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Emerging technology policies and democracy in Africa

South Africa, Kenya, Nigeria, Ghana, and Zambia in focus

Ayantola Alayande, Samuel Segun, and Leah Junck

Atlantic Council

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Cover: Young people browse the internet in Lagos, Nigeria, July 26, 2018. REUTERS/ Akintunde Akinleye.

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Executive summary

Africa is increasingly asserting its participation in the advancement of emerging technologies by engaging in active dialogues and devising roadmaps for the development, deployment, and regulation of these technologies. However, strategies to employ emerging technologies vary widely both in levels of progress as well as regulatory mechanisms. This report explores how five African countries—South Africa, Kenya, Nigeria, Ghana, and Zambia—are strategically navigating the governance of new technologies to enrich their citizens' lives while mitigating potential risks. It focuses on three key emerging technology domains, namely: connectivity, digital public infrastructure, and artificial intelligence (AI).

Beginning with an analysis of the foundational digital technology policies around data protection and governance and cybersecurity, the country reviews highlight the current landscape of laws, and strategies governing each of the emerging technologies of interest. By exploring the strengths and weaknesses of each country's policy landscape across these technology domains, the report offers insights into prospects and challenges in harnessing emerging technologies for societal good.

The report finds that governments are generally optimistic about the potential impact of emerging technologies on economic development in their respective countries. This is reflected in the large public investment in technology infrastructure, promotion of innovative ecosystems, and the integration of information and communication technologies (ICTs) into e-governance and e-services toward a holistic digitalized economy and society. The countries' multistakeholder approaches highlight the need for responsible governance while promoting active private-sector engagement for the public good.

Nigeria, South Africa, Kenya, and Ghana were found to have comparatively robust policies for each emerging technology examined, or at least—as is the case with Kenya—documentation or drafts in the form of gazettes and public consultation documents. Government efforts are more prominent in the AI domain, given the increased attention it has garnered lately. However, these frameworks are hampered by limited implementation capacities, poor infrastructure, policy fragmentation and overlap, low digital literacy levels, and a growing digital divide. Zambia on the other hand, while having strong aspirations to become an ICT-enabled knowledge economy, lacks dedicated policies pertaining to emerging technologies. Although the country's data-protection laws, intellectual property, cyber security, and consumer protection provide a foundational framework, more updated regulations are required to keep pace with the speed at which emerging technologies are playing an increasingly pivotal role in citizens' daily lives.

A SWOT (i.e., strengths, weaknesses, opportunities, and threats) analysis of the broader digital-technologies sector across these countries reveals some universal themes. Strengthwise, governments are generally proactive and enthusiastic about engaging new technology issues, and ICT authorities tend to adapt quickly to new developments by publishing subsidiary laws, releasing draft statements, or convening multistakeholder workshops, where national policy frameworks are absent. An overarching rather than specific sectoral or technology-domain approach also drives national technology pursuits, where for example, all the five countries examined have a national ICT/digital economy strategy which predates and already makes foundational provisions for emerging technology policies. Policy-formulation processes were driven by stakeholder engagement and public consultations, as seen in regular calls for contributions and multistakeholder convenings leading up to policy enactment. Yet huge disparities were observed within countries, where rural and marginalized urban communities, as well as women, are left behind by governmental technology ambitions. This calls for updated policy frameworks and strategies that emphasize inclusion and other sociopolitical considerations to avoid deepening inequities.

For Africa to leverage emerging technologies for socioeconomic development while maintaining accountable and transparent systems, legislative frameworks must be streamlined alongside strong institutional integration to ensure effective enforcement. It is imperative that policymakers develop a strong understanding of emerging technologies to enhance their capacities for developing comprehensive policies to address them. Equally important is raising public awareness to protect the African people's digital rights and foster safe digital environments.

Introduction

The global technology landscape is generally moving at a very fast pace. Emerging technologies is an elusive term, encompassing several new inventions that combine multiple technology types or introduce "upgrades" to existing technologies. However, it could be broadly defined[1] as those technologies that are novel, grow at a rapid pace, show prominent impact, exhibit coherence in approach, and contain some ambiguity[2] in how they are used. Research shows most of the progress made in emerging technologies is concentrated in advanced economies.[3] African countries, unlike their counterparts, are experiencing a less rapid development and adoption of emerging technologies, partly due to the huge entry costs innovators face, but largely because governance efforts in this direction have been limited.[4]

This report has two objectives. First, it examines how African states are embracing the opportunities that the adoption of various technologies present to solve old problems. Given that many still face the grand challenge of digital inclusion along the rural-urban axis, gender, education, age, and socioeconomic status, this project aims to tackle the key policy issues that can expand African opportunities in the age of the digital economy and strengthen Africa's democracies. The report covers African regulatory approaches, policy drivers, processes, and relevant stakeholders for engagement. Second, the report covers major trends across African countries in terms of governance approaches, including an analysis of how emerging national technology policies and strategies impact democracy and society at large.

The analysis focuses on five country cases: South Africa, Kenya, Nigeria, Ghana, and Zambia. This selection is an interesting mix: On one hand, South Africa, Kenya, and Nigeria are regarded as some of the continent's strongest digital economy nations; on the other hand, Ghana and Zambia are much less so, highlighting the massive digital development disparity that exists across countries[5] (see figure 1). Therefore, this selection not only offers us the opportunity to assess individual country policy contexts but also allows us to provide cross-country and regional comparisons.

The report outline is as follows:

- An overview and analysis of the African Union's governance framework for emerging technologies.
- Case studies of five countries: South Africa, Kenya, Nigeria, Ghana, and Zambia.
- An analysis of the governance ecosystems in these five countries.
- A mapping of stakeholders in all five countries is included as an annex.

1.1. Continental insights

While the African Union (AU) has been pushing for a uniform and integrated approach to regulation in African states, the existing state of governance in Africa remains fragmented. In recent years, several laws governing data protection, cybersecurity, electronic transactions, protection of intellectual property, and competition in the digital economy have been emerging across the continent. This research report aims to understand the extent to which these existing laws address the unique risks associated with the adoption of various technologies and where the gaps in governance might be for future reform. This report also contains a mapping of African tech stakeholders with the aim of building future collaboration and a network for action.

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[1] Daniele Rotolo, Diana Hicks, and Ben R. Martin, "What Is an Emerging Technology?," *Research Policy* 44, no. 10 (2015): 1827-1843.

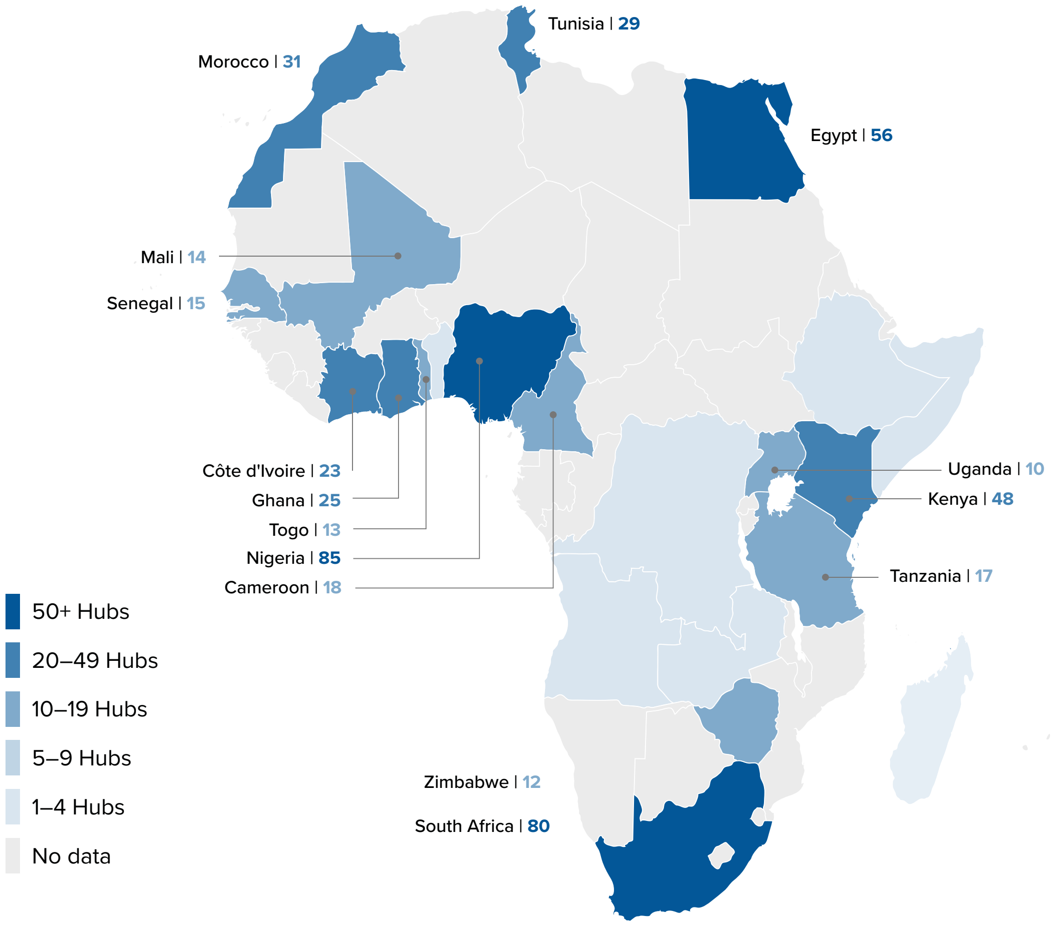
[2] For example, virtual assistant technologies such as Alexa combine a variety of technologies such as natural language processing, automatic speech recognition (ASR), and cloud computing, and it could be a stand-alone device or connected to an Internet of Things (IoT) system.

[3] For example, more than 91 percent of the global patent share in advanced digital production technologies such as 3D printing and cloud computing is concentrated among ten countries—all advanced economies. Relative to their counterparts, adoption of ADP-related technologies in African countries, such as Ghana, is still very much in the analogue/simple mechanization stage. See United Nations Industrial Development Organization (UNIDO), *Industrial Development Report 2020: Industrialising in the Digital Age*, 2020, https://www.unido.org/sites/default/files/files/2019-12/UNIDO%20IDR20%20main%20report.pdf.

[4] Louis Fox and Landre Signé, *From Subsistence to Disruptive Innovation: Africa, the Fourth Industrial Revolution, and the Future of Jobs*, Africa Growth Initiative, Brookings Institution, March 2022, https://www.brookings.edu/wp-content/uploads/2022/03/4IR-and-Jobs_March-2022_Final.docx.pdf.

[5] "618 Active Tech Hubs: The Backbone of Africa's Tech Ecosystem," Global System for Mobile Communications Association (GSMA), July 10, 2019, https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/blog/618-active-tech-hubs-the-backbone-of-africas-tech-ecosystem/.

Figure 1. Concentration of African tech hubs, by country



Source: Global System for Mobile Communications Association (GSMA), 2019; latest data.

At a continental level, in 2016, a high-level panel on emerging technology was established by the AU, under the leadership of its Development Agency, known as AUDA-NEPAD.[6] The role of the panel was to advise the AU on the current and future trends in emerging technologies, identify priority areas where investment and research and development efforts should be concentrated, to provide scientific evidence for harnessing these technologies for economic development, and to help harmonize the different national regulatory frameworks into a regional or continental policy regime for the purpose of shared management. The NEPAD program has since published several policy frameworks, advised governments, and organized workshops on emerging technologies in Africa—most prominently AI and robotics. The AU's digital transformation strategy for 2020–2030[7] also sets out discussions on using AI and other emerging technologies to promote socioeconomic development on the continent.

In 2022, the AU adopted a communique on emerging technologies and new media,[8] with a key focus on curtailing the impact of advanced digital technologies and social media on democracy and good governance in Africa. The communique emphasizes "digital sovereignty" as the principle that should underline technology development in Africa.

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6. See "African Union High Level Panel on Emerging Technologies (APET)," AUDA-NEPAD, https://www.nepad.org/microsite/african-union-high-level-panel-emerging-technologies-apet. In 2018, the planning and coordination agency of the New Partnership for Africa's Development (NEPAD) became the African Union Development Agency-NEPAD, or AUDA-NEPAD.
7. African Union, *The Digital Transformation Strategy for Africa (2020-2030)*, 2022, https://au.int/en/documents/20200518/digital-transformation-strategy-africa-2020-2030.
8. African Union, *Communiqué of the 1097th Meeting of the PSC Held on 4 August 2022, on Emerging Technologies and New Media: Impact on Democratic Governance, Peace and Security in Africa,* August 17, 2022, https://www.peaceau.org/en/article/communique-of-the-1097th-meeting-of-the-psc-held-on-4-august-2022-on-emerging-technologies-and-new-media-impact-on-democratic-governance-peace-and-security-in-africa.

1.2. Synthesis of case study lessons

Overall, technology governance frameworks in many African countries are fragmented. Current efforts are also concentrated around AI because of the generative AI boom of the last few years. The policy discourse on emerging technologies—especially at the continental level, such as in AU policy frameworks—is sometimes presented under broader terms like the fourth industrial revolution (4IR), which potentially shrouds the progress being made on the governance of specific technologies.

Countries also are at different stages in their AI policy development: South Africa is just ramping up plans for a national AI strategy; Zambia has recently completed and launched its strategy;[9] Nigeria has recently published a draft of its national AI Strategy; Ghana is one of the earliest African countries to have a national AI strategy; and Kenya is yet to finalize one but has begun a consultation process.

Government efforts toward AI development also is uneven across the countries examined. South Africa and Nigeria have relatively more developed government-led national AI research efforts—through the establishment of research centers such as the AI Institute of South Africa, the Centre for AI Research, and the Defense Artificial Intelligence Research Unit (DAIRU) in South Africa and the National Center for AI and Robotics (NCAIR) in Nigeria. There are no government-led national AI research centers in Kenya, Ghana, or Zambia.

