity and limited inclusion in the political economy of computing infrastructure. Financial constraints and the high costs of resource extraction - both in terms of raw materials and data - further hamper progress.

Becoming integrated into the data processing economy is a complex and costly undertaking in which the implications of dependencies, desires for independence and competitiveness and environmental costs must all be carefully weighed. To meaningfully contribute to AI governance (both locally and globally) and prevent further widening of digital divides, policymakers must be equipped with critical information. This includes an understanding of the underlying business models and practices that drive and sustain AI.

Digital literacy and digital skills gaps across Africa, with significant regional variations and knowledge concentrated in a few capitals, render participation in the AI economy difficult for many. Socioeconomic factors such as income disparities, geographic limitations and limited access to educational resources further exacerbate this shortage, limiting opportunities for marginalised communities.

Limited capacity of educational institutions, insufficient funding for AI research, and lack of critical infrastructure needed for advanced technical research also play a crucial role. Addressing these barriers will require improved access to updated education initiatives, support of capacity-building initiatives across various industries and services and the facilitation of more equitable growth. Revamping or improving educational curricula across the continent is an important component to developing skills in technical, domain-specific, ethical, governance and socio-cultural competencies. The fact that the contributions of Africans to international conference outputs and journal publications is minimal reflects a skewness in the global knowledge economy that urgently needs addressing to ensure they feature in more scaled discussions around AI governance.

Open-source AI initiatives have led to exciting initiatives, such as the African Information Highway, and are promising to have a democratising effect on AI development, fostering transparency and accountability. While these initiatives have led to benefits such as increased knowledge-sharing among technologists and researchers, they also involve risks, including misuse (e.g., for surveillance) and the perpetuation of bias.

AI regulation on the continent is still emerging, and many countries are yet to adopt comprehensive regulatory agendas that incorporate amended key foundational laws impacting the governance of AI. This exposes gaps that can be exploited, leading to issues such as data misuse, privacy violations and security risks. Although data protection laws and regulations exist in most African countries, implementation and enforcement vary widely, often due to resource constraints, varying levels of digital literacy and differing cultural attitudes towards privacy. Policymakers are also sometimes hindered by the capacity and maturity of existing institutions.

Moreover, local laws and institutional responsibilities are often fragmented, producing uncertainty regarding how justice in certain instances should be applied and leading to bureaucratic bottlenecks. Where there are progressive and consolidated AI regulations, challenges may arise from a lack of institutional continuity and, consequently, effective implementation.

The key role of data in AI applications raises important questions about the relationship between competition policy and data protection regulation, recognising that competition and broader social mandates are not mutually exclusive. The same applies to data localisation and cross-border data sharing that permits only controlled, compliant access.

There is not yet a clear definition as to what constitutes open data, and open washing may distract from critical policy issues around data governance, anticompetitive behaviour, tax revenue, platform liability and broader societal impacts of AI. Policy provisions specifically geared towards open-source systems are limited. To navigate these risks and ensure equitable distribution of benefits from open-source AI, clearly defined frameworks and principles are crucial.

As structured environments that enable AI developers to experiment with new products and services under limited regulatory supervision, regulatory sandboxes could serve as valuable tools for promoting innovation, while ensuring responsible and equitable advancement of AI technologies and open-source models.

Overall, this study offers recommendations for various stakeholders to leverage AI as a tool for sustainable development. By identifying gaps, highlighting successful initiatives and recommending strategic actions, it seeks to empower African states to harness AI's potential to create solutions for their unique challenges and to build a future where AI innovation thrives across the continent.