Beyond a comparative lens, a deep dive into country case studies reveals dynamism in policy approaches on the continent. In South Africa, while a single emerging-technologies policy framework is lacking, an all-encompassing effort in the form of a presidential commission on the fourth industrial revolution was established in 2020. Alongside other areas of the 4IR, the commission's first summary report,[10] published in October 2020, identifies six major emerging technologies that will drive South Africa's industrialization efforts: AI, big data analytics, blockchain, drones, 3D printing, and the Internet of Things (IoT). This has been followed by an implementation plan[11] that focuses on advanced digital skills development in these areas. The rest of the policy frameworks are focused on AI: for example, the institutionalization of the South Africa-Organisation for Economic Co-operation and Development intergovernmental policy guidelines on AI in 2019, the establishment of an AI institute in 2022, and ongoing discussions toward publishing a national AI strategy.

There is no overarching policy framework of reference for emerging-technologies governance in Kenya. However, government interests in emerging-tech governance are more direct than in other countries examined (except Nigeria). For instance, as far back as 2018, Kenya established the Emerging Technology and AI Taskforce, whose mandate was to explore and analyze upcoming digital technologies that demonstrate great potential to transform Kenya's economy.[12] The task force published its pioneer report in July 2019.[13] The report clearly outlines two major emerging technologies: distributed ledger technologies (blockchain) and AI, and their role in improving a variety of public-sector functions, such as minimizing national debt through a digital asset framework, reducing transaction costs, facilitating financial inclusion, improving public service delivery with blockchain, eliminating corruption, and improving the land registry system. As in other African countries, the emerging technology policy discourse in Kenya is now disproportionately focused on AI. Even with this, Kenya is yet to publish a national AI strategy, although a bill called Robotics and Artificial Intelligence Society[14] is currently under review in parliament.

In Nigeria, the release of a draft artificial intelligence strategy—a collaborative effort of 120 Nigerian academics, policymakers, and industry experts—is an important milestone in setting an agenda for Africa's largest population and its digital economy. Further, the recent adoption of foundational laws in data protection and competition point to an economy that is laying the right policy foundations to enable responsible innovation in the country. Nigeria further has governance frameworks in place in 5G and has the most comprehensive policy environment for emerging technologies across all five countries studied.

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9. "Artificial Intelligence Strategy Launched, a Steppingstone to Wealth and Job Creation," Ministry of Technology and Science, November 21, 2024, https://www.mots.gov.zm/?p=4492.

10. Republic of South Africa, *Summary Report and Recommendations: Commission on the Fourth Industrial Revolution*, Department of Communications and Digital Technologies, Republic of South Africa, October, 2020, https://www.dcdt.gov.za/documents/reports/file/241-report-of-the-presidential-commission-on-the-4th-industrial-revolution-south-african-government-www-gov-za.html.

11. Department of Communications and Digital Technologies, Republic of South Africa, *Implementation Programme Guide for the National Digital and Future Skills Strategy of South Africa (2021–2025)*, 2021, https://www.dcdt.gov.za/documents/reports/file/198-implementation-programme-guide-for-the-national-digital-and-future-skills-strategy-of-south-africa-2021-2025.html.

12. "Kenya Govt Sets Up Blockchain & Artificial Intelligence Taskforce!," *Kenyan Wall Street* (platform), June 7, 2021, https://kenyanwallstreet.com/kenya-govt-sets-blockchain-artificial-intelligence-taskforce/.

13. Republic of Kenya, *Emerging Digital Technologies for Kenya: Exploration & Analysis,* Ministry of Information, Communications and the Digital Economy, July 2019, https://www.ict.go.ke/blockchain.pdf.

14. Robotics Society of Kenya, *The Kenya Robotics and AI Society Bill, 2023,* 2023, https://www.dataguidance.com/sites/default/files/the_kenya_robotics_and_artificial_intelligence_society_bill_2023.docx.pdf.

In Ghana, the combination of strong data protection laws, enhanced cybersecurity frameworks—including the establishment of its National Cyber Security Center (NCSC)[15] and a National Cyber Security Awareness Program[16]—and data services regulation make it a strong hub of digital regulations among the five countries examined. However, key concerns remain as to how well and frequently the government's formulated policies are updated and implemented. For example, since it first published the *National Broadband Policy and Implementation Strategy* in 2012, there has been no revised version of a national strategy toward newer and more advanced broadband networks (e.g., 4G and 5G); rather, the government's approach has been driven by a series of initiatives and partnerships around licensing mechanisms and mobilizing infrastructure investment from the private sector, instead of a governance approach on 4G and 5G. As a result, of the five countries examined, Ghana is the only one yet to implement 5G infrastructure at the time of compiling this report (the latest data puts 5G coverage at zero percent of the population, as shown in figure 2). Similarly, despite being the earliest of the five to have a national AI strategy drafted as of 2022, the framework is yet to be adopted or ratified by the government.

Zambia has limited policies on emerging technologies across the areas examined. However, its growing foundational laws and oversight institutions such as in data protection show a willingness by the government to expand its networks of regulation in line with recommendations from the African Union. The launch of the Artificial Intelligence Strategy by the Ministry of Technology and Science in November 2024 also creates the roadmap toward building a digital technology economy. [17] Zambia, like most African countries, needs to tackle the digital divide in the country first before it can concentrate on robust policy developments across all technology areas.

1.3. Trends in emerging technologies research

Policy discourses on emerging technologies in Africa have largely focused on their potential to drive industrialization, innovation, green transition, and economic growth on the continent.[18] Research on the impact of the technologies is also replete with an economic framing, especially their potential to accelerate Africa's industrialization ambitions.[19] A few works have been done on emerging technology use in critical sectors such as agriculture,[20] education,[21] energy,[22] and healthcare.[23] One consistent finding from this body of research is that twenty-first century Africa is witnessing a growing adoption of forms of technologies more rapidly than it did in the postindependence era.[24] Such rapid adoption, however, has a significant impact on the continent's democracy. Beyond being a tool for good—for example, enabling public-service efficiency, improving government-citizen communications, increasing citizen participation, and enhancing productivity—these technologies also exhibit adverse effects, including widening inequality, enabling the spread of disinformation, and enabling new forms of human rights suppression (i.e., digital authoritarianism).[25] Yet, the research approaches on emerging tech on the continent generally tend to be overly optimistic, glossing over the structural, political, organizational, legal, and sociocultural barriers, drivers, and inhibitors of progress in these specific technology domains.[26]

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[15] See "About Us," National Cyber Security Centre, https://cybersecurity.gov.gh/about.html.

[16] "2023 National Cyber Security Awareness Month (NCSAM) Launched," Cyber Security Authority, accessed October 25, 2024, https://www.csa.gov.gh/national-cybersecurity-awareness-month-2023-launched.php.

[17] "Artificial Intelligence Strategy Launched," Ministry of Technology and Science.

[18] See, for example, Blaise Bayou and Rob Floyd, "How Emerging Technology Can Boost Africa's Green Industrial Future," Africa Center for Economic Transformation (ACET), August 22, 2023, https://acetforafrica.org/research-and-analysis/insights-ideas/commentary/how-emerging-technology-can-boost-africas-green-industrial-future/; and UN Economic Commission for Africa (UNECA), *Harnessing Emerging Technologies: The Cases of Artificial Intelligence and Nanotechnology, Draft Report by the Africa Regional Science, Technology and Innovation Forum,* 2021, https://www.uneca.org/sites/default/files/TCND/AFSTIF2021/Emerging-technologies-for-Sustainable-VK1.pdf.

[19] Freeman Munisi Mateko, "Opportunities in Emerging Technologies for Southern Africa: How the Global South Should Adopt to Take Advantage?," *Electronic Journal of Information Systems in Developing Countries* (2024): e12321; and see Ogundiran Soumonni, "Innovation in Emerging Technologies and Socio-economic Transformation in Africa: Fallacy or Foresight?," *AfricaGrowth Agenda* 2016, no. 10: 18-22, https://journals.co.za/doi/abs/10.10520/EJC199564.

[20] For example, Heike Baumüller and Muhammadou M. O. Kah, "Going Digital: Harnessing the Power of Emerging Technologies for the Transformation of Southern African Agriculture," *Transforming Agriculture in Southern Africa* (2019): 179-187, https://www.taylorfrancis.com/chapters/oa-edit/10.4324/9780429401701-24/going-digital-heike-baum%C3%BCller-muhammadou-kah.

[21] See, e.g., Christiana Etong Enang, "Emerging Technologies in Teaching and Learning of Business Education Programmes in the New Normal in Tertiary Institution in Nigeria," *Nigerian Journal of Business Education (NIGJBED)* 9, no. 2 (2022): 64-71, https://www.nigjbed.com.ng/index.php/nigjbed/article/view/589.

[22] Chukwuma Ogbonnaya et al., "The Current and Emerging Renewable Energy Technologies for Power Generation in Nigeria: A Review," *Thermal Science and Engineering Progress* 13 (2019): 100390.

[23] Ibrahim Taiwo Adeleke et al., "Health Information Technology in Nigeria: Stakeholders' Perspectives of Nationwide Implementations and Meaningful Use of the Emerging Technology in the Most Populous Black Nation," *American Journal of Health Research* 3, no. 1-1 (2014): 17-24, https://rb.gy/mc5w5l; and Rachael Olakunmi Ogunye et al., "The Impact of Emerging Technologies on Pharmaceutical Process Design and Optimization in Africa: A Review," *Journal of Pharmaceutical Research International* 36, no 9 (2024): 46-60, http://library.go4manusub.com/id/eprint/2271/.

[24] Joseph Amankwah-Amoah, "Technological Revolution, Sustainability, and Development in Africa: Overview, Emerging Issues, and Challenges," *Sustainable Development* 27, no. 5 (2019): 910–922, https://doi.org/10.1002/sd.1950.

The advent of AI has somewhat widened the scope of emerging technologies research on the continent, bringing with it a growing awareness of the sociopolitical impacts of technologies, beyond their economic promise. This wave of research shows that while emerging technologies such as AI have the potential to accelerate developmental growth, they also pose substantial harms to society, including but not limited to job displacement, bias and prejudice, risks to human rights, and disinformation.[27]

Policy responses have increasingly followed the AI boom, with several African countries publishing a national AI strategy or working toward one. The African Union also recently published its continental AI strategy, which outlines the organization's vision for utilizing AI to drive the AU Agenda 2063 and the sustainable development goals (SDGs)[28]. Regionally, specific emerging-technology policy frameworks have been lacking—with the exception of the AU AI Strategy. Although both the *AU Science, Technology and Innovation Strategy 2024*[29] and its *Digital Transformation Strategy for Africa (2020-2030)*[30] dedicate a small section to emerging technologies such as nanotechnologies, AI, 5G, and machine-to-machine (M2M) applications, they lack an explicit strategy singling out different technologies from other forms of digital innovation identified in the respective strategy. However, several governmental responses in the form of communiques, resolutions, and statements on emerging technologies have surfaced, such as the African Commission on Human and Peoples' Rights (ACHPR) 2021 resolution to conduct research on the impact of emerging technologies on human rights,[31] the AU Communique on Emerging Technologies and New Media,[32] published in 2022, and the Nairobi Statement on AI and Emerging Technologies in Eastern Africa.[33] These have largely focused on mitigating the sociopolitical risks and harms that stem from emerging technology use.

On an international dimension, Africa's participation in global processes for regulating emerging technologies is weak. However, given that many emerging technologies are reliant on critical minerals—in which Africa is rich—there is a growing interest in bilateral and trilateral partnerships in emerging technologies, such as a strong US-Africa collaboration.[34]

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[25] Tope Shola Akinyetun and Chukwugekwu Victor Ebonine, "Digital Democracy and Democratic Decline: Unpacking the Role of Digitalization in Undermining Democracy in Africa," *African Journal of Democracy and Election Research* 3, no. 1 (2023): 159, https://journals.co.za/doi/abs/10.31920/2752-602X/2023/v3n1a8.

[26] See Charmaine Distor et al., "Emerging Technologies in Africa: Artificial Intelligence, Blockchain, and Internet of Things Applications and Way Forward," in *Proceedings of the 16th International Conference on Theory and Practice of Electronic Governance* (2023), 33-40, https://dl.acm.org/doi/abs/10.1145/3614321.3614326?casa_token=MKez4OGgrm4AAAAA:tLNxc3Tr0kzTHq-Ra5jAM1Gh14U_CeTceqoKmOBDK0ZsND1uk8ps0uTIFGZdCK-L9FoeupjL3qfJBw.

[27] Damian Okaibedi Eke, Wakunuma Kutoma, and Akintoye Simisola, *Responsible AI in Africa: Challenges and Opportunities* (Palgrave Macmillan, 2023), 1-10.

[28] African Union. Agenda 2063: The Africa We Want. https://au.int/en/agenda2063/overview

[29] African Union, *Science, Technology and Innovation Strategy for Africa 2024 (STISA-2024),* Ten-year Strategy, 2014, https://au.int/sites/default/files/newsevents/workingdocuments/33178-wd-stisa-english_-_final.pdf.

[30] AU, *The Digital Transformation Strategy for Africa (2020-2030)*.

[31] See ACHPR Res. 473 (EXT.OS/ XXXI), Resolution on the Need to Undertake a Study on Human and Peoples' Rights and Artificial Intelligence (AI), Robotics and Other New and Emerging Technologies in Africa, African Commission on Human and Peoples' Rights, March 10, 2021, https://achpr.au.int/en/adopted-resolutions/473-resolution-need-undertake-study-human-and-peoples-rights-and-art.

[32] AU, "Communiqué of the 1097th Meeting of the PSC Held on 4 August 2022 on Emerging Technologies and New Media: Impact on Democratic Governance, Peace and Security in Africa," August 14, 2022, https://www.peaceau.org/en/article/communique-of-the-1097th-meeting-of-the-psc-held-on-4-august-2022-on-emerging-technologies-and-new-media-impact-on-democratic-governance-peace-and-security-in-africa.

[33] Republic of Kenya and UN Educational, Scientific and Cultural Organization (UNESCO), *Nairobi Statement on Artificial Intelligence and Emerging Technologies in Eastern Africa*, June 26, 2024, https://unesdoc.unesco.org/ark:/48223/pf0000390381.