References

[1] OECD.AI 'Total VC investments in AI by country and industry' OECD.AI. https://oecd.ai/en/data?selectedArea=investments-in-ai-and-data&selectedVisualization=total-vc-investments-in-ai-by-country-and-industry (2024).
[2] GSMA. 'The Mobile Economy Sub-Saharan Africa 2023' GSMA. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-economy/wp-content/uploads/2023/10/20231017-GSMA-Mobile-Economy-Sub-Saharan-Africa-report.pdf (2023)
[3] We hypothesise that the high adoption rates of cloud services are driven by infrastructural challenges such as power cuts and local hardware shortages. These challenges make cloud services an attractive solution. Additionally, companies are investing in cloud services to address existing capacity gaps, aiming to catch up and benefit from economies of scale and efficiency. However, it is important to note that this study is based on a relatively small sample size of 100 companies, averaging about two companies per country across the continent, which may not be fully representative.
[4] Blumberg, Sven; Gelle, Jean-Claude and Isabelle Tamburro 'Africa's leap ahead into cloud: Opportunities and barriers'. McKinsey. https://www.mckinsey.com/~/media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/africas%20leap%20ahead%20into%20cloud%20opportunities%20and%20barriers/africas-leap-ahead-into-cloud-opportunities-and-barriers.pdf?shouldIndex=false (January 2024)
[5] Statista. Artificial Intelligence - Africa. https://www.statista.com/outlook/tmo/artificial-intelligence/africa#market-size (Accessed October, 2024).
[6] Dario Giuliani, Dario and and Sam Ajadi '618 active tech hubs: The backbone of Africa's tech ecosystem' GSMA. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/blog/618-active-tech-hubs-the-backbone-of-africas-tech-ecosystem/ (July 2019)
[7] AfriLabs. 'Mapping AI startups in Africa: Unlocking Their Status, Challenges and Opportunities .https://www.afrilabs.com/new-ai-insights-afrilabs-publishes-two-groundbreaking-reports-funded-by-the-gates-foundation/ Afrilab (Circa May 2024).'
[8] AfriLabs. 'Mapping AI startups in Africa: Unlocking Their Status, Challenges and Opportunities .https://www.afrilabs.com/new-ai-insights-afrilabs-publishes-two-groundbreaking-reports-funded-by-the-gates-foundation/ Afrilab (Circa May 2024).'
[9] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[10] Access Partnership. ''Artificial Intelligence for Africa: An Opportunity for Growth, Development, and Democratisation' , Access Partnership. https://accesspartnership.com/artificial-intelligence-for-africa-an-opportunity-for-growth-development-and-democratisation/ (November 2018)
[11] Stanford University, 'AI Index 2024 Annual Report', Human-centred AI Institute. https://aiindex.stanford.edu/wp-content/uploads/2024/05/HAI_AI-Index-Report-2024.pdf. (May, 2024).
[12] Nivedita Balaji, Aparna Bharadwaj, Jessica Apotheker, and Megan Moore, 'Consumers Know More About AI Than Business Leaders Think', Boston Consulting Group. https://www.bcg.com/publications/2024/consumers-know-more-about-ai-than-businesses-think (April, 2024).
[13] Charles Asiegbu & Chanisa T. Okolo, 'How AI is Impacting Policy Processes and Outcomes in Africa', Brookings. https://www.brookings.edu/articles/how-ai-is-impacting-policy-processes-and-outcomes-in-africa/ (May, 2024).
[14] Intellectual Property and Information Technology Law (CIPIT), 'How is AI being Utilized in Africa'. https://app.powerbi.com/view?r=eyJrIjoiYjc5NTQyMzQtNTFiZS00ZTdjLTkwMmMtZWZkOGU3Njk1ZjM2IiwidCI6IjdhNTNiMjZhLTI1YTUtNGNiYS05NGM4LTM4ZWFlMWY3MzVjYSJ9&pageName=ReportSection
[15] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[16] ICT Works, 'How Zambian Journalists are Using Artificial Intelligence in Newsrooms'. https://www.ictworks.org/zambian-journalists-ai-newsrooms/ (September, 2024).
[17] Madu, Nanko, Ezenwa, Lydia, Adebayo Philip, et al 'Mapping AI Start-ups in Africa' https://online.flippingbook.com/view/783480578/ (May 2024)
[18] Stanley, Andrew. 'African Century', International Monetary Fund. https://www.imf.org/en/Publications/fandd/issues/2023/09/PT-african-century (September 2023)
[19] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[20] Northern African Wireless Communications, Southern African Wireless Communications . 'African Wireless Communication Yearbook 2022'. https://www.africanwirelesscomms.com/Media/Default/archive/AWCY/AWCY22.pdf. (2022)
[21] Thomas Alsop. 'Computer penetration rate among households in Africa 2005-2019'. Statista. https://www.statista.com/statistics/748549/africa-households-with-computer/ (November 2023)
[22] Saifaddin Galal. 'Internet penetration in Africa January 2024, by country'. Statista. https://www.statista.com/statistics/1124283/internet-penetration-in-africa-by-country/ (March 2024).
[23] Paula Gilbert. 'Sub-Saharan Africa has world's most expensive data prices'. Connecting Africa. https://www.connectingafrica.com/digital-inclusion/sub-saharan-africa-has-world-s-most-expensive-data-prices (April 2021).
[24] Ani Petrosyan 'Internet penetration rate worldwide 2024, by region'. Statista, https://www.statista.com/statistics/269329/penetration-rate-of-the-internet-by-region/ (October 2024)
[25] African Development Bank. 'Cross-Border Road Corridors - Expanding Market Access in Africa and Nurturing Continental Integration', African Development Bank- Infrastructure and Urban Development Department. https://www.afdb.org/en/documents/cross-border-road-corridors-expanding-market-access-africa-and-nurturing-continental-integration. (November 2023)
[26] Song, Steve. 'African Telecommunications Infrastructure in 2023', ManyPosibilities.com https://manypossibilities.net/2024/01/african-telecommunications-infrastructure-in-2023/. (January 2024)
[27] African Union. 'The Digital Transformation Strategy for Africa, 2020-2030.' https://au.int/sites/default/files/documents/38507-doc-DTS_for_Africa_2020-2030_English.pdf (2020)
[28] African Union. 'AU Data Policy Framework.' https://au.int/sites/default/files/documents/42078-doc-AU-DATA-POLICY-FRAMEWORK-ENG1.pdf (February 2022)
[29] Nii Simmonds & Ayodele Okeowo. 'Why Africa could provide the next semiconductor ecosystem for the chip business'. https://www.weforum.org/agenda/2024/07/why-africa-could-provide-the-next-semiconductor-ecosystem-for-the-chip-business/ (July 2024)
[30] Ars Technica. 'Meta unveils a new large language model that can run on a single GPU' https://arstechnica.com/information-technology/2023/02/chatgpt-on-your-pc-meta-unveils-new-ai-model-that-can-run-on-a-single-gpu/ (February 2024); Microsoft. 'Microsoft and G42 announce $1 billion comprehensive digital ecosystem initiative for Kenya'. https://news.microsoft.com/2024/05/22/microsoft-and-g42-announce-1-billion-comprehensive-digital-ecosystem-initiative-for-kenya/ (May 2024); Steve Song. 'Undersea Cables'. Submarine Network. https://www.submarinenetworks.com/en/stations/africa (Accessed March 26, 2025).
[31] Centre for Intellectual Property and Information Technology Law (CIPIT). 'The State of AI In Africa Report 2023', Strathmore University. https://cipit.org/wp-content/uploads/2023/12/Final-Report-The-State-of-AI-in-Africa-Report-2023-3.pdf (2023)
[32] Amegah, Alice; Voufo, Christiane; Amoka, Grace; Diabate Souleymane; McCarthy-Fakhry, Una. 'Empowering Africa's future: Prioritizing STEM skills for youth and economic prosperity' World Bank Blogs. https://blogs.worldbank.org/en/education/empowering-africas-future-prioritizing-stem-skills-youth-and-economic-prosperity (September 2023)

[33] Nestor Maslej, Loredana Fattorini, Erik Brynjolfsson, John Etchemendy, Katrina Ligett, Terah Lyons,James Manyika, Helen Ngo, Juan Carlos Niebles, Vanessa Parli, Yoav Shoham, Russell Wald, Jack Clark, and Raymond Perrault, "The AI Index 2023 Annual Report," AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA. https://hai-production.s3.amazonaws.com/files/hai_ai-index-report-2023_chapter_1-1.pdf (April 2023).
[34] Araba Sey and Oarabile Mudongo. Case Studies on AI Skills Capacity-building and AI in Workforce Development in Africa. Research ICT Africa. https://researchictafrica.net/publication/case-studies-on-ai-skills-capacity-building-and-ai-in-workforce-development-in-africa/ (July 2021).
[35] https://aims.ac.za/about-aims-south-africa/
[36] https://www.africa.engineering.cmu.edu/
[37] Kyle Daigle & GitHub Staff. 'Octoverse: The state of open source and rise of AI in 2023'. https://github.blog/news-insights/research/the-state-of-open-source-and-ai/ (November 2023).
[38] Pham, Thanh. 'Analyzing The Software Engineer Shortage' Forbes. https://www.forbes.com/councils/forbestechcouncil/2021/04/13/analyzing-the-software-engineer-shortage/ (April 2021)
[39] Värendh Månsson, Cecilia 'Africa's youths can help solve the global tech talent shortage' Brookings. https://www.brookings.edu/articles/africas-youths-can-help-solve-the-global-tech-talent-shortage/ (November 2022)
[40] Africa Check. 'How many universities are there in Africa?' https://africacheck.org/infofinder/explore-facts/how-many-universities-are-there-africa (January 2024).; Kimberly Mutandiro. 'African universities are failing to prepare tech graduates for jobs in AI'. Rest of World. https://restofworld.org/2024/ai-skills-training-africa/ (April 2024); Mastercard Foundation. 'ALX Kick-Starts Inaugural All-Tech Training Programs For Over 32,000 Learners Across Africa'. https://mastercardfdn.org/saving-lives-and-livelihoods/alx-kick-starts-inaugural-all-tech-training-programs-for-over-32000-learners-across-africa/ (May 2023); National Information Technology Development Agency of Nigeria. National Digital Literacy Framework. https://nitda.gov.ng/wp-content/uploads/2023/07/Digital-Literacy-Framework.pdf. (July 2023); Patrick Dupoux, Qahir Dhanani, Tolu Oyekan, Sana Rafiq, and Karol Yearwood. 'Africa's Opportunity in Digital Skills and Climate Analytics'. BCG. https://www.bcg.com/publications/2022/africas-opportunity-in-digital-skills (November 2022).
[41] See Chapter 5: Strategic Recommendations for more detail.
[42] Liu Youmin and Huang Wei. 'Zoom Africa: AI emerges as new frontier of China-Africa cooperation'. Xinhua. https://english.news.cn/20250319/4085426d668649999b512cf19e150fb7/c.html (2025 March).
[43] Grace Chege. 'Is open-access AI the great safety equalizer for African countries?' Brookings Institute. .https://www.brookings.edu/articles/is-open-access-ai-the-great-safety-equalizer-for-african-countries/#:~:text=Open%2Daccess%20AI%20is%20gaining,developers%20between%202022%20and%202023. (2025 February 21)
[44] Orange.com. 'Orange to expand open-source AI models to African regional languages for digital inclusion'. https://newsroom.orange.com/orange-to-expand-open-source-ai-models-to-african-regional-languages-for-digital-inclusion/. (2024 November 26).
[45] Natasha Karanja. 'Fostering AI Innovation in Africa: Synergizing Intellectual Property Rights and Open-Source Software Models'. Centre for Intellectual Property and Information Technology Law (CIPT), Strathmore University. https://cipit.strathmore.edu/fostering-ai-innovation-in-africa-synergizing-intellectual-property-rights-and-open-source-software-models/#sdfootnote16anc (September 2024).
[46] See https://www.masakhane.io/
[47] Hoffmann Manuel, Frank Nagle, and Yanuo Zhou. 'The Value of Open Source Software.' Harvard Business School Working Paper, No. 24-038, January 2024. https://www.hbs.edu/faculty/Pages/download.aspx?name=24-038.pdf. (Accessed October 12, 2024).
[48] The highest value is seen in the services and retail trade sectors.
[49] Open Source Initiative. 'The Open Source AI Definition – 1.0-RC'. https://opensource.org/deepdive/drafts/the-open-source-ai-definition-1-0-rc1 (October 2024).