[34] Simmonds Nii, "Why US Technology Multinationals Are Looking to Africa for AI and Other Emerging Technologies: Scaling Tropical-tolerant R&D Innovations," *GeoTech Cues,* Atlantic Council blog post, April 27, 2023, https://www.atlanticcouncil.org/blogs/geotech-cues/why-us-technology-multinationals-are-looking-to-africa-for-ai-and-other-emerging-technologies/; and Udo Wisdom Samuel et al., "Conceptualizing Emerging Technologies and ICT Adoption: Trends and Challenges in Africa-US Contexts," *World Journal of Advanced Research and Reviews* 21, no. 3 (2024): 1676-1683.

2. Current African policy landscape

2.1. A continental overview

2.1.1. AU Science Technology and Innovation Strategy for Africa (STISA) 2024

Anchored in the AU Agenda 2063, the AU STISA is the overarching policy guide on science and innovation on a continental level. Published in 2014, the ten-year strategy outlines AU's ambition for stimulating socioeconomic development through four core pillars of focus:

- Upscaling the continent's research capabilities.
- Developing professional and technical competencies.
- Stimulating entrepreneurship and innovation.
- Providing an enabling environment for science and innovation to thrive.

A major emphasis of the strategy is mobilizing domestic and international investment in science and technology as well as facilitating a multitier stakeholder engagement that involves the government, private sector, civil society, academia, and the diaspora in boosting sustainable economic growth through innovation, scientific research, and industrialization. These efforts will be directed at six priority areas that define the strategy, namely: agriculture and food security; disease prevention; physical infrastructure and information communication technologies; space science, natural resources, and biodiversity; strengthening governance capacities; and knowledge-led economic development.

Responsibility for implementing the strategy straddled three governmental levels: on the continental level, through the AU's affiliated bodies such as the AU Commission, the African Development Bank (AfDB), and the AUDA-NEPAD; on a regional level, through the different regional economic commissions such as the East African Community (EAC); and at an individual member-state level.

As 2024 marks the strategy's final year, the AU has already published a review of performance in the last ten years of the strategy.[35] The report reveals that weak stakeholder engagement in the design process and a lack of strategy for domesticating the policy have hindered uptake at the national and local level. The implementation plan has also been independently critiqued[36] for not incorporating a mid-term evaluation, which would have been essential for implementing bodies to monitor performance and adjust where progress was lacking. Finally, funding has also been a major challenge.

The AU STI Task Force has already begun developing another STI policy for the next ten years (STISA 2034), which is expected to be ratified at the AU summit in early 2025.[37]

2.1.2. AU continental AI strategy

The AU adopted a continental AI strategy in August 2024. The strategy identifies several pillars including innovation as a core pillar for driving Africa's economy. Some key recommendations in the strategy include the establishment of AI innovation hubs, expanding access to diverse sets of data through regulatory sandboxes that promote responsible AI innovation, and the creation of more openly available datasets. Other recommendations include ensuring access to reliable energy sources and broadband, storage, and computing infrastructure. Further, the strategy requires the establishment of data-governance frameworks consistent with the AU data-policy framework discussed below and advancement of African led AI research. In addition, the strategy encourages support for local entrepreneurship and the academic community, and the necessity for the mapping of AI research gaps to facilitate research and innovation. Recognizing the impact of AI across all social dimensions, the strategy recommends the development of AI innovations for vulnerable persons to enable equal access to AI resources and opportunities, incentives for women-led AI innovation, and investment in national AI innovation projects.

2.1.3. AU's continental strategy on digital innovation

The African Union published its digital transformation strategy in 2020. Central to the strategy is the acknowledgment that the vision of digital transformation for Africa requires digital innovation backed with a development policy agenda that is aligned to the SDGs and the STISA adopted in 2014.[38] The aim is to use these strategies to enhance the competitiveness of

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[35] AU, *Review of the Science, Technology & Innovation Strategy for Africa* (STISA-2024), Final Report, Department of Education, Science, Technology and Innovation in collaboration with UNESCO, December 2023, https://repo.aau.org/index.php/s/yjDK9rFLr6datpf.

[36] "Evaluating Public Policies in Africa: Insights from the Science, Technology, and Innovation Strategy for Africa 2024 (STISA-2024)," Policy@Sussex brief, December 2018, https://blogs.sussex.ac.uk/policy-engagement/files/2019/02/2018-12-STISA-PB-Chux-Daniels.pdf.

[37] Nana Appiah Acquaye, "Africa Charts New Course for Science, Technology, and Innovation Strategy," Tech Review Africa, June 3, 2024, https://techreviewafrica.com/news/1432/africa-charts-new-course-for-science-technology-and-innovation-strategy#0.

[38] AU, *The Digital Transformation Strategy for Africa: 2020-2030*.

Table 1. African Union AI strategy schematic

AI Governance and Regulations	Maximising AI Benefits	AI for Development	AI adoption by the public sector
			AI in priority sectors
			Adoptions of AI by the private sector
			Building vibrant AI startup ecosystem
	Building Capabilities for AI	Core AI Capabilities	Datasets and computing platforms
			AI skills and talent
			Information integrity, media and information literacy
			Research and innovation
	Minimising AI Risks	Ethical, Safe and Secure AI	Gender, equality, inclusion and diversity in AI
			AI safety and security
	African Public and Private Sector Investment in AI	Public and Private Partnership	African public sector investment in AI
			African private sector investment in AI
	Regional and International Cooperation and Partnerships	Coordination and Cooperation	Intra-African coordination and cooperation
			African participation in global AI governance
			AI-related cooperation and partnership between Africa and the rest of the world

Source: African Union, *Continental Artificial Intelligence Strategy: Harnessing AI for Africa's Development and Prosperity*, August 9, 2024, https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf.

Table 2. Key principles guiding the AU's AI strategy

Principle	Description
Local first	AI innovation should occur through local talent and ecosystems and should target challenges such as healthcare delivery, food security, clean energy, climate change, and water management and opportunities with African solutions. People-centered: AI should promote inclusive growth, sustainable development, well-being, and cultural renaissance.
Human rights and human dignity	AI development and use should respect the African Charter on Human and Peoples' Rights and other international human rights law.
Peace and prosperity	AI should foster safety and security.
Inclusion and diversity	AI innovation should respect the diversity of African people, cultures, languages, gender dimensions, and nations.
Ethics and transparency	Member states to embrace a responsible AI concept.
Cooperation and integration	Regionally integrated governance approaches are needed. Member states should develop the capacity to self-manage their data and AI and take advantage of regional initiatives and regulated data flows to govern data appropriately.
Skills development, public awareness, and education	AI solutions should support formal and informal AI education to equip the African population with the necessary skills for the AI-driven future.

the African digital economy, support Africa's ICT sector, and develop Africa's own model of innovation that is responsive to its socioeconomic realities.[39] Key recommendations arising out of the strategy include:

- Improve policies for digital innovation and entrepreneurship.
- Create a conducive environment to empower people to innovate and facilitate access to finance and funding mechanisms for digital enterprises.
- Create an enabling ecosystem that addresses all interrelated barriers and needs and improve advisory services to stimulate digital entrepreneurship for digital enterprises.
- Establish and strengthen partnerships among African actors to harmonize efforts related to digital entrepreneurship at the continental, regional, and national levels.
- Implementing these recommendations resulted in the subsequent adoption of the AU Data Policy Framework in 2022.

The strategy recognizes the potential of emerging technologies and the impact that policy and regulatory frameworks can have on using these technologies to achieve the objectives of the strategy. The strategy builds on existing initiatives in Africa, most prominently the African Continental Free Trade Area. It identifies several foundation pillars that require policy interventions and makes recommendations on how to address these pillars. The identified pillars include achieving an enabling environment for policy and regulation, digital infrastructure, digital skills and human capacity, digital innovation and entrepreneurship, critical sectors (specifically, digital industry, digital trade and financial services, digital government, digital education, digital health, digital agriculture) to drive the digital transformation and cross-cutting themes (i.e., digital content and applications, digital ID, emerging technologies, cybersecurity, privacy and personal data protection, research and development) to support the digital ecosystem.

According to the AU, "being prepared for digital transformation and emerging technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), Machine to Machine communications (M2M) and 5G is fundamental."[40] The identified priority areas for an enabling policy environment identified by the African Union at a national and continental level include:

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[39] AU, *The Digital Transformation Strategy for Africa: 2020-2030*.

[40] AU, *The Digital Transformation Strategy for Africa: 2020-2030*.

- National and sectoral digital strategies.
- Cyberspace policy and legislation.
- Data protection and privacy policy, and regulation in line with the Malabo Convention[41] and enabling the free flow of nonpersonal data.

The AU recommends the design of "policies based on a human-centered and holistic approach that takes into account the local context and cross-cutting issues relevant to all stages of policy design and implementation."[42] It also emphasizes the need to prioritize equity seeking groups such as women, people living in remote areas, people with disabilities, and disadvantaged and marginalized communities.

Given access to infrastructure is a fundamental barrier to the adoption of emerging technologies in Africa, the AU acknowledges the need for a policy and regulatory environment that overhauls Africa's infrastructure network, services and platforms to support a high-speed, multichannel connectivity that will ensure ubiquitous, reliable, affordable access.

These interventions are aimed at spurring innovation in Africa. To that end, the AU encourages member states to design "customized interventions to strengthen their specific entrepreneurship ecosystems of mutually reinforcing components."[43] These include—through adaptive and anticipatory regulations—legal and regulatory systems promoting academic and other forms of entrepreneurship, building government capacity on policy design, implementation on technology-related policies, as well as strengthening the protection of intellectual property rights among others.

The AU recommends the adoption of policies that address the spectrum issues around emerging technologies in general, including the development of a 5G and AI strategy and IoT devices, and most importantly, the development of outcome-based regulations and the testing of new models in sandboxes.

The AU also recommends the establishment of national and regional task forces to conduct research on secure emerging technologies and propose guidelines that will educate internet users on how to identify and secure IoT devices, improve coordination among sectoral regulation, promote human rights-based ethical reflection, research, and public dialogue on the implications of new and emerging technologies and their potential societal impacts.

2.1.4. AU Data Policy Framework

The aim of the AU Data Policy Framework is to establish "a consolidated data environment and harmonized digital data governance systems to enable the free and secure flow of data across the continent while safeguarding human rights, upholding security and ensuring equitable access and sharing of benefits."[44]

The framework further aims to provide a pathway for African countries to maximize the benefits of a data-driven economy through a policy environment that supports data-driven value creation and innovation. Ultimately, the framework crafts ways for African states to realize opportunities and mitigate associated risks by creating an enabling and trusted environment. A key recommendation of the framework is to promote research, development, and innovation in various data-based areas, including big data analytics, AI, quantum computing, and blockchain.

The key principles identified in the AU Data Policy Framework to foster regional integration across the continent include cooperation through interoperability of data systems to a flourishing African digital single market, integration through intra-Africa data flows by removal of legal barriers to data flow. Others include fairness and inclusiveness, trust, safety, and accountability as well as sovereignty of states to self-manage their data, take advantage of data flows and govern data appropriately. The framework also seeks to promote the development of data infrastructure, human capacity, and the harmonization of regulations and legislation as well as to ensure data is not used to discriminate unfairly or infringe on human and peoples' rights.

As part of the implementation approach for the framework, other AU instruments are important in the realization of the objectives of the framework. These include the African Continental Free Trade Agreement (AfCFTA), the AfCFTA Protocol on Digital Trade, and the Convention on Cybersecurity and Personal Data Protection.

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41. AU, *African Union Convention on Cyber Security and Personal Data Protection,* June 27, 2014, https://au.int/en/treaties/african-union-convention-cyber-security-and-personal-data-protection.
42. AU, *The Digital Transformation Strategy for Africa: 2020-2030*.
43. AU, *The Digital Transformation Strategy for Africa: 2020-2030*.
44. AU, *AU Data Policy Framework*, February 2022, https://au.int/sites/default/files/documents/42078-doc-AU-DATA-POLICY-FRAMEWORK-ENG1.pdf.

2.1.5. African Continental Free Trade Agreement

The AfCFTA is relevant for AI governance in Africa, especially in the protection of personal data. The aim of AfCFTA in creating a single market for goods and services that is facilitated by the movement of persons and a liberalized market for goods and services have implications for data protection.[45] Several economic areas are to be regulated and harmonized in the creation of a single market, especially for a digital economy. These include intellectual property, investment, competition, and digital trade. Negotiations are currently underway for the development of protocols related to these areas and the recently adopted Protocol on Digital Trade is particularly relevant for emerging technologies.

2.1.6. Protocol on Digital Trade

To enable the implementation of AfCFTA, the AU adopted the Protocol on Digital Trade in 2024. The protocol establishes harmonized rules and common principles and standards that will enable digital trade for sustainable and inclusive development in Africa.[46] One of the central objectives of the protocol is to "encourage trusted, safe, ethical, and responsible adoption and regulation of the use of emerging and advanced technologies to support and promote digital trade."[47] The protocol addresses key issues central to technology governance such as interoperability, protection of personal data and digital identities, location of computing facilities, data-sharing models, the transfer of source codes, internet access, and a requirement for state parties to further develop an annex to the protocol on emerging and advanced technologies to facilitate adoption and regulation.

2.1.7. Convention on Cyber Security and Personal Data Protection

Another important AU framework that is applicable to technology governance is the 2014 AU Convention on Cyber Security and Personal Data Protection, which only came into force in 2022 after enough states ratified it. The Malabo Convention aims to regulate the cross-border flow of personal data, and a key objective of the convention is for personal data not to be transferred to a nonmember state of the African Union unless such a state ensures an adequate level of protection of the privacy, freedoms, and fundamental rights of persons whose data are being processed.

2.1.8. Implications for African states

The extent to which these policies are being adopted by member states is explored below with a review of developments in South Africa, Kenya, Nigeria, Ghana, and Zambia.

This section discusses in detail the emerging-technologies regulatory landscape in each of these five African countries. Beginning with a brief background of the overall digital technology-governance context, the section provides an overview of the key national (and regional) institutions, frameworks, and policies that are relevant to emerging technologies in each country of focus.

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[45] Ololade Shyllon, "Advancing the Protection of Personal Data in the Implementation of the African Continental Free Trade Area: A Human Rights Perspective," in *Digital Trade in Africa: Implications for Inclusion and Human Rights,* United Nations Economic Commission for Africa (ECA), Regional Integration and Trade Division, African Trade Policy Center, and UN High Commissioner for Human Rights (Addis Ababa: UN ECA, 2019), https://repository.uneca.org/handle/10855/43059.