[50] See Nico Klingler. 'AI Licenses: What You Should Know [Updated 2025]'. Viso AI. https://viso.ai/deep-learning/ai-licenses/ (October 2024)
[51] Access Partnership. 'Accountability in the EU AI Act: Who is Responsible for Decisions Made by AI?'. 'https://accesspartnership.com/accountability-in-the-eu-ai-act-who-is-responsible-for-decisions-made-by-ai/ (February 2022).
[52] Michelle Duke. 'Top tips for creating a healthy and sustainable open source community. GitHub Blog.' https://github.blog/open-source/maintainers/healthy-and-sustainable-communities/#:~:text=Open%20source%20communities%20are%20also,%2C%20to%20grow%2C%20and%20improve. (2022 July 7).
[53] This ideally should apply to both open-source and proprietary models.
[54] Rob Floyd, 'Great Opportunities Lie Ahead for Data Governance in Africa. So Do Great Challenges'. Africa Center for Economic Transformation. https://acetforafrica.org/research-and-analysis/insights-ideas/commentary/great-opportunities-lie-ahead-for-data-governance-in-africa-so-do-great-challenges/ (March 2024).
[55] The GIP Digital Watch Observatory. 'Smart Africa alliance forged to promote data and digital identity interoperability'. https://dig.watch/updates/smart-africa-alliance-forged-to-promote-data-and-digital-identity-interoperability (May 2023)
[56] Open Government Partnership (OGP). 'OGP Multi-Donor Trust Fund'. https://www.opengovpartnership.org/ogp-multi-donor-trust-fund/ (Accessed November 30, 2024).
[57] African Union. 'Continental AI Strategy: Harnessing AI for Africa's Development and Prosperity'. https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf. (July 2024).
[58] African Union. 'The Digital Transformation Strategy for Africa (2020-2030)'.
[59] Kate Jones. 'AI governance and human rights: Resetting the relationship'. Chatham House Research Paper. January 2023. https://www.chathamhouse.org/sites/default/files/2023-01/2023-01-10-AI-governance-human-rights-jones.pdf
[60] David Evan Harris. 'Not Open and Shut: How to Regulate Unsecured AI'. Centre for International Governance Innovation. https://www.cigionline.org/articles/not-open-and-shut-how-to-regulate-unsecured-ai/ (September 2024).
[61] Samuel Segun. 'The Global Security Risks of Open-Source AI Models'. United Nations Office of Disarmament Affairs Blog. https://disarmament.unoda.org/responsible-innovation-ai/blog/ (2025).
[62] UN Human Rights Office of the High Commissioner. 'Access to remedy and the technology sector: Basic concepts and principles'. https://www.ohchr.org/sites/default/files/Documents/Issues/Business/B-Tech/access-to-remedy-concepts-and-principles.pdf (January 2021).
[63] Principles for Digital Development, 'Share, Reuse and Improve'. https://digitalprinciples.org/principles/share-reuse-and-improve/
[64] Sebastian Steinbuss (Ed.), 'IDS RAM 4', International Data Spaces Association. https://docs.internationaldataspaces.org/ids-knowledgebase/ids-ram-4/ (Accessed March 26, 2025).
[65] T20 Brasil, 'Task Force 05 Statement'. https://t20brasil.org/media/documentos/arquivos/TF05_Statement_A5.pdf (2024)
[66] Tony Roberts and Kevin Hernandez, 'Open Data for Agriculture and Nutrition: A Literature Review and Proposed Conceptual Framework', Institute of Development Studies. https://www.ids.ac.uk/publications/open-data-for-agriculture-and-nutrition-a-literature-review-and-proposed-conceptual-framework/ (January, 2021)
[67] See TensorFlow User Groups https://www.tensorflow.org/community/groups
[68] Mark Zuckerbeg 'Open Source AI Is the Path Forward'. Meta. https://about.fb.com/news/2024/07/open-source-ai-is-the-path-forward/ (July 2024).
[69] Meta. 'Announcing the inaugural Llama Impact Grant and Llama Impact Innovation Award recipients'. https://ai.meta.com/blog/llama-impact-grant-innovation-award-winners-2024/ (September 2024)
[70] Meta 'No Language Left Behind'. https://ai.meta.com/research/no-language-left-behind/
[71] Chijioke Okorie and Vukosi Marivate. 'How African NLP Experts Are Navigating the Challenges of Copyright, Innovation, and Access'. Carnegie Endowment for International Peace. https://carnegieendowment.org/research/2024/04/how-african-nlp-experts-are-navigating-the-challenges-of-copyright-innovation-and-access?lang=en (April 2024).

[72] FAIR Forward. 'Open Data for AI'. Federal Ministry for Economic Cooperation and Development (BMZ), Germany. https://www.bmz-digital.global/en/overview-of-initiatives/fair-forward/
[73] Mozilla. 'Common Voice: African Languages'. https://foundation.mozilla.org/en/what-we-fund/opportunities/common-voice-kiswahili-awards/
[74] Mbaza AI Chatbot https://digitalumuganda.com/chatbot/
[75] Mark Wamai. 'Open Access AI Training Data & Courses'. Makerere University. https://news.mak.ac.ug/2020/10/open-access-ai-training-data-courses/ (October 2020).
[76] Lacuna Fund. 'Four New Machine Learning Datasets in Agriculture, Health, and Language Domains'. https://lacunafund.org/four-new-machine-learning-datasets-in-agriculture-health-and-language-domains/ (March 2024).
[77] GIZ. 'Using artificial intelligence and open-source satellite data to ensure food security'. https://www.giz.de/en/mediacenter/104305.html (January 2022).
[78] Zindi. 'Ghana Crop Disease Detection Challenge'. https://zindi.africa/competitions/ghana-crop-disease-detection-challenge
[79]'Masakhane'. https://www.masakhane.io/. See more at Willem de Vries , Chris Emezue , Bonaventure Dossou. 'Masakhane leads the way for low-resourced African languages online' - Interviews. Voertaal. https://voertaal.nu/masakhane-leads-the-way-for-low-resourced-african-languages-online/ (July, 2021).
[80] Code for Africa 'OpenAfrica' https://open.africa/
[81] Zindi. https://zindi.africa/
[82] Zindi. 'Zindi solutions: A useful open-source model of urban air quality for Africa'. Medium. https://zindi.medium.com/zindi-solutions-a-useful-open-source-model-of-urban-air-quality-for-africa-709a5b15f107. (April 2020)
[83] Lelapa. 'InkubaLM: A small language model for low-resource African languages'. https://lelapa.ai/inkubalm-a-small-language-model-for-low-resource-african-languages/ (October 25, 2024).
[84] Ghana NLP. https://ghananlp.org/about
[85] See more about the initiative on https://hausanlp.github.io/
[86] Barack Wanjawa, Lilian Wanzare, Florence Indede, Owen McOnyango, Edward Ombui, and Lawrence Muchemi. *Kencorpus: a Kenyan language corpus of Swahili, Dholuo and Luhya for natural language processing tasks* (2022). Working paper, available at https://arxiv.org/abs/2208.12081
[87] See more via Alliance AI. 'AI Communities'. https://www.alliance4ai.org/communities/
[88] Vax-Llama is one of Meta's Llama Impact Innovation Awards recipients. See Meta. 'Announcing the inaugural Llama Impact Grant and Llama Impact Innovation Award recipients'. https://ai.meta.com/blog/llama-impact-grant-innovation-award-winners-2024/ (September 2024)
[89] See 'HelpMum Vax-Llama Model Documentation'. https://helpmum.org/vax_llama
[90] PROMPT by Jacaranda Health is one of Llama Impact Grants Award recipients.
[91] Tanzania-AI-Community/Twiga. https://github.com/Tanzania-AI-Community/twiga
[92] The creators of this project have noted the peculiar challenge of working with closed and proprietary models like Open AI's GPT 3.5 in low-resourced contexts like Ghana. See Boateng, George, Jonathan Abrefah Mensah, Kevin Takyi Yeboah, William Edor, Andrew Kojo Mensah-Onumah, Naafi Dasana Ibrahim, and Nana Sam Yeboah. "Brilla AI: Ai contestant for the national science and maths quiz." In *International Conference on Artificial Intelligence in Education*, pp. 214-227. Cham: Springer Nature Switzerland, 2024
[93] Brilla AI https://github.com/brilla-ai/brilla-ai
[94] Niclas Benni. 'Bridging the data gap in agricultural financing: The case of FarmDrive'. Rural Finance Investment & Learning Centre. https://www.rfilc.org/bridging-the-data-gap-in-agricultural-financing-the-case-of/ (March 2023)
[95] CGAIR 'Tumaini: an AI-powered mobile app for pests and diseases'. https://www.cgiar.org/innovations/tumaini-an-ai-powered-mobile-app-for-pests-and-diseases/
[96] Selvaraj, Michael Gomez, Alejandro Vergara, Henry Ruiz, Nancy Safari, Sivalingam Elayabalan, Walter Ocimati, and Guy Blomme. 'AI-powered banana diseases and pest detection.' *Plant Methods,* 15 (2019): 1-11.
[97] BMZ. 'Smart sowing: AI for more harvest in Kenya and Uganda'. https://www.bmz-digital.global/en/smart-sowing-ai-for-more-harvest-in-kenya-and-uganda/ BMZ Digital Global (July 2024).
[98] Digital Green's Farmer Chat is one of the Llama Impact Grant Award recipients.
[99] PhosoAI is one of the Llama Impact Innovation Award recipients.
[100] BMZ, 'Smart sowing: AI for more harvest in Kenya and Uganda'. https://www.bmz-digital.global/en/smart-sowing-ai-for-more-harvest-in-kenya-and-uganda/(July, 2024).
[101] RAICA. 'RAGA: An Artificial Intelligence Based System for Predicting Groundwater Availability - Executive Summary'. https://rain-ca.org/projects/raga-an-artificial-intelligence-based-system-for-predicting-groundwater-availability/
[102] Mozilla. 'Leveraging Satellite Data and Machine Learning for Air Quality Prediction in Africa'. https://foundation.mozilla.org/en/blog/leveraging-satellite-data-and-machine-learning-for-air-quality-prediction-in-africa/ (June 2024).
[103] Bainomugisha, Engineer, Joel Ssematimba, Deogratius Okedi, Anold Nsubuga, Marvin Banda, George William Settala, and Gideon Lubisia. "AirQo sensor kit: A particulate matter air quality sensing kit custom designed for low-resource settings." *HardwareX* 16 (2023): e00482.
[104] AirQo Platform. https://github.com/airqo-platform/
[105] African Union. 'Continental AI Strategy: Harnessing AI for Africa's Development and Prosperity.'
[106] GSMA. *AI for Africa: Use cases delivering impact.* https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2024/07/AI_for_Africa.pdf (July 2024).
[107] The latest version of Meditron - Meditron 3 itself was trained on Llama 3.1, and is a collaborative effort involving researchers from Carnegie Mellon University Africa, EPFL School of Computer Science and the Yale School of Medicine. See 'Open Meditron Initiative' - https://huggingface.co/OpenMeditron
[108] The Global Index on Responsible AI (GIRAI) assesses how all actors in the AI ecosystem uphold human rights and ethical principles in the design, development, deployment and governance of AI. See Rachel Adams, Fola Adeleke, Ana Florido, Larissa de Magalhães Santos, Nicolas Grossman, Leah Junck, & Kelly Stone. 'Global Index on Responsible AI 2024 (1st Edition)'. Global Center on AI Governance. https://coral-trista-52.tiiny.site/ (2024).
[109] Spurt Solutions. 'State Of AI Adoption In Africa', Spurt Solutions. https://spurt.solutions/publications/state-of-ai-adoption-in-africa (July 2024)
[110] Centre for Intellectual Property and Information Technology Law (CIPIT). 'The State of AI in Africa Report 2023', Strathmore University. https://cipit.org/wp-content/uploads/2023/12/Final-Report-The-State-of-AI-in-Africa-Report-2023-3.pdf (2023)
[111] United Nations. Economic Commission for Africa (UNECA). ''AI in Africa: opportunities, challenges and policy considerations'. https://repository.uneca.org/handle/10855/48193 (August, 2021).
[112] Convergence. '2024 Q1 AI in Africa Summary Report', Convergence. https://convergenceai.io/wp-content/uploads/2023/08/Convergence-2024-Q1-AI-in-Africa-Summary-Report.pdf
[113] African Union. 'Continental Artificial Intelligence Strategy: Harnessing AI for Africa's Development and Prosperity'. African Union. https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf (Juy 2024)
[114] Smart Africa. Artificial Intelligence for Africa. https://smartafrica.org/wp-content/uploads/2023/11/70029-eng_ai-for-africa-blueprint-min.pdf. (2021).
[115] AUDA-NEPAD. 'White Paper: Regulation and Responsible Adoption of AI in Africa Towards Achievement of AU Agenda 2063'. https://onedrive.live.com/?authkey=%21AKJcwcnXeRGANKQ&cid=14DDAD979C3656DF&id=14DDAD979C3656DF%2145406&parId=14DDAD979C3656DF%2145404&o=OneUp(June 2023).
[116] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[117] African Union. 'The Digital Transformation Strategy for Africa, 2020-2030.'