[46] *Protocol to the Agreement Establishing the African Continental Free Trade Area on Digital Trade*, African Continental Free Trade Area Secretariat, February 9, 2024, https://www.bilaterals.org/IMG/pdf/afcfta_digital_trade_protocol_-_9_february_2024_draft.pdf.

[47] *Protocol to the Agreement,* Article 2 (2) (f).

3. Case studies

3.1. South Africa

3.1.1. Country context

With one of the largest markets in Africa, South Africa is a digital-sector leader. The country's telecommunications sector has surged rapidly after a market liberalization in the mid-1990s and government policies such as the Broad-Based Black Economic Empowerment (BBBEE) ICT Code.[48] Classified as an emerging economy, South Africa seeks to position itself as a tech hub with the capacity to follow the standards established by so-called developed countries.

In this spirit, the Presidential Commission on the Fourth Industrial Revolution (PC4IR) envisioned an "era where people are using smart, connected and converged Cyber, Physical and Biological systems and smart business models to define and reshape the social, economic and political spheres."[49] Supported by a blend of private-sector investment and state initiatives to embrace technological advancements, domestic and international private companies have invested heavily in South Africa's tech infrastructure,[50] establishing data centers, AI research, and educational programs funded by companies like Equinix, Google, and Vantage Data Centers.[51]

Despite the leaps in terms of expanding digital innovation and infrastructure, there are persistent challenges to achieving equitable and widespread digital inclusion in South Africa. The underserved and urban communities are affected by disparities in internet connectivity, digital literacy, and access to affordable digital services. These divisions also obstruct socioeconomic developments more broadly, limit access to essential services, and deepen existing inequalities.

3.1.2. Overview of regulatory and governance environment

South Africa's regulatory landscape reflects the ambitions of the *National Development Plan–2030*,[52] which sees South Africa taking on a global role with a boost in competitiveness, more investment, and economic growth through innovation, technological advancement, and a robust digital economy. The country's development and use of technologies have been shaped by different public entities and dispersed digital policy. In recent years, some important milestones were reached in terms of regulating emerging technologies, including the building of institutional capacities and attempting a more strategic approach to responding to them, a refinement of focus areas, the inclusion of different stakeholders, and a specific focus on education as well as the seizing of business opportunities. These lay the groundwork for more consolidated statutory and regulatory efforts but also illustrate conceptual shortcomings. What an analysis of existing approaches to regulation and governance of emerging technologies in South Africa also lays bare is a strong emphasis on AI, possibly to the detriment of other emerging technologies.

South Africa's 2019 *White Paper on Science, Technology, and Innovation*[53] supports the development of emerging technologies through its goal of fostering a stronger culture of innovation across both society and government, enhancing policy coherence and budget alignment, strengthening local innovation systems, and expanding the country's research ecosystem.

The white paper highlights priority areas in emerging technologies, including graphene (used, for instance, in sensory devices to monitor glucose levels and cholesterol); regenerative medicine; carbon capture and storage; modeling, simulation, and gaming (exploring scenarios too expensive or risky in real life); artificial intelligence and virtual reality for entertainment and education; and quantum computing, which can process much more information much faster than other forms of computing.

It was followed by a monitoring and evaluation framework for the South African Science, Technology and Innovation (STI) system, mandated by the National Advisory Council on Innovation (NACI).[54] However, a National Science Innovation (NSI) Gender Framework, as suggested in the white paper, has not been published to date. This is despite South Africa's National Policy Framework for Women's Empowerment and Gender Equality (2000), which states that mechanisms for engaging women with science and technology must be devised to increase the quality of national production and notes that women should be actively involved in the definition, design, development, implementation, and gender-impact evaluation of policies related to the economic and social changes.[55]

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[48] B-BEE ICT Sector Council, *Amended Broad-Based Black Economic Empowerment (B-BBEE) ICT Sector Code*, December 2017, https://bbbeecommission.co.za/wp-content/uploads/2017/12/B-BBEE-ICT-SECTOR-a.pdf.

[49] Republic of South Africa, *Summary Report and Recommendations: Commission on the Fourth Industrial Revolution*.

[50] International Trade Administration, "South Africa–Country Commercial Guide: Information Technology," accessed October 28, 2024, https://www.trade.gov/knowledge-product/south-africa-information-technology.

[51] Kelello Mashiane and Rethabile Molala, "Foreign Direct Investment Tracker: Fourth Quarter 2022," Trade and Industrial Policy Strategies, accessed September 16, 2024, https://www.tips.org.za/manufacturing-data/fdi-tracker/item/4543-fdi-tracker-q4-2022.

[52] Presidency of South Africa, National Development Plan–2030, National Planning Commission, Presidency of South Africa, https://www.nationalplanningcommission.org.za/National_Development_Plan.

[53] Republic of South Africa, *White Paper on Science Technology and Innovation: Science, Technology and Innovation Enabling Inclusive and Sustainable South African Development in a Changing World,* Department of Science and Technology, Republic of South Africa, March 2019, https://www.gov.za/sites/default/files/gcis_document/201912/white-paper-science-technology-and-innovation.pdf.

The appointment of the PCP4IR in February 2019 marked another important moment in response to technological advances, seeking to manage the challenges and opportunities they come with through engagement with the private sector and civil society. The PCP4IR's appointment was detailed in the Strategic Implementation Plan.[56] Both initiatives are guided by the goal of identifying policies, strategies, and action plans to leverage emerging technologies for South Africa's economic growth.

Members of the commission consider the following areas to be of importance: technology start-ups, social entrepreneurs, academia, cybersecurity, research and innovation, social scientists, additive manufacturing, and industry 4.0 experts. The document also acknowledges that these elements are cutting across sectors and require coordination and implementation at different levels of governance and society, reaching across technological value chains and the digital economy. However, the report was already criticized at the time for being in disharmony with existing regulatory setups, such as a deficiently integrated justice system.[57] Furthermore, there is limited documented progress (in terms of budgets or use cases) to date that demonstrate the realization of the P4IR vision. Specifically, established plans have not been paired with a comprehensive policy position or strategy of utilizing emerging technologies in a way that speaks to the pertinent and long-standing social issues in South Africa (including crime, high unemployment, inequality, and unreliable electricity supply).

The commission's first summary report in October 2020[58] demonstrates an understanding that the government needs to play a key role in light of historic exclusions manifested in poverty, unemployment, and inequality. It focuses on six emerging technologies that are anticipated to drive industrialization efforts: AI, big data analytics, blockchain, drones, 3D printing, and IoT. This was followed by an implementation plan focused on advanced digital skills development in these areas. Further, key infrastructure components and related resources covered in the report include fiber (broadband nationally and internationally, on land and the seas); the scaling of data centers; wireless infrastructure with emphasis on 5G; computing and storage facilities; as well as institutional and operational capacity and cybersecurity.

With the increasing relevance of data for emerging technologies and the need to ensure security, privacy, and compliance with legal standards dealing with it (while also fostering trust and innovation in digital services), the South African National Policy on Data and the Cloud (2024) was formulated. It seeks to leverage cloud technologies for national development while balancing innovation, security, and economic growth and focuses on data localization to maintain control, the enhancement of data security, and the protection of personal information and national security.[59] Cloud computing is taken to play an important part in driving economic growth, creating jobs, and improving public-service delivery across sectors like healthcare and education. The policy also outlines regulatory standards aligned with international best practices and the Protection of Personal Information Act (POPIA). Further, it encourages capacity building through education, training, and research, along with public-private partnerships, incentives, and awareness campaigns. Monitoring and evaluation ensure continuous adaptation and improvement.

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[54] National Advisory Council on Innovation, *Monitoring and Evaluation Framework for the South African Science, Technology and Innovation System*, Department of Science and Innovation, Republic of South Africa, 2021, https://www.naci.org.za/wp-content/uploads/2021/05/monitoring-and-evaluation-framework-for-the-south-african-sciencetechnology-and-innovation-system.pdf.

[55] Office on the Status of Women, *South Africa's National Policy Framework for Women's Empowerment and Gender Equality*, Republic of South Africa, accessed October 22, 2024, https://www.dffe.gov.za/sites/default/files/docs/national_policy_framework.pdf.

[56] *PC4IR Strategic Implementation Plan (PC4IR SIP): National Departments Consultation Presentation*, Department of Communications and Digital Technologies, Republic of South Africa, March 2021, https://www.dpme.gov.za/keyfocusareas/Provincial%20Performance%20Publication/Documents/PC4IR%20SIP%20Presentation_National%20Departments%20Consultation%202021.pdf.

[57] Barry Dwolatzky and Mark Harris, "Huge Gap between SA's 4IR Strategy and What Commission Recommends," University of the Witwatersrand, January 15, 2021, https://www.wits.ac.za/news/latest-news/opinion/2021/2021-01/huge-gap-between-sas-4ir-strategy-and-what-commission-recommends.html.

[58] Republic of South Africa, *Summary Report and Recommendations Presented by the Commission on the Fourth Industrial Revolution,* Department of Communications and Digital Technologies, October 23, 2020, https://www.ellipsis.co.za/wp-content/uploads/2020/10/201023-Report-of-the-Presidential-Commission-on-the-Fourth-Industrial-Revolution.pdf.

[59] Department of Communications and Digital Technologies, *National Policy on Data and Cloud*, May 31, 2024, https://www.gov.za/sites/default/files/gcis_document/202406/50741gen2533.pdf.

Within the framework of the *National Development Plan–2030*, South Africa's core e-government policy is the 2017 *National e-Government Strategy and Roadmap*,[60] focused on three key areas: e-services, e-governance, and building a digitally enabled society through collaborations between government, industry, and civil society. Notable policy moments include the 2013 National Broadband Policy, the 2016 National Integrated ICT Policy White Paper, and the National e-Strategy, which speaks to broader aspects of the digital and knowledge economy.

The *National Digital Health Strategy for South Africa 2019-202461* captures the trend of the health sector pivoting toward emerging technologies to improve healthcare delivery and access through digital tools such as telemedicine, mobile apps, and data systems for better patient management and service integration. It also shows concern for patient privacy and stresses capacity building for healthcare professionals to adapt to new digital tools.

3.1.3. Foundational laws and policies

3.1.3.1. Data protection

With the advent of democracy in 1996, the Constitution of the Republic of South Africa, established the right to privacy. The Promotion of Access to Information Act of 2000 (Act No. 2 of 2000) (PAIA) took a further concrete step toward transparency, granting citizens the right to scrutinize government decisions and demand accountability.

The POPIA of 2013 (Act No. 4 of 2013) was a crucial legislative step in safeguarding personal data with an increased use of digital platforms. The act provides for the establishment of the Information Regulator, an agency to oversee all matters relating to data protection and access to information. It covers many contemporary data protection issues, such as the regulation of automated decision-making and the provision of protection against decisions that rely solely on automated processes, which could lead to profiling, discrimination, or legal consequences for individuals. The act also prohibits the processing of sensitive personal information such as biometric data or information relating to religious, philosophical, and political beliefs. However, broad exemptions are granted when a government agency processes such data and when it is related to criminal investigations. The crucial issue of cross-border data transfer is also addressed, with the act explicitly prohibiting the transfer of personal information to third-party organizations outside of South Africa, except in a few circumstances relating to contractual agreements and consent from the data subject.

With a need for a more unified way of managing information and data, the Public Administration Management Act of 2014 (Act No. 11 of 2014) came into being with the goal of facilitating information sharing across government systems and collaborative governance. The immense value of data was reflected in the *National Integrated ICT Policy White Paper* of 2016,[62] realizing its role in driving innovation, the need for digital inclusion, and stringent privacy measures.

3.1.3.2. Cybersecurity

With technologies taking an increasing societal hold and considering the need for secure online transactions, the Electronic Communications and Transactions Act of 2002 (Act No. 25 of 2002) was enacted to render electronic activities safe and protect from fraud. Also in 2002, the Regulation of Interception of Communications and Provision of Communication-Related Information Act (RICA) was established to protect against communication interceptions and manifest the right to privacy in the digital age.

However, the RICA has been criticized for lacking clear mechanisms for protecting individuals' constitutionally[63] recognized right to privacy and safeguarding against digital surveillance while pursuing public interest. Scholars have expressed fears that the law may be weaponized to suppress dissenting political views, under the guise of national security interests.[64]

Additionally, an awareness of the cyber threats that could undermine national security and economic stability resulted in the National Cybersecurity Policy Framework (NCPF) in 2015, followed by the Cybercrimes Act of 2020 (Act No. 19 of 2020). The NCPF sets out the South African government's strategic approach to building countrywide capacity in cybersecurity—including through strengthening local and international coope-

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60. Telecommunications and Postal Services, *National e-Government Strategy and Roadmap*, South Africa's Government Gazette No. 41241, November 10, 2017, https://www.gov.za/sites/default/files/gcis_document/201711/41241gen886.pdf.

61. *National Digital Health Strategy for South Africa 2019-2024*, National Department of Health, 2019, https://www.health.gov.za/wp-content/uploads/2020/11/national-digital-strategy-for-south-africa-2019-2024-b.pdf.

62. *National Integrated ICT Policy White Paper*, Government Gazette, South Africa, October 3, 2016, https://www.gov.za/sites/default/files/gcis_document/201610/40325gon1212.pdf.

63. Indeed, in February 2021, in a case brought against the government by South African journalist Sam Sole, who challenged the government's right to intercept his phone calls under the pretext of RICA, the Constitutional Court of South Africa ruled that the RICA had failed to protect citizens' right to privacy and freedom of expression. See John Paul Ongeso, "South Africa: Constitutional Court Upholds Declaration of Invalidity of RICA," Bowman, February 5, 2021, https://bowmanslaw.com/insights/south-africa-constitutional-court-upholds-declaration-of-invalidity-of-rica/#:~:text=The%20court%20found%20that%20RICA,access%20and%20who%20may%20not.

64. See Watney Murdoch, "State-on-nationals' Electronic Communication Surveillance in South Africa: A Murky Legal Landscape to Navigate?," in *2015 Information Security for South Africa (ISSA)*, IEEE, 2015, 1-6, https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7335047.

ration, promoting a cybersecurity culture, setting technical and operational standards in cyberspace, and encouraging a multistakeholder approach to cybersecurity. The framework also establishes the Justice, Crime Prevention and Security (JCPS) Cybersecurity Response Committee under the State Security Agency to oversee all matters relating to national cybersecurity strategy.