[118] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[119] United Nations Educational, Scientific and Cultural Organization (UNESCO). 'Artificial Intelligence Needs Assessment Survey In Africa'. https://unesdoc.unesco.org/ark:/48223/pf0000375322 (2021)
[120] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[121] Beatriz Kira et. al., 'Regulating digital ecosystems: bridging the gap between competition policy and data protection'. https://www.researchgate.net/publication/354113966_Regulating_digital_ecosystems_bridging_the_gap_between_competition_policy_and_data_protection ; (August 2021)
[122] Tamer Nagy and Nazly Khedr, 'Antitrust enforcement is on the rise in Africa', https://www.whitecase.com/insight-our-thinking/africa-focus-summer-2024-antitrust-enforcement#:~:text=Africa%20is%20undergoing%20significant%20changes,and%20anticompetitive%20conduct%2C%20among%20others, (September 2024)
[123] Baker & McKenzie, Competition in Africa Report 2024. Noted above.
[124]COMESA is a regional economic and trade organisation for Eastern and Southern Africa with 21 Member States.
[125] COMESA. Draft COMESA Competition and Consumer Protection Regulations (As Amended In November 2023). https://comesacompetition.org/wp-content/uploads/2024/01/CCC-Draft-Proposed-Amendments-the-Regulations-shared_stakeholders.pdf (November 2023).
[126] Reichel Carsten et. al., 'COMESA's proposed regulations could lead to a dramatic increase in African competition enforcement', https://www.dlapiper.com/en/insights/publications/2024/04/comesas-proposed-regulations-could-lead-to-a-dramatic-increase-in-african-competition-enforcement (April 2024)
[127] Beatriz Kira et. al., 'Regulating digital ecosystems: bridging the gap between competition policy and data protection'. https://www.researchgate.net/publication/354113966_Regulating_digital_ecosystems_bridging_the_gap_between_competition_policy_and_data_protection ; (August 2021)
[128] ECOWAS. 'Supplementary Act on Personal Data Protection within ECOWAS'. https://www.ictpolicyafrica.org/en/document/z69cbq7b51?page=1 (February 2010).
[129] Southern African Development Community (SADC). Harmonization of ICT Policies in Sub-Saharan Africa (HIPSSA) - Data Protection Model Law. https://www.itu.int/en/ITU-D/Projects/ITU-EC-ACP/HIPSSA/Documents/FINAL%20DOCUMENTS/FINAL%20DOCS%20ENGLISH/sadc_model_law_data_protection.pdf (2013).
[130] EAC. Draft EAC legal framework for cyberlaws. http://repository.eac.int:8080/bitstream/handle/11671/1815/EAC%20Framework%20for%20Cyberlaws.pdf?seq (Accessed October 2024).
[131] Babalola, O. (2023). Data Protection Legal Regime and Data Governance in Africa: An Overview. In: Ndemo, B., Ndung'u, N., Odhiambo, S., Shimeles, A. (eds) Data Governance and Policy in Africa. Information Technology and Global Governance. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-24498-8_4
[132] Noted above.
[133] Africa Data Protection. 'List of African countries with a dedicated data protection law'. https://blog.africadataprotection.org/en/legislation/ (Accessed March 26 2025).
[134] Africa Privacy Report 2023/2024; A Review of Policy Trends and Digital Frontiers in the Data Protection Landscape; https://www.ictworks.org/wp-content/uploads/2024/05/Africa-Privacy-Report.pdf
[135] Munung, Nchangwi Syntia, Ciara Staunton, Otshepeng Mazibuko, P. J. Wall, and Ambroise Wonkam. "Data protection legislation in Africa and pathways for enhancing compliance in big data health research." *Health Research Policy and Systems* 22, no. 1 (2024): 1-14.
[136] Kingdom of Morocco, General Directorate of Information Systems Security. 'Law No. 09-08 on the protection of individuals with regard to the processing of personal data' https://www.dgssi.gov.ma/sites/default/files/legislative/brochure/2024-07/law%2009-08%20in%20french.pdf (February 2009).
[137] Article 23
[138] Tara Davis and Wendy Trott, 'The regulation of artificial intelligence through data protection laws: Insights from South Africa' (2024) African Journal on Privacy & Data Protection 207-219 https://doi.org/10.29053/ajpdp.v1i1.0010
[139] DLA Piper, 'Data Protection Laws of the World', https://www.dlapiperdataprotection.com/index.html?t=law&c=ZA
[140] LaCasse, Alex. Report examines state of African nations' data protection laws, implementation efforts; IAPP
[141] Access Now, Strengthening Data Protection in Africa: Key issues for implementation, https://www.accessnow.org/wp-content/uploads/2024/01/Strengthening-data-protection-in-Africa-key-issues-for-implementation-updated.pdf (January 2024)
[142] Alexander Beyleveld and Franziska Sucker, 'Cross-border Data Flows in Africa: Policy Considerations for the AFCFTA Protocol on Digital Trade', October 2022, https://www.wits.ac.za/mandelainstitute/research/publications/
[143] Institute of International Finance (IIF), 'Data Localization: Cost, Tradeoffs, and Impacts Across the Economy', p. 2-3, https://www.iif.com/Publications/ID/4225/Data-Localization-Costs-Tradeoffs-and-Impacts-Across-the-Economy; McKinsey Global Institute, Digital Globalization: The New Era of Global Flows, , March 2016, p. 30, https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/digital-globalization-the-new-era-of-global-flows (December 22, 2020)
[144] Anupam Chander and Uyên P. Lê, 'Data Nationalism', Emory Law Journal, 64 (2015), p. 700
[145] 'Data Nationalism', Noted above.
[146] Cory and Dascoli, 'How Barriers to Cross-Border Data Flows Are Spreading Globally', pp. 1, 14-15.
[147] McKinsey & Company, 'Localization of data privacy regulations creates competitive opportunities' https://www.mckinsey.com/capabilities/risk-and-resilience/our-insights/localization-of-data-privacy-regulations-creates-competitive-opportunities, (June 2022)
[148] 'Localization of data privacy regulations creates competitive opportunities', Noted above
[149] Article 24 of the Data Protection Law
[150] Articles 43 and 44 of the law No. 09-08 on Processing of Personal Data, 2009
[151] Article 34 of the Data Protection Law
[152] Article 391 of the Benin Digital Code
[153] Article 42 of the law No. 001-2021 / AN
[154] Article 19 of the Data Protection Act
[155] Article 20 of the Personal Data Protection Law
[156] Section 36 of the Data Protection Act 2017
[157] Article 52 of the Data Protection Act 2011
[158] Article 28 of the cybersecurity and personal data protection law
[159] Article 7 of the Data Protection Law
[160] Article 23 of the personal data protection law 2016
[161] Article 19 of the law on data protection
[162] Article 28 of the data protection law
[163] Munung, Nchangwi Syntia, Ciara Staunton, Otshepeng Mazibuko, P. J. Wall, and Ambroise Wonkam. "Data protection legislation in Africa and pathways for enhancing compliance in big data health research." *Health Research Policy and Systems* 22, no. 1 (2024): 1-14. https://health-policy-systems.biomedcentral.com/counter/pdf/10.1186/s12961-024-01230-7.pdf