3.1.4. Technology policies

3.1.4.1. Connectivity

A report on the state of 5G in South Africa (2021) reinforces the expectation that the quality of internet coverage will improve significantly and that the cost of broadband services will reduce drastically.[65] This is expected to allow for improved remote working, enhanced distance learning, telemedicine and e-health, surveillance and cybersecurity, manufacturing, and financial services. It also recommends a clear framework for infrastructure deployment, fixed wireless access, and satellite to help bridge the digital divide in areas where optical fiber cannot be deployed, addressing cybersecurity risks and misinformation about 5G.

3.1.4.2. Digital public infrastructure

South Africa is exploring the implementation of digital public infrastructure (DPI). While specific projects and initiatives are still in the planning and development stages, the government is considering investing in digital identity and payment systems.

The Protection of Personal Information Act can serve as a foundation for data protection and privacy rights, setting standards for collecting, processing, and storing personal information. Other relevant legislation includes the Electronic Communications and Transactions Act (ECTA), which governs electronic communications and transactions, and the Financial Intelligence Centre Act (FICA). However, the government will need to introduce additional regulations to address the unique human rights challenges posed by DPI.

One of the primary concerns surrounding the deployment of digital public infrastructure is the potential for human rights risks and vulnerabilities, particularly in the realm of digital identification and biometric data. Critics rightly highlight the risks of surveillance, discrimination, and exclusion if DPI systems are not designed and implemented with robust privacy and security measures. It is crucial that these measures are in place to mitigate the risks associated with the collection, storage, and use of biometric data—such as fingerprints and facial recognition.

The South African National Policy on Data and the Cloud (2024) provides a framework for the rapid expansion of digital infrastructure. The policy identifies digital infrastructure as the first policy intervention necessary to build South Africa's emerging technology ecosystem. In the policy, digital infrastructure refers to the technological foundation that supports digital services, processes, and applications. It can include hardware, software, networks, and communication systems. The policy encourages partnerships between the government and the private sector to improve scalability and cut costs.

The policy sets out the following primary goals:

- Accelerating the rollout of infrastructure to ensure fast, secure, and reliable broadband connectivity.
- Ensuring data privacy and security.
- Promoting open data and data interoperability.
- Adopting a cloud-first approach.
- Acknowledging the slow pace of adoption of technologies within government.

The policy aims to develop common data-governance mechanisms to promote integration, sharing, and system interoperability. Also central to the new policy is digital inclusion of the indigent, youth, women, and people with disabilities to access government services, have access to data and internet connectivity to enable them to innovate, and develop digitally tradable goods and services necessary to ensure their economic inclusion.

While South Africa is home to data storage centers, the lack of reliable energy is a key concern for their management, which will need to rely on alternative energy sources to avoid disruption. Further, a comprehensive approach to data-management infrastructure is needed to address the different types of data and the associated technical choices that will make such data accessible.

The Data and Cloud Policy states that the "absence of a regulatory environment might deter increased investment in digital technologies as investors largely seek regulatory certainty to ensure adequate protection of their investments. Connectivity and utilization of technologies should be supported by a reliable energy supply." In addition, the policy states:

> Data centers also rely significantly on cooling systems that require vast volumes of water. In addition to energy supply challenges, issues of sustainability are beginning to take center stage. The implication for South Africa is that in its pursuit of reliable energy supply solutions, consideration should be given to ensuring that data center providers ensure that they make self-provisioning for water and electricity while addressing carbon emission reductions to mitigate against environmental degradation.[66]

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[65] Independent Communications Authority of South Africa, *The State of 5G in South Africa: From Readiness to Recommendations,* 2021, https://www.icasa.org.za/legislation-and-regulations/5g-annual-report-2021.

[66] Data and Cloud Policy, South Africa's Government Gazette 707, no. 50741 (2024): 8, https://www.gov.za/sites/default/files/gcis_document/202406/50741gen2533.pdf.

3.1.4.3. Artificial intelligence

The Global Index on Responsible AI[67] (GIRAI) ranked South Africa highest in Africa with a total score of 27.61,[68] in terms of the country's commitment toward responsible, human-rights focused AI. The country scored remarkably high, at 68.53, for nonstate actor engagements and low, at 3.26, in terms of government frameworks, with data protection and privacy being a positive exception.

In April 2024, the Department of Communications and Digital Technologies (DCDT) shared the national AI planning discussion document, which collates inputs from different stakeholders as part of a prepolicy process.[69] Guided by the PC4IR, the discussion document looks favorably on the potential of AI to advance social and economic prosperity for South Africa, with an emphasis on not being "left behind in the global AI race."[70] The overarching focus of the document is creating a blueprint harnessing AI for national development, by developing critical enablers such as institutions, partnerships, data infrastructure, and governance mechanisms. The document neither delineates a risk-based approach nor discusses in detail South Africa's approach to AI regulations or policies. Rather, the document constitutes a collection of existing information, examples, and regulation listings from other countries, meant to encourage AI innovation alongside the development of a national AI policy—which could inform legal frameworks and principles to guide the use and development of AI in South Africa. Admittedly, setting out regulatory frameworks is beyond the scope of a discussion document, and it is expected that a finalized version of the AI strategy would spell this out more clearly.

3.1.5. Summary considerations

3.1.5.1. Strengths

The South African government and other stakeholders are increasingly focusing on policy and regulatory matters related to emerging technologies. The country takes on a leading role in that regard in the region and there are institutional frameworks and content provisions in terms of digital and technological service and data protection. Efforts to realize what the framework of the *National Development Plan-2030* broadly envisioned in a digitally enabled society take the form of educational and skills strengthening, the provision and increased accessibility of digital services, and private-public partnerships.

3.1.5.2. Weaknesses and (potential) threats

One weakness of government efforts is that AI takes the center stage. This poses a risk that other technologies will be disregarded in regulatory discussions. Despite education and skills building being in focus, South Africa still trails other African nations in digital skills, which impacts industry attitudes toward adopting new technologies. The country must also contend with basic education backlogs at all levels, covering everything from basic and tertiary education. If not, there is a risk to excluding a large portion of the severely unequal society.

There is also a risk that private interests dominate in private-public partnerships, that they fail to reflect the actual interests of the public, and that they do not acknowledge peoples' realities in terms of literacy and access, for example. Crucially, the increasing reliance of government services on emerging technologies poses the threat of excluding those who are already at the margins of society, especially given that the implementation of digital transformation in the public sector is inconsistent.

3.1.5.3. Opportunities and recommendations

As emerging technologies become more pervasive and investments in the sector increase, there is an urgent need for regulatory clarity and consolidated guidelines. Current government discussions seem to favor AI over other technology policy matters.

South Africa has a comprehensive set of laws that protect personal data, intellectual property, and copyrights. Most recent initiatives around the Presidential Commission on the Fourth Industrial Revolution are ambitious in their cross-sectoral scope and desire to speak to technology start-ups, social entrepreneurs, academia, cybersecurity, research and innovation, social scientists, additive manufacturing, and experts alike.

While the PC4IR and the National Policy on Data and the Cloud seek to strike a balance between opportunities and risk, there remains scope for a more comprehensive policy and regulatory setup to enable broad and inclusive access to data for innovation and services, which are increasingly digitized but might not be accessible to the breadth of the public. Without a cohesive ethical framework or unified approach to the governance of emerging technologies to ensure consistent application across all relevant legal areas, the effectiveness of these protections is limited.

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[67] Rachel Adams et al., *Global Index on Responsible AI 2024*, First Edition, Global Center on AI Governance, 2024; see Africa regional results at https://www.global-index.ai/Region-Africa.

[68] The Global Index on Responsible AI (GIRAI) measures country-level progress on responsible AI across three dimensions of responsible AI: human rights, governance, and national AI capabilities; and three pillars of the AI ecosystem: frameworks, government actions, and nonstate actors. The index covers nineteen thematic areas and fifty-seven indicators. The overall score is a composite score of 100, across all the indicators measured. The GIRAI covers a two-year period (2021 to 2023) and is based on data collected by in-country researchers and AI experts; the GIRAI assesses 138 countries, including forty from Africa.

[69] Artificial Intelligence Institute of South Africa, *AI National Government Summit: Discussion Document*, Department of Communications & Digital Technologies, October 2023, https://www.dcdt.gov.za/images/phocadownload/AI_Government_Summit/National_AI_Government_Summit_Discussion_Document.pdf.

[70] Artificial Intelligence Institute of South Africa, *AI National Government Summit*, ii.

3.2. Kenya

3.2.1. Country context

Kenya's economy is the largest in East Africa and the third largest in sub-Saharan Africa, behind Nigeria and South Africa.[71] Kenya is a member of the Common Market for Eastern and Southern Africa (COMESA) and the EAC.

In 2007, the government of Kenya declared a long-term plan for attaining middle income status[72] as a nation by 2030. To implement that *Vision 2030* plan,[73] the government has been preparing successive medium-term plans that outline the policies, programs, and projects that the government intends to implement over a five-year period.[74] The Fourth Medium Term Plan, which runs from 2023 to 2027, is focused on an economic transformation agenda for inclusive growth; among its priorities is establishing an Africa Regional Hub and promoting the development of software for export.[75] It seeks to leverage emerging technologies by strengthening AI, blockchain, and machine learning to support revenue mobilization.

As with many countries in Africa, Kenya is taking steps to cope with the rapidly changing landscape induced by the development of emerging technologies. The country is harnessing these technologies to address critical needs in agriculture, healthcare, education, and financial services, through a combination of strategic government-led initiatives, a thriving tech start-up and private-sector ecosystem, innovative partnerships, as well as a vibrant civil society.[76] However, these developments are taking place in a context of a lagging dedicated governance framework to effectively enhance the country's ambition to become the "Silicon Savannah" of Africa. Under the lead of its Ministry of ICT and Digital Economy, with support from the Federal Republic of Germany's development agency, which is known as GIZ, and other partners, the government of Kenya has embarked on a consultative process for the drafting of a national emerging technologies and AI strategy. This underscores its commitment to provide strategic guidance for the development, adoption, deployment, and responsible and ethical use of AI in Kenya.[77]

3.2.2. Overview of regulatory and governance environment

The 2010 Constitution of Kenya resembles modern democratic constitutions and contains elaborate provisions aimed at achieving broad national goals. It does this by upholding democratic ideals, aiming to secure rights and freedoms, and promoting transparency and accountability in managing public affairs.[78]

The Science Technology and Innovation Act 2013 was enacted with the broad scope of promoting and regulating the progress of science, technology, and innovation in Kenya and prioritizing the development of STI. The act established the National Commission for Science, Technology, and Innovation (NACOSTI) to regulate and assure quality in the STI sector.

The Kenya Information and Communications Act, Regulations and Guidelines was enacted to facilitate the development of Kenya's information and communications sector. The act established the Communications Authority of Kenya, which is responsible for the regulation of broadcasting, cybersecurity, multimedia, telecommunications, and electronic commerce, among other things. The Communications Authority has issued guidelines including on the use of IoT devices, which apply to IoT devices, machine-to-machine based devices, and those with embedded universal integrated circuit cards (eUICCs), and it provides for specific compliance requirements for these technologies.

The Data Protection Act (2019) provides for the regulation and processing of personal data and created the Office of the Data Protection Commissioner.

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[71] "Kenya: Economic Overview," in *The World Factbook*, Central Intelligence Agency, updated October 28, https://www.cia.gov/the-world-factbook/countries/kenya/.

[72] The World Bank classifies economies for analytical purposes into four income groups: low, lower-middle, upper-middle, and high income. Middle-income countries are defined as economies with a gross national income (GNI) per capita between $1,136 and $13,845 as of 2024. See more at https://www.worldbank.org/en/country/mic/overview.

[73] "Kenya Vision 2030," last accessed December 1, 2024, https://vision2030.go.ke/.

[74] "The Kenyan Economy," National Treasury & Economic Planning, Republic of Kenya, accessed September 16, 2024, https://www.treasury.go.ke/kenya-economy/.

[75] Republic of Kenya, *Fourth Medium Term Plan: Bottom-Up Economic Transformation Agenda for Inclusive Growth*, National Treasury and Economic Planning, 2024, https://www.planning.go.ke/wp-content/uploads/2024/03/MTP-IV-2023-2027.pdf.

[76] "Shaping Kenya's AI Future: UNESCO Contributes to National AI Strategy Formulation," UNESCO, updated May 26, 2024, https://www.unesco.org/en/articles/shaping-kenyas-ai-future-unesco-contributes-national-ai-strategy-formulation.

[77] "Shaping Kenya's AI Future," UNESCO.

[78] Kenya Law Reform Commission, *A Guide to Legislative Process in Kenya*, 2015, https://klrc.go.ke/index.php/reports-and-publications/562-a-guide-to-the-legislative-process-in-kenya.

The National Payment System Act (2011), regulations (e.g., Digital Credit Providers Regulation 2022), and guidelines (e.g., Guidelines on Cybersecurity for Payment Service Providers, 2019) regulate payment systems and provide for the supervision of the activities of payment service providers.

The National ICT Policy 2019 was formulated after broad-based consultations and several iterations. The objectives of the policy include:

- Providing enabling infrastructure and frameworks that support the growth of data centers, pervasive instrumentation (IoT), machine learning, and local manufacturing while fostering a secure innovation ecosystem.
- Growing the contribution of ICT to the economy to ten percent by 2030, by using ICT as a foundation to the creation of a more robust economy.
- Positioning the country to take advantage of emerging trends such as the shared and gig economy by enhancing education institutions, skills, and fostering an innovation and start-up ecosystem.

A report titled *Digital Economy Blueprint* (2019) is the outcome of multistakeholder consultations across the Kenyan public and private sectors and trades associations, and it provides a conceptual framework for a sustainable digital economy.[79]

The Kenya National eHealth Policy 2016–2030 and the Health Information System Policy (2014–2030) provide for strategic direction on the use of ICTs in the health sector and guidance on the collection and processing of medical data of patients.

The Civil Aviation Regulations and the Unmanned Aircraft Systems-Manual of Implementing Standards (2020) provide the standards for the operation of drones in Kenya.

The National Industrialization Policy (2012–2030) was developed through a consultative process involving the public sector, private sector, civil society, development partners, and non-governmental stakeholders; it also takes into account lessons learned and best practices from newly industrialized countries. The policy seeks to drive commercialization of research outputs and it prioritizes advanced manufacturing sectors comprising nanotechnology and biotechnology-based industries.

3.2.3. Foundational laws and policies

3.2.3.1. Data protection

The Data Protection Act 2019 is Kenya's prevailing legislative framework. It protects individuals' data and enforces responsible data-processing practices, overseen by the Office of the Data Protection Commissioner (ODPC). The act gives effect to the 2010 Constitution, which preserves the right to privacy as a fundamental right.[80] Since the enactment of the law, the ODPC has received over 1,600 registration applications from entities processing data. Its mandate extends to protecting individuals' privacy, instituting legal and institutional mechanisms for data protection, and granting data subjects' rights and remedies against unauthorized data processing. The act recognizes that every data subject has a right not to be subjected to a decision based solely on automated processing, including profiling, which produces legal effects concerning or significantly affecting the data subject. In addition to the act, data protection regulations and guidelines have been issued. Notably, the Data Protection (General) Regulations (2021) explain in detail the rights of data subjects, restrictions on commercial use of personal data, duties and obligations of data controllers and data processors, elements of implementing data protection, notification of personal data breaches, and conduct of data protection impact assessment and other general provisions.

Kenya also has sector-specific legislation that deals with the use and processing of data. The Public Health Act (2012), Health Act (2017), HIV and AIDS Prevention and Control Act (2006), and the Digital Health Act (2023) all contain provisions on the management of health data. The processing of financial data is regulated by the National Payment System Act (2011) and the National Payment System Regulations (2014), while the Consumer Protection Act (2012) provides for the protection of consumers of all services.[81] While the respective sectoral regulatory bodies generally enforce the sectoral laws, compliance with the Data Protection Act is a requirement.

3.2.3.2. Cybersecurity

Like comparable members of the Commonwealth, Kenya is significantly affected by cybercrime, owing to the increasing use of internet-driven services without a corresponding improvement in regulations. As a result of the rapid digitization in Kenya from the late 2000s, the incidence of cybercrime has grown exponentially, and it is now estimated to cost the Kenyan economy more than US$210 million annually.[82]

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[79] *Digital Economy Blueprint: Powering Kenya's Transformation*, State Department for Lands and Physical Planning, Republic of Kenya, 2019, https://lands.go.ke/wp-content/uploads/2021/04/Kenya-Digital-Economy-Blueprint-2019.pdf.

[80] Nzilani Mweu, "Kenya-Data Protection Overview," OneTrust DataGuidance (research platform), February 9, 2024, https://www.dataguidance.com/notes/kenya-data-protection-overview.

[81] Mweu. "Kenya-Data Protection Overview."

[82] Brian Sang YK and Ivan Sang, "A Comparative Review of Cybercrime Law in Kenya: Juxtaposing National Legislation with International Treaty Standards," *Commonwealth Cybercrime Journal* 1 (2023): 60-83, https://production-new-commonwealth-files.s3.eu-west-2.amazonaws.com/s3fs-public/2023-03/D19156-CCJ-1-1-Kenya-Cybercrime-Law-Review--Sang-Sang.pdf.

The Kenya Information and Communications Act passed in 1998 mandates the Communications Authority of Kenya (CAK) to develop a national cybersecurity management framework. Consequently, the government established the National Kenya Computer Incident Response Team-Coordination Centre (National KE-CIRT/CC) to mitigate cyberthreats and foster a safer cyberspace. A multiagency collaboration framework, the Response Team, acts as an interface between local and international ICT services providers whose platforms are used to perpetrate cybercrimes, and Kenyan law enforcement to investigate and prosecute cybercrimes.[83]

The enactment of Kenya's first comprehensive cybercrime legislation, the Computer Misuse and Cybercrimes Act 2018,[84] was a significant milestone in laying down legal regulations for cyber activities. This cybercrime act provides for the protection of critical information infrastructure, i.e., information technology systems that are considered essential for national security and whose destruction or alteration can cause disruption to essential services such as health, energy, or financial services or cause causalities or fatalities. The act also creates obligations for owners or operators of a system designated as critical infrastructure. This provision enhances the applicability of the act to emerging technologies to the extent that they are considered to constitute critical information infrastructure. Two international treaty instruments—the Budapest Convention on Cybercrime and the African Union Convention on Cyber Security and Personal Data Protection—were influential in drafting the cybercrimes act. The act further provides for offences related to computer systems, to enable timely and effective detection, investigation, and prosecution of computer and cybercrimes. It also aims to facilitate international cooperation in dealing with computer and cybercrime matters. However, it has been noted[85] that some of the provisions of the act that establish key definitions and criminal offences are inconsistent with these international treaty standards and in breach of Kenya's Constitution,[86] and there have been calls for reform to mitigate the risk of interfering with digital rights and undermining the efficacy of Kenya's cybercrime law.[87] As is the case in other African countries, there are records of the Kenyan government weaponizing the cybercrime act to stifle citizen dissent: For example, in the case of Kenyan social media activist Edwin Mutemi Kiama, who, under this act, was charged in 2021 for "publishing false information" about then-President Uhuru Kenyatta, based on his satirical artwork depicting the president with an unfavorable caption.[88]

3.2.4. Technology policies

Kenya's emerging technologies landscape has grown significantly over the years, thus creating the demand for a strong governance framework. Notwithstanding, there are pieces of legislation and regulations with provisions that impact aspects of the governance of emerging technologies and are scattered across production and service sectors, leading to incoherence in their application. Regulations for specific sectors tend to be more stringent as they are defined by the normal mode of operation of the sector rather than its potential for innovation. The financial sector has been the strictest due to the need for precautionary measures to prevent potential misuse and abuse of new technologies.[89]

In the absence of specific laws and policies regulating aspects of emerging technologies, regulation of emerging technologies in Kenya largely stems from the 2010 Constitution. The cabinet secretary for ICT in 2019 established the Distributed Ledgers Technologies and Artificial Intelligence Taskforce. The mandate of the task force was to explore and analyze upcoming digital technologies that demonstrate great potential to transform Kenya's economy, including disruptive technologies that are currently shaping the global economy such as distributed ledger technologies, AI, 5G wireless technology, and the IoT. The task force report outlines regulatory approaches that the government should take with respect to different forms of emerging technologies and strategies for implementation.

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[83] "Cybersecurity," Communications Authority of Kenya, accessed October 24, 2024, https://www.ca.go.ke/cyber-security.

[84] As noted in the act, cybercrime includes a range of illegal activities such as phishing, identity theft and impersonation, cyberterrorism and state sabotage, cyberfraud, unauthorized access to computers or internet systems, cyber espionage, child pornography, cyber harassment, publication of false information, and aiding or abetting the commission of these offences, etc.

[85] Sang YK and Sang, "A Comparative Review."

[86] Sang YK and Sang, "A Comparative Review."

[87] In addition to the Cybercrimes Act, there are specific industry regulations and guidelines such as the Central Bank of Kenya's Prudential Guidelines for Institutions Licensed under the Banking Act, which applies to banking institutions and provides basic standards that must be implemented to safeguard customer data under the Consumer Protection Guidelines.

[88] "Kenyan Government Using Repressive Cybercrime Law to Stifle Dissent," Journalists for Justice, April 19, 2021, https://jfjustice.net/kenyan-government-using-repressive-cybercrime-law-to-stifle-dissent/.

[89] Madara Ogot et al., *Leveraging on Emerging Technologies Landscape to Bolster Kenya's Innovation Ecosystem*, Sustainable Development website, UN Department of Economic and Social Affairs (UN DESA), n.d., sdgs.un.org/sites/default/files/2023-05/A40%20-%20Salome%20Guchu%20-%20Leveraging%20on%20Emerging%20Technologies%20Landscape%20in%20Kenya.pdf.

3.2.4.1. Connectivity

Kenya currently has not adopted a specific policy on 5G technology, although it published a draft National Roadmap and Strategy in 2021.[90] As the regulatory authority for the ICT industry in Kenya, the Communication Authority of Kenya (CAK) oversees and manages the country's numbering and frequency spectrum resources through licensing and monitoring.

In the public consultation report on the roadmap, the CAK stated[91] that it is ready to handle 5G "through appropriate policies, rules and regulations to facilitate the sector to achieve ambitious 5G rollout plans." The report further states that 5G standards are being developed by multiple standards bodies including the 3rd Generation Partnership Project (3GPP), Internet Engineering Task Force (IETF), and International Telecommunication Union (ITU), and that the CAK plans to leverage the expertise of various stakeholders and international best practices in cybersecurity to develop technical codes and a standardized minimum-security assessment checklist to ensure that 5G networks meet the up-to-date technical standards and are in line with global norms in relation to 5G security.

The *National Broadband Strategy: 2018-2023*[92] outlined Kenya's vision to establish affordable, fast, and secure broadband connectivity. The strategy identified several challenges including low broadband penetration in rural areas, the high cost of broadband services and devices as well as a lack of relevant local content and digital skills. To address these challenges, it proposed several initiatives including last-mile connectivity to wards across Kenya, local manufacturing of broadband devices, and promoting broadband integration into healthcare, agriculture, housing, and the manufacturing sector. A multistakeholder National Broadband Council will coordinate the strategy's implementation with robust monitoring and evaluation mechanisms.

The strategy emphasizes both supply and demand for broadband, aiming to bridge the digital divide and enhance digital literacy and content creation across Kenya. The total estimated budget for the strategy over five years is KES 111 billion.

3.2.4.2. Digital public infrastructure

Kenya has been investing in deploying digital public infrastructure including the eCitizen portal, which offers online access to various government services such as applying for passports and business registration certificates. Another key component is M-Pesa, a mobile money service that allows users to make payments and store value on their mobile phones. This platform is seen as a tool for promoting financial inclusion, especially for those who lack access to traditional banking services.

A legal framework governing DPI in Kenya has not yet been developed, but the 2019 Data Protection Act lays the groundwork for regulating personal data by outlining data-processing principles, data subject rights, and data-controller obligations. Several criticisms have been raised concerning the human rights risks and vulnerabilities associated with Kenya's DPI initiatives, particularly in the context of digital identification and biometric data. Concerns surrounding the Huduma Namba project, the initial Kenyan digital ID system, focused on data security and potential misuse. There were fears about the government's capacity to protect sensitive biometric data from breaches and unauthorized access, and how this data might be used for purposes beyond its intended scope.

Currently, Kenya is introducing a new digital ID system to replace the controversial Huduma Namba. The new system, Maisha Namba, consists of a unique identification number assigned at birth and used for various government services like education, healthcare, and taxation.[93] The Maisha Namba would be linked to biometric data, such as iris scans and fingerprints, for verification. The government also intends to issue a physical Maisha Namba ID card.

Civil society organizations have raised concerns about potential data breaches and unauthorized access to sensitive personal information. The centralized nature of the National Population Master Register, which stores all this data, poses significant privacy and data security risks. Additionally, the project faces criticism for possible exclusion and accessibility issues, especially for marginalized communities that lack access to registration centers or digital infrastructure.[94] These concerns underscore the need for robust data protection frameworks, voluntary enrollment, and inclusive alternatives to mitigate risks and ensure equitable access to essential services. The experience with Huduma Namba demonstrates the importance of centering human rights in the approach to DPI development and implementation, one that prioritizes inclusivity, transparency, and robust safeguards for privacy and data protection.[95] Civil society organizations have urged the government to conduct a human rights impact assessment to address potential inequalities and exclusionary practices.

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[90] Communications Authority of Kenya, "Public Consultation on the Roadmap and Strategy for 5th Generation Mobile Communications in Kenya," accessed September 16, 2024, https://repository.ca.go.ke/server/api/core/bitstreams/751380bb-da0b-4ee9-b4ac-1907fcba9197/content.

[91] Communications Authority of Kenya, "Public Consultation."

[92] Republic of Kenya, *National Broadband Strategy: 2018-2023*, Ministry of Information, Communications and the Digital Economy, 2018, https://repository.kippra.or.ke/bitstream/handle/123456789/2800/MICT-Kenya-National-Broadband-Strategy-2018-2023.pdf?sequence=1&isAllowed=y.

[93] Teddy Odira, *Kenya's Maisha Namba Project: Balancing Digital Innovation with Human Rights Concerns*, International Society for Human Rights, accessed November 18, 2024, https://ishr.org/kenya-kenyas-maisha-namba-project/.

[94] Amnesty International Kenya, *Ready or Not? Citizens' Perspectives on Maisha Namba*, September 2024, https://www.amnestykenya.org/wp-content/uploads/2024/09/Maisha-Namba-Report-FINAL-EDIT.pdf.

Kenya has not adopted specific policies on cloud computing. However, in furtherance of its mandate to set and enforce ICT standards and guidelines across all aspects of ICT, the ICT Authority of Kenya established the Government Enterprise Architecture (GEA) framework which defines the minimum components of an ICT Plan and provides ICT standards as implementation guidelines. Standards set out under the GEA Framework include the Cloud Computing Standard (2023). Developed based on international best practices, the Cloud Computing Standard provides guidelines on the acquisition and deployment of cloud-based computing products and services.[96] The standard sets out certain general requirements for the use of cloud computing services including compliance with "all current laws, information security standards and risk management policies." It also provides that the relevant government ministry, department, or agency shall determine the licensing needs to be met by a cloud service provider.

The regulatory framework for big data and cloud computing in Kenya therefore revolves around the Information and Communications Act 2011, which empowers the Communications Commission to facilitate the development of the ICT sector, the Data Protection Act 2019 (to address issues relating to data confidentiality), and the ICT standard.

3.2.4.3. Artificial intelligence

There are no specific policies for AI in Kenya. Existing laws that are expected to impact AI include the Data Protection Act (2017), which recognizes the right of every data subject not to be subject to a decision based solely on automated processing; the Computer Misuse and Cybercrimes Act (2018), which regulates critical information infrastructure; and the Consumer Protection Act (2012), which protects the interests of consumers of goods and services.