[164] Graham Greenleaf and Bertil Cottier, 'International and Regional Commitments in African Data Privacy Laws: A Comparative Analysis' (2022) 44 Computer Law & Security Review 1, 14–15.
[165] African Commission on Human and Peoples' Rights (ACHPR). 'Declaration of Principles on Freedom of Expression and Access to Information in Africa' https://achpr.au.int/sites/default/files/files/2022-08/declarationofprinciplesonfreedomofexpressioneng2019.pdf (November 2019).
[166] African Union. 'AU Data Policy Framework. https://au.int/sites/default/files/documents/42078-doc-AU-DATA-POLICY-FRAMEWORK-ENG1.pdf. (February, 2022).
[167]African Union. 'The Digital Transformation Strategy for Africa (2020-2030)'.
[168] African Continental Free Trade Area Secretariat. 'Protocol to the Agreement Establishing the African Continental Free Trade Area on Digital Trade'. https://www.bilaterals.org/IMG/pdf/afcfta_digital_trade_protocol_-_9_february_2024_draft.pdf (February 2024).
[169] African Union. 'African Union Convention on Cyber Security and Personal Data Protection'. https://au.int/sites/default/files/treaties/29560-treaty-0048_-_african_union_convention_on_cyber_security_and_personal_data_protection_e.pdf (June 2014).
[170] https://www.researchgate.net/publication/378555631_Artificial_Intelligence_and_the_Law_in_Africa
[171] Yvonne Nyaboke, 'Intellectual Property Rights in the Era of Artificial Intelligence', Journal of Modern Law and Policy (JMLP) Vol.4, Issue No.2, pp 57 - 72; https://carijournals.org/journals/index.php/JMLP/article/view/2162/2549 (July 2024)
[172] Article 7(1) of the Agreement Establishing the African Continental Free Trade Area requires State Parties to enter into negotiations on intellectual property rights.
[173]African Union. 'Protocol to the Agreement establishing the African Continental Free Trade Area on Intellectual Property Rights'. https://www.bilaterals.org/IMG/pdf/en_-_draft_protocol_of_the_afcfta_on_intellectual_property_rights.pdf .(January 2023).
[174] African Union, 'African Digital Transformation Strategy and African Union Communication and Advocacy Strategy among major AU initiatives in final declaration of STCCICT3', Directorate of Information and Communication. https://au.int/sites/default/files/pressreleases/37592-pr-stc_pr-1-5.pdf
[175] Aggrey Ambali, Justina Dugbazah, Barbara Glover, Bhekani Mbuli, Chifundo Kungade and Nhlawulo Shikwambane, 'Taking A Continental Leap Towards A Technologically Empowered Africa At The AUDA-NEPAD AI Dialogue', AU-NEPAD. https://www.nepad.org/blog/taking-continental-leap-towards-technologically-empowered-africa-auda-nepad-ai-dialogue
[176] Rob Floyd, Amr Farouk Safwat, Souhila Amazouz, Mlindi Mashologu, James Elieta and Joseph Ishie, 'Collaboration is Critical for Successful AI Development in Africa', African Center for Economic Transformation. https://acetforafrica.org/research-and-analysis/insights-ideas/commentary/collaboration-is-critical-for-successful-ai-development-in-africa/ (September, 2024)
[177] African Union. 'CONTINENTAL ARTIFICIAL INTELLIGENCE STRATEGY: Harnessing AI for Africa's Development and Prosperity', African Union. https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf (July 2024)
[178] UNESCO, 'UNESCO's support to AU's Continental AI Framework and Strategy', UNESCO. https://www.unesco.org/en/articles/unescos-support-aus-continental-ai-framework-and-strategy (August 2024)
[179] Nelishia Pillay, 'Artificial intelligence for Africa: An opportunity for growth, development, and democratisation', The University of Pretoria. https://www.up.ac.za/media/shared/7/ZP_Files/ai-for-africa.zp165664.pdf. (April 2020)
[180] Infocomm Media Development Authority, 'Singapore prepares ahead to leverage Artificial Intelligence for a better future', Infocomm Media Development Authority, https://www.imda.gov.sg/resources/press-releases-factsheets-and-speeches/press-releases/2024/sg-unveils-digital-enterprise-blueprint (May 2024)
[181] APET, 'White Paper: Regulation and Responsible Adoption of AI for Africa Towards Achievement of AU Agenda 2063', AUDA-NEPAD. https://dig.watch/resource/auda-nepad-white-paper-regulation-and-responsible-adoption-of-ai-in-africa-towards-achievement-of-au-agenda-2063 (June 2023)
[182] Olamide Goriola, Olivia Shirley, Rob Floyd, 'How Africa Can Benefit from Artificial Intelligence: The Way Forward', African Center for Economic Transformation. https://acetforafrica.org/research-and-analysis/insights-ideas/articles/how-africa-can-benefit-from-artificial-intelligence-the-way-forward/ (August, 2023)
[183] GSMA, 'AI for Africa: Use cases delivering impact South Africa deep dive'. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2024/07/SOUTHAFRICA_AIforAfrica-1.pdf (August, 2024)
[184] Rachel Adams, Fola Adeleke, Ana Florido, Larissa Galdino de Magalhães Santos, Nicolás Grossman, Leah Junck and Kelly Stone, 'Global Index on Responsible AI 2024' (1st Edition) Global Center on AI Governance https://girai-report-2024-corrected-edition.tiiny.site/ (2024)
[185] African Observatory on Responsible Artificial Intelligence, https://www.africanobservatory.ai/
[186] United Nations Development Programme, 'AI Hub for Sustainable Development Strengthening Local AI Ecosystems through Collective Action'. https://www.undp.org/sites/g/files/zskgke326/files/2024-07/ai_hub_report_digital.pdf . (July, 2024).
[187] UN Global Pulse, ' UN Global Pulse', https://www.unglobalpulse.org/un-global-pulse-uganda/ (n.d.)
[188] International Development Research Centre, 'Meet the AI4D Africa partners leading policy research', IDRC. https://idrc-crdi.ca/en/research-in-action/meet-ai4d-africa-partners-leading-policy-research
[189] Niyel, 'IDIA (Initiative pour le Développement de l'Intelligence Artificielle)', https://niyel.net/project/multi-annual-project-test/Niyel. (n.d.)
[190] Aisha Walcott-Bryant and Perry Nelson, '6 ways Google is working with AI in Africa' , Google Africa Blog. https://blog.google/intl/en-africa/company-news/6-ways-google-is-working-with-ai-in-africa/ (June 2023).
[191] The Official Microsoft Blog, 'AI in Africa: Meeting the opportunity', Microsoft. https://blogs.microsoft.com/wp-content/uploads/prod/sites/5/2024/01/AI-in-Africa-Meeting-the-Opportunity.pdf (January 2024)
[192] Microsoft Unlocked, 'Curbing malnutrition with AI', Microsoft. https://unlocked.microsoft.com/amref/ (n.d.)
[193] AUDA-NEPAD, 'Memorandum Signing Between AUDA-NEPAD and Meta: Paving the way for Digital Transformation in Africa', AUDA-NEPAD.https://www.nepad.org/news/memorandum-signing-between-auda-nepad-and-meta-paving-way-digital-transformation-africa (March, 2024)
[194] African Development Bank (AFDB), 'Digital Future for Africa: African Development Bank and Intel Train Millions in AI', AFDB. https://www.afdb.org/en/news-and-events/press-releases/digital-future-africa-african-development-bank-and-intel-train-millions-ai-71649, (October, 2023)
[195] OnePlanET, https://oneplanetproject.eu/.
[196] ECOWAS, 'ECOWAS Concludes 28th Technical Meeting on Early Warning and Conflict Prevention with Strengthened Regional Collaboration' (Press Release). https://www.ecowas.int/ecowas-concludes-28th-technical-meeting-on-early-warning-and-conflict-prevention-with-strengthened-regional-collaboration/ (June, 2024).
[197] IGAD, 'IGAD Regional Strategy For Disaster Risk Management (2019-2030)'. https://www.icpac.net/publications/igad-regional-strategy-for-disaster-risk-management/ (January, 2023).
[198] Unesco-Eastern Africa Sub-Regional Forum on Artificial Intelligence (EARFAI), 'Nairobi Statement on Artificial Intelligence and Emerging Technologies in Eastern Africa' https://unesdoc.unesco.org/ark:/48223/pf0000390381 (June, 2024)
[199] Caroline Khene and Kevin Hernandez, 'How can a new UK government deliver AI for development?', Institute of Development Studies. https://www.ids.ac.uk/opinions/how-can-a-new-uk-government-deliver-ai-for-development/, (June 2024).
[200] UK Foreign, Commonwealth & Development Office and The Rt Hon James Cleverly MP, 'UK unites with global partners to accelerate development using AI' (press release). https://www.gov.uk/government/news/uk-unites-with-global-partners-to-accelerate-development-using-ai (November, 2023)
[201] Our World in Data. 'Annual global corporate investment in artificial intelligence, by type' https://ourworldindata.org/grapher/corporate-investment-in-artificial-intelligence-by-type (June 2024).