Like South Africa, much of Kenya's progress in responsible AI is driven by nonstate actors, whose efforts slightly outpace those of the government. Results from the Global Index on Responsible AI (GIRAI) show Kenya among the top six performers in nonstate-actor AI efforts (17.67).[97] Kenya's weak legal and regulatory environment for AI is particularly evident in its low score on indicators such as the *Frameworks* (8.67) and *Government Actions* (4.68). With an overall score of 8.79 across the multiple indicators on the GIRAI, Kenya ranks ninth in responsible AI efforts on the African continent.

In view of this absence of AI governance in Kenya, the Ministry of ICT and Digital Economy, in partnership with GIZ and the UN Educational, Scientific and Cultural Organization (UNESCO),[98] has embarked on a consultative process with different stakeholders for the drafting of a national emerging-technologies and AI strategy. A stakeholder workshop was held in May 2024, and a draft AI strategy is expected to be published later in 2024.

Further, the Kenya Bureau of Standards (KEBS) published the Draft Information Technology Artificial Intelligence Code of Practice on April 8, 2024.[99] The code was developed to help organizations develop, provide, and use AI responsibly while ensuring that the rights of individuals are not compromised in the development of AI systems. The code is still in draft form, and KEBS is in ongoing consultations with the public for comments on the code.

3.2.5. Summary considerations

3.2.5.1. Strengths

The paucity of emerging technologies governance in Kenya has become more evident as the country continues to experience technological development, foreign investments, and increased information and technological literacy among its people. As part of the steps that Kenya has taken to regulate emerging technologies, government agencies such as the ICT Authority embark on extensive consultations with stakeholders in the public and private sectors including regional and international organizations, academia, and corporations. The involvement of relevant stakeholders in designing the regulation of emerging technologies makes for better regulation involving knowledgeable and experienced individuals and organizations.

3.2.5.2. Weaknesses and (potential) threats

Although Kenya has taken the judicious step of adapting existing governance frameworks to regulate emerging technologies while more tailored laws and policies are being developed, the fast rate of evolution and permeation of emerging technologies render the continued reliance on existing structures tantamount to forcing square pegs into round holes. The existing governance frameworks should be administered with caution. Furthermore, as novel business models emerge, regulators will be faced with the question of the robustness of the "new" regulatory structures, which could quickly become outdated. A 2018 *Deloitte Insights* article exploring the challenges of regulating emerging technologies describes what happens when traditional assumptions about regulations "crafted slowly and deliberately" for what is expected to be long-term use are "upended" by new conditions:

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[95] Haki Na Sheria Initiative, *Digital Identity and the Legal Obligation to Conduct a Human Rights Impact Assessment in Kenya*, University of California, Berkeley's International Human Rights Law Clinic, April 2023, https://www.law.berkeley.edu/wp-content/uploads/2023/10/HSI-UCB-Digital-ID-HR-impact-assessments-2023.pdf.

[96] ICT Authority of Kenya, *Government ICT Standards: Cloud Computing Standards*, 2023, https://cms.icta.go.ke//sites/default/files/2023-07/Cloud%20Standard%202023.pdf.

[97] Adams et al., *Global Index on Responsible AI 2024*.

[98] See "Shaping Kenya's AI Future."

[99] Kenya Bureau of Standards, *Information Technology–Artificial Intelligence–Code of Practice for AI Applications*, via OneTrust DataGuidance, 2024, https://www.dataguidance.com/sites/default/files/kebs-tc_094_n66_public_review_kenya_standard_dks_3007_ai_code_of_practice.pdf.

> As new business models and services emerge, such as ridesharing services and initial coin offerings, government agencies are challenged with creating or modifying regulations, enforcing them, and communicating them to the public at a previously undreamed-of pace. And they must do this while working within legacy frameworks and attempting to foster innovation.[100]

Also, while reference is made to emerging technologies in some of the programs that Kenya has embarked upon, they seem to be leaning toward AI. In 2022, the Ministry of ICT launched the *National Digital Master Plan 2022–2032* (DMP),[101] which consolidates the ICT initiatives of the government into a ten-year plan, hence becoming a single point of reference for all government ICT Plans. The DMP refers to the creation of a National AI Masterplan, which will require the government to convene an interagency AI task force comprising national government agencies, county governments, higher education, and private-sector organization stakeholders to create a National AI Research and Development Strategic Plan.[102] While AI as an emerging technology requires regulation, it is important that the regulation of other technologies, which the government has also identified as being vital to the growth of its digital economy, are not neglected.

The limited extent of digital education among policymakers may also account for the paucity in the regulation of emerging technologies in Kenya as it is difficult to regulate what is not understood.

3.2.5.3. Opportunities and recommendations

Utilize regulatory sandboxes

One important recommendation from the Report of the Ministry of ICT's Distributed Ledgers Technologies and Artificial Intelligence Taskforce was that the government should consider innovative approaches to regulating emerging technologies, such as using regulatory sandboxes to test methods for balancing the needs of both the public and private sectors.[103] A regulatory sandbox is a tool that allows businesses to explore and experiment with new and innovative products, services, or businesses under a regulator's supervision. It provides innovators with incentives to test their innovations in a controlled environment, allows regulators to better understand the technology, and fosters consumer choice in the long run.[104] Kenyan regulators' use of sandboxes will help address any delays in formulating regulations caused by insufficient understanding of the technology to be regulated. In addition, investing in local research to understand the implications of emerging technologies within the Kenyan context will make for more suitable regulation.

Engage stakeholders

Central to the development of a regulatory framework for emerging technologies is the identification and involvement of important stakeholders in designing a fitting system that addresses different technologies as they affect various sectors and interest groups. The stakeholders should be made aware of their roles and responsibilities in their engagement.

Policy conversations on emerging technologies are gaining traction across Africa. To ensure the establishment of a rounded regulatory structure for AI governance, important stakeholders to be consulted should include:

- Members of parliament and government regulatory agencies: This covers lawmakers and regulatory bodies as law enforcers.
- Technology companies and developers: This category covers existing companies engaged in emerging technologies (including local subsidiaries of foreign corporations) and start-ups, as well as trade associations in the tech sector (such as the FinTech Association of Kenya and the ICT Association of Kenya).
- Academia and research institutions: Experts will provide insights into technical aspects of AI, while think tanks

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[100] William D. Eggers, Mike Turley, and Pankaj Kishnani, "The Future of Regulation: Principles for Regulating Emerging Technologies," *Deloitte Insights*, June 19, 2018, https://www2.deloitte.com/us/en/insights/industry/public-sector/future-of-regulation/regulating-emerging-technology.html.

[101] Ministry of ICT, *The Kenya National Digital Master Plan 2022–2032*, Innovation and Youth Affairs, April 2022, https://cms.icta.go.ke/sites/default/files/2022-04/Kenya%20Digital%20Masterplan%202022-2032%20Online%20Version.pdf.

[102] See also the tone of the *Nairobi Statement on Artificial Intelligence and Emerging Technologies in Eastern Africa*.

[103] See Republic of Kenya, *Emerging Digital Technologies for Kenya,* 17, 41.

[104] European Parliamentary Research Services, *Artificial Intelligence Act and Regulatory Sandboxes*, June 2022, https://www.europarl.europa.eu/RegData/etudes/BRIE/2022/733544/EPRS_BRI(2022)733544_EN.pdf.

will focus on guidelines and frameworks that shape policy discussions.

- Civil society and advocacy groups: This category includes consumer advocacy groups and human rights defense organizations.
- Legal and compliance experts: Lawyers and experts in areas of privacy and data protection, fintech law, and consumer protection will provide insights.
- International organizations and trade institutions.
- Public- and private-sector users that adopt emerging technologies in service provision.
- Citizens.

Governance of emerging technologies involves these diverse categories of stakeholders, each with unique perspectives and interests; and effective regulation requires collaboration among these groups to ensure that laws are balanced, enforceable, and aligned with societal values.

Pursue equitable design

The Africa Regional Science Technology and Innovation Forum report, *Harnessing emerging technologies: The cases of artificial intelligence and nanotechnology,*[105] identified that the full benefits of emerging technologies will not accrue to Africa unless certain simple steps are taken. These include the development of national and regional strategies that evenly balance economic, social, and environmental aspects of technology; investment in building a workforce that is empowered to design, produce, operate, and further upgrade emerging technologies; working closely with the private sector to build adequate research and communication infrastructure that are secure and reliable and instituting adequate data protection measures that enable access without sacrificing the rights of consumers and the security of countries. In addition, the Deloitte Center for Government Insights report highlights a variety of approaches that should guide future efforts toward regulation, including a greater focus on results and performance; fostering a more responsive and repetitive approach; engaging with a broad range of stakeholders across the societal ecosystem; and making use of real-time data to stay ahead of developments.[106]

With its extensive engagement of stakeholders in designing laws and policies, development of national strategies, and involvement in regional efforts to regulate certain emerging technologies, Kenya's efforts toward the regulation of emerging technologies thus far are steps in the right direction, with an obvious necessity to give heed to areas that have been disregarded.

3.3. Nigeria

3.3.1. Country context

Nigeria is an important economic player on the African continent and is considered a middle-income, mixed-economy, and global emerging market.[107] It is a member of several economic blocs and a partner in several bilateral agreements, such as the AU and the Economic Community of West African States (ECOWAS), where it plays a critical role in facilitating regional trade and economic activities. It has been a member of the World Trade Organization since 1995 and ratified AfCFTA in December 2020. Nigeria is a member of the International Monetary Fund and the World Bank; it has bilateral investment agreements with thirty-one countries. Nigeria holds "double tax treaties with 13 countries, and is a signatory to 21 investment-related instruments," the International Trade Administration notes.[108]

As of 2024, Nigeria ranks as Africa's fourth-largest economy,[109] with GDP of US$252.74 billion,[110] dropping from its 2022 number-one spot after a serious economic contraction/decline that erased more than US$219.8 billion from the total value of goods and services produced within its economy. A combination of factors flattened Nigeria's economy—lower oil prices, unfavorable macroeconomic fundamentals, erratic policy adjustments in monetary and exchange rates, and the COVID-19 pandemic—which had been on an average growth rate of seven percent annually from 2000–2014.

Technological adoption in Nigeria is often driven by its very youthful population. In the last decade, the country has seen a significant growth in the number of start-ups using technology to solve local problems, with Nigerian start-ups, along with

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[105] See UNECA, *Harnessing Emerging Technologies.*

[106] Deloitte Center for Government Insights, "The AI Regulations That Aren't Being Talked About," *Deloitte Insights Magazine*, November 2023, https://www2.deloitte.com/us/en/insights/industry/public-sector/ai-regulations-around-the-world.html.

[107] Christopher S. Chivvis, Zainab Usman, and Beatrix Geaghan-Breiner, "Nigeria in the Emerging World Order," Carnegie Endowment for International Peace, December 7, 2023, https://carnegieendowment.org/research/2023/12/nigeria-in-the-emerging-world-order?lang=en.

[108] International Trade Administration, "Nigeria Country Commercial Guide," June 6, 2023, https://www.trade.gov/country-commercial-guides/nigeria-trade-agreements.

[109] Saifaddin Galal, "African Countries with the Highest Gross Domestic Product (GDP) in 2024," Statista, https://www.statista.com/statistics/1120999/gdp-of-african-countries-by-country/.

[110] International Monetary Fund, "Nigeria: World Economic Outlook," April 2024, https://www.imf.org/external/datamapper/profile/NGA.

Egypt, Kenya, and South Africa, attracting 92 percent of Africa's investment in tech.[111]

Additionally, there has been significant investment and support from global tech giants in terms of their contribution to technology infrastructure to drive adoption and growth. In May 2023, Amazon Web Services announced that it would have its new Direct Connect location for that networking service in Lagos, Nigeria, a development that holds a lot of promise for cloud storage and computing. In February 2024, Meta's 2Africa subsea internet cable, which is about 45,000 kilometers in length and designed to connect thirty-two African countries, reached Nigeria.[112] In sum, these developments show the growth potential and opportunity for technology innovation in Nigeria.

3.3.2. Overview of regulatory and governance environment

The country's key statute is the Constitution of the Federal Republic of Nigeria. Regarding emerging technologies, the government continues to take proactive steps to create a conducive environment through the creation and implementation of several statutory and policy frameworks.

Nigeria's national policies are aimed at guiding technological innovation and driving economic development. Enacted policies often walk the delicate balance of ensuring that policies play a dual role—improving economic outcomes and mitigating risks. Some of the policies that reflect this posture include: the National Industrial Revolution Plan (NIRP), a five-year plan designed to accelerate Nigeria's industrial capacity across the agro-allied, metals and solid minerals, and oil- and gas-related industries, and construction, light manufacturing, and services sectors.[113] Others include the economic recovery and growth plan (ERGP), a medium-term initiative focused on restoring economic growth and boosting investments in Nigeria.[114] There also is the *National Digital Economy Policy and Strategy*, expected to run from 2020–2030,[115] which outlines Nigeria's vision for a digital economy and provides a roadmap for its development. It addresses key areas such as broadband penetration, digital skills, and cybersecurity. Other sectoral policies are discussed below along with the statutory institutions that regulate them.

3.3.3. Foundational laws and policies

This section focuses on key sectoral frameworks and policies that directly or indirectly impact emerging technologies in Nigeria. It also identifies institutions responsible for crafting and regulating these policies and recommendations.

3.3.3.1. Data protection

The Nigerian Data Protection Act (NDPA) 2023[116] represents significant progress in Nigeria's efforts to stay on top of the ever-evolving digital and technology landscape. The act is a comprehensive data protection law aimed at safeguarding the privacy and rights of individuals with respect to their personal data; it established the Nigeria Data Protection Commission and its Governing Council. Further, it defines the principles and lawful basis governing the processing of personal data, rights of a data subject, data security, enforcement, and legal proceedings.[117]

Apart from the Nigeria Data Protection Commission, there are sectoral regulators such as the Central Bank of Nigeria (CBN), which administers, protects, and regulates financial data including fintech and digital payments, as enshrined in the CBN Consumer Protection Regulation.[118] Another regulator is the Nigerian Communications Commission (NCC), which is responsible for overseeing the licensing and regulating the data collection, storage, and processing of telecommunication companies and internet service providers in Nigeria. Part IV of Consumer Code of Practice Regulations of the NCC regulation speaks to the protection of consumer data.[119] Lastly, there is the National Information Technology Development Agency (NITDA), which is responsible for promoting the development and adoption of information technology in Nigeria. It plays a significant role in regulating the IT industry and ensuring the ethical use of technology.