[202] Nestor Maslej, Loredana Fattorini, Raymond Perrault, Vanessa Parli, Anka Reuel, Erik Brynjolfsson, John Etchemendy, Katrina Ligett, Terah Lyons, James Manyika, Juan Carlos Niebles, Yoav Shoham, Russell Wald, and Jack Clark, 'The AI Index 2024 Annual Report'. AI Index Steering Committee, Institute for Human-Centered AI, Stanford University, Stanford, CA, https://aiindex.stanford.edu/wp-content/uploads/2024/04/HAI_2024_AI-Index-Report.pdf (April 2024).
[203] Lennart Heim "This Can't Go On(?) - AI Training Compute Costs". Blog.heim.xyz, https://blog.heim.xyz/this-cant-go-on-compute-training-costs (June 2023).
[204] TOP500 Highlights - (2024 June). Available at: https://www.top500.org/lists/top500/2024/06/highs/
[205] Wee Tracker. 'Africa's AI Startups Miss Out On AI Gold Rush With <1% Of Funding' https://weetracker.com/2024/08/08/africa-ai-startups-slow-funding/ (August 2024).
[206] CB Insights. State of AI Q2'24 Report. https://www.cbinsights.com/research/report/ai-trends-q2-2024/ (July 2024).
[207] Gigi Zamora. 'Gates Foundation Allocates $30 Million Towards Advancing AI In Africa'. Forbes. https://www.forbes.com/sites/gigizamora/2023/10/10/gates-foundation-allocates-30-million-towards-advancing-ai-in-africa/ (October 2023)
[208] Bill & Melinda Gates Foundation. Gates Foundation Celebrates 20 Years of "Grand Challenges" With New Investments and a Call to Make R&D Breakthroughs Available More Quickly and Equitably https://www.gatesfoundation.org/ideas/media-center/press-releases/2023/10/grand-challenges-ai-equity-womens-health#:~:text=Today%2C%20Gates%20announced%20that%20the%20foundation%20is,ideas%20into%20scalable%20health%20and%20development%20solutions (October 2023).
[209] Bergur Thormundsson, 'Funding raised for AI startups in Q4 2023, by region'. Statista. https://www.statista.com/statistics/1369622/ai-startup-funding-by-region/ (May 22, 2024).
[210] Abdullahi Tsanni 'This company is building AI for African languages'. MIT Tech Review. https://www.technologyreview.com/2023/11/17/1083637/lelapa-ai-african-languages-vulavula/ (November 2023).
[211] Nixon Kanali, 'Nigerian AI startup Intron Health raises $1.6M to strengthen its African languages speech recognition tool'. Tech Trends. https://techtrendske.co.ke/2024/07/25/nigerian-ai-startup-intron-health-raises-1-6m-to-strengthen-its-african-languages-speech-recognition-tool/ (July 2024)
[212] Tom Jackson, 'Ghanaian AI startup Aya Data raises $900k seed funding'. Disrupt Africa https://disruptafrica.com/2024/10/23/ghanaian-ai-startup-aya-data-raises-900k-seed-funding/ (October 2023).
[213] Osamu Ekhator, 'Logistics startup Logidoo secures $50,000 to build AI-powered solution'. Tech Point. https://techpoint.africa/2024/07/17/logistics-startup-logidoo-gets-funding/ (July 2024).
[214] Damilare Dosunmu, 'How InstaDeep became Africa's biggest AI startup success' Rest of World. https://restofworld.org/2024/instadeep-africa-ai-startup-acquisition/ (September 2024); Max Cuvellier Giacomelli 'Here comes the Q3 Round-Up [1/3]' Africa: The Big Deal. https://thebigdeal.substack.com/p/q32024 (October 2024); Tage Kene-Okafor, 'From InstaDeep to Paystack: Here are Africa's biggest startup exits and how much they raised'. Tech Crunch https://techcrunch.com/2024/09/01/from-instadeep-to-paystack-here-are-africas-biggest-startup-exits-and-how-much-they-raised/ (September 2024); Wee Tracker. 'Africa's AI Startups Miss Out On AI Gold Rush With <1% Of Funding' https://weetracker.com/2024/08/08/africa-ai-startups-slow-funding/ (August 2024).
[215] See Chapter 5: Strategic Recommendations for more detail.

globalcenter.ai