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[111] Aimée Dushime, "These Four Countries Are Leading Africa's Start-up Scene—Here's Why," World Economic Forum, August 24, 2022, https://www.weforum.org/agenda/2022/08/africa-start-up-nigeria-egypt-kenya-south-africa/.

[112] Victor Oluwole, "World's Longest Subsea Cable Spanning 45,000km Has Landed in Nigeria," *Business Insider Africa*, February 23, 2024, https://africa.businessinsider.com/local/markets/worlds-longest-subsea-cable-45000km-lands-in-lagos-nigeria/ss6x3pz.

[113] See "The NIRP Project Office," n.d., http://www.nirpproject.org/the-nirp-project-office/.

[114] Ejeh Adoyi Williams and Orokpo Ogbole Francis, "The Economic Recovery and Growth Plan (ERGP) as Developmental State Paradigm: An Introspection," *International Journal of Public Administration and Management Research* 5, no 3 (2021): 12-20, https://journals.rcmss.com/index.php/ijpamr/article/view/329.

[115] Federal Ministry of Communication and Digital Economy, *National Digital Economy Policy and Strategy (2020-2030),* Nigeria Data Protection Commission, 2019, https://ndpc.gov.ng/Files/Policy-National_Digital_Economy_Policy_and_Strategy.pdf.

[116] Ebimobowei Jikenghan, Justice Uka-Ofor, and Ayomide Abiodun, *Nigeria Data Protection Act, 2023: A Review*, G. Elias (business law solicitors), July 2023, https://www.gelias.com/images/Newsletter/The_Nigerian_Data_Protection_Act_2023_-_A_Review.pdf.

[117] Nigeria Data Protection Act 2023, Federal Republic of Nigeria Official Gazette, July 1, 2023, https://ndpc.gov.ng/Files/Nigeria_Data_Protection_Act_2023.pdf.

[118] Central Bank of Nigeria, Consumer Protection Regulations, 2023 December, https://cenbankwebapi.azurewebsites.net/Out/2024/CCD/EXPOSURE%20DRAFT%20REVISED%20CONSUMER%20PROTECTION%20REGULATIONS%202.0.pdf.

[119] Consumer Code of Practice Regulations, 2007, Federal Republic of Nigeria Official Gazette, July 10, 2007, https://www.ncc.gov.ng/accessible/documents/102-consumer-code-of-practice-regulations-1/file.

3.3.3.2. Cybersecurity

Nigeria has made strides in cybersecurity, with the *National Cybersecurity Policy and Strategy* (NCPS) and the Cybercrimes (Prohibition, Prevention) Act of 2015.[120] Despite this, the country faces ongoing threats from cybercrime, including fraud and hacking. Investment in cybersecurity infrastructure and capacity building remains critical. The Cybercrimes Act of 2015 addresses offenses and the maximum penalties attached to them. Offenses documented in the act include hacking, denial-of-service attacks, phishing, malware cyberattacks, and the distribution and sale of hardware or software used for cybercrime, identity theft, and electronic theft.[121] The 2021 Nigerian Cybersecurity Policy and Strategy is based on the 2015 policy and aims to solve Nigeria's cybersecurity problems, make the country more competitive in the digital world, develop local technology, and protect critical national technology systems.[122]

Other applicable laws and regulations include the 1999 Constitution of the Federal Republic of Nigeria (as amended), the Nigeria Data Protection Act (NDPA) 2023, the Advance Fee Fraud and other Related Offences Act (2006),[123] Terrorism (Prevention and Prohibition) Act (2022),[124] the NCC Guidelines for the Provision of Internet Service, CBN Risk-Based Cybersecurity Framework and Guidelines for other Financial Institutions (2022),[125] the Economic and Financial Crimes Commission (Establishment Act, 2004),[126] the Money Laundering (Prevention and Prohibition) Act (2022),[127] and the Nigerian Communications Act (2003).

3.3.4. Technology policies

3.3.4.1. Connectivity

As of 2024 the internet user penetration of Nigeria is estimated to be about 42.65 percent,[128] relative to the country's population. Many locations still struggle with internet/broadband penetration. To address this gap, the Federal Ministry of Communications and Digital Economy has put in motion the *Nigerian National Broadband Plan 2020–2025* with the priority of deploying 4G across the country and to deliver minimum data download speeds of 25 megabits per second (Mbps) in urban areas, and 10 Mbps in rural areas, effectively covering 90 percent[129] of its population at "a price no more than N390" per 1 gigabyte (GB) of data—approximately 2 percent of median income or 1 percent of the minimum wage.[130]

In 2021, the country released its national policy on 5G networks[131] following consultations with the public, the Office of the National Security Adviser (ONSA), the Nigerian Communications Commission, National Frequency Management Council (NFMC). The vision is to accelerate the deployment of the 5G network, and the policy contains plans for deployment; a legal and regulatory framework; network rollout and security, coverage, and capacity; 5G technology standards; and use cases for the digital economy, healthcare, safety, and the environment.

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[120] Cybercrimes (Prohibition, Prevention, Etc.) Act, Nigerian Financial Intelligence Unit, 2015, https://www.nfiu.gov.ng/images/Downloads/downloads/cybercrime.pdf.

[121] John Onyido et al., "Cybersecurity Laws and Regulations: Nigeria 2024, International Comparative Legal Guides, Global Legal Group, November 14, 2023, https://iclg.com/practice-areas/cybersecurity-laws-and-regulations/nigeria.

[122] Advocacy for Policy Innovation, *National Cybersecurity Policy & Strategy, 2021*, accessed October 24, 2024, https://api.apiintelligence.org/upload/4650ae0b15daf1e5c3fac12e93cbde610.pdf.

[123] Advance Fee Fraud and Other Fraud Related Offences Act, Policy and Legal Advocacy Centre, 2006, https://placng.org/lawsofnigeria/print.php?sn=18.

[124] Terrorism (Prevention and Prohibition) Act, 2022, National Counter Terrorism Center, 2022, https://drive.google.com/file/d/1LehOSLGbs5am6waPwBvKYAozbA4EwCNR/view.

[125] Omer Imran Malik, "CBN Issues Risk-based Cybersecurity Framework & Guidelines," *Data Privacy Automation* blog, Securiti, July 28, 2022, https://securiti.ai/blog/cbn-issues-risk-based-cybersecurity-framework/.

[126] Economic and Financial Crimes Commission (Establishment) Act 2004, Economic and Financial Crimes Commission, accessed October 28, 2024, https://www.efcc.gov.ng/efcc/images/pdfs/establishment_act_2004.pdf.

[127] Money Laundering (Prevention and Prohibition) Act 2022, Federal Republic of Nigeria Official Gazette, May 2022, https://placng.org/i/wp-content/uploads/2022/05/Money-Laundering-Prevention-and-Prohibition-Act-2022.pdf.

[128] Doris Dokua Sasu, "Nigeria: Online Usage Penetration 2018-2027," Statista, March 12, 2024, https://www.statista.com/statistics/484918/internet-user-reach-nigeria/.

[129] *Nigerian National Broadband Plan 2020–2025*, Federal Ministry of Communications and Digital Economy, March 2020, https://digitalrightslawyers.org/wp-content/uploads/2021/01/Nigerian_National_Broadband_Plan_2020-2025.pdf.

[130] *Nigerian National Broadband Plan 2020–2025.*

[131] *National Policy on Fifth Generation (5G) Networks for Nigeria's Digital Economy*, Federal Ministry of Communications and Digital Economy, September 2021, https://nimc.gov.ng/docs/national_policy_on_5g_isbn.pdf.

More recent efforts to scale up connectivity in Nigeria include public-private partnerships, such as the proposed National Digital Broadband Fund,[132] which aims to raise about $2 million to build 90,000 km of fiber-optic cable in order to expand internet access in the country. The project has recently received support from the World Bank,[133] and is poised to mobilize private-sector support through the National Broadband Alliance.

3.3.4.2. Digital public infrastructure

Nigeria has invested in developing DPI to enhance government services and efficiency. The government is implementing the National e-Government Master Plan, which aims to digitize these services. As a result, several digital platforms have been created, including the Government Integrated Financial Management Information System (GIFMIS) and the Integrated Personnel and Payroll Information System (IPPIS).

A key DPI initiative is the National Identification Number (NIN) program, which seeks to provide unique identification for every citizen and legal resident. NINs are used to verify identities, match biometric data, and link all records associated with an individual in the National Identity Database (NIDB).[134] To date, over 105 million people, about half of the Nigerian population, have received their NINs.

The Nigeria Data Protection Regulation (NDPR) provides a framework for data privacy. However, there are growing concerns about the need for comprehensive regulations specifically addressing DPI, especially with the anticipated expansion of digital identification systems and the integration of sensitive data like biometrics. Human rights advocates have raised concerns about the lack of legal protections to safeguard individuals from data misuse and the potential for this policy to exclude millions of Nigerians from essential services. Digital rights organizations warn that the NIN system could enable harmful surveillance and promote digital authoritarianism by allowing the government to access extensive personal data, including location, financial activities, and private communications. Moreover, the NIN may worsen the challenges faced by vulnerable groups—such as migrants, refugees, asylum seekers, internally displaced persons, individuals with disabilities, and those living in rural and remote areas—by effectively preventing them from accessing government programs that require the NIN for eligibility.[135]

The *Nigeria Cloud Computing Policy*[136] is the primary source of regulation for cloud computing and works alongside the Nigeria Data Protection Act (2023), and other adjacent data regulations in finance, healthcare, and telecommunications. The overarching objective of the policy is to enable government efficiency and improve public service delivery by improving the procedures by which government agencies access IT resources, data, and information. The policy also aims to achieve at least a 30 percent increase in cloud service adoption[137] by government agencies (including all federal public institutions such as universities, research centers, and government corporations) and small and medium-size enterprises (SMEs) that provide digital services to the government. The critical issue of the intersection of cloud computing with data localization and data exchange is what is regarded as an issue of international dimensions of cloud computing: The general slant of the framework is that where international data exchange will be required, government agencies must contract with service providers that operate in jurisdictions with similar data protection policies as Nigeria's Data Protection Regulation (now Data Protection Act, as noted above).

The National Information Technology Development Agency (NITDA) is the custodian of the *Nigeria Cloud Computing Policy* and drives a cloud-first policy. The goals of the policy are to create an enabling environment to support and increase private-sector investment in cloud computing infrastructure; design programs that ensure a 30 percent increase in cloud adoption and migration in the public sector and SMEs that provide service for the government; and to create a competitive environment for cloud services providers. The *Nigeria Cloud Computing Policy* contains details about data classification, information security, interoperability requirements, consumer protection, data withdrawal, national cloud computing governance, enforcement procedures, and key regulatory instruments for the actualization of cloud policy.

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[132] "Nigeria Partners with World Bank to Raise $3 Billion to Invest in Fiber Optics," Extensia, February 14, 2024, https://extensia.tech/nigeria-partners-with-world-bank-to-raise-3-billion-to-invest-in-fiber-optics/.

[133] Justice Okamgba. "World Bank Backs Nigeria's 90,000km Fibre-optic Project," *Punch (Nigeria)*, October 23, 2024, https://punchng.com/world-bank-backs-nigerias-90000km-fibre-optic-project.

[134] Damian Eke et al., "Nigeria's Digital Identification (ID) Management Program: Ethical, Legal and Socio-Cultural Concerns," *Journal of Responsible Technology* 11 (2022): 100039, https://www.sciencedirect.com/science/article/pii/S2666659622000166.

[135] Paradigm Initiative, *Joint Statement: Urgent Call to the Nigerian Communications Commission to Protect Human Rights and Privacy in Nigeria*, March 12, 2024, https://paradigmhq.org/joint-statement-urgent-call-to-the-nigerian-communications-commission-to-protect-human-rights-and-privacy-in-nigeria/.

[136] National Information Technology Development Agency (NITDA), *Nigeria Cloud Computing Policy*, August 2019, https://nitda.gov.ng/wp-content/uploads/2020/11/NCCPolicy_New1.pdf.

[137] Apart from adoption, the framework also sets targets for investment and institutional measures to aid cloud services in Nigeria. All targets had a 2024 deadline, suggesting the policy had a five-year lifespan. The extent to which these targets have been achieved is yet unknown, as the government has not published any evaluation report or updates to the policy.

The National Identity Management Commission (NIMC) Act of 2007[138] set up the agency responsible for managing the national identity database, assigning a NIN to every citizen and issuing a token general multipurpose card, which is crucial for various digital services.

The National Information Technology Development Agency (NITDA) released the National Blockchain Policy for Nigeria[139] in May 2023. This policy document contains the country's vision of creating an economy powered by blockchain, leveraging its benefits to support secure transactions, data sharing, and value exchange. It also outlines Nigeria's goal of using blockchain technology for improved transparency and accountability, enhanced security, financial inclusion, job creation, talent development, innovation, and its role in government and corporate digital services and governance.

3.3.4.3. Artificial intelligence

Nigeria has made very recent strides in its AI governance efforts. Prior to the recent release of its National AI Strategy, the country ranked tenth overall on the continent in the Global Index on Responsible AI,[140] scoring particularly low on government frameworks and actions.

However, with a National AI Strategy draft published in August 2024, Nigeria joined the league of a very few countries that have put together a coordinated national framework of how to use and regulate AI. The document contained the country's vision and guiding principles for AI use, its strategic pillars and implementation plan, strategies for mitigating risks and the like.[141] The drafting of this national strategy was done in collaboration between the National Centre for Artificial intelligence and Robotics and the National Information Technology Development Agency. The document builds on the work done in the Nigerian Data Protection Regulation (NDPR) of 2019. The strategy among other things aims to boost economic growth and develop a "homegrown AI strategy that provides Nigeria with a clear roadmap for AI application [that] will catalyse relevant innovation and aid in rebalancing power structures." The strategy describes AI as transformative, positioning Nigeria to leverage AI to address socioeconomic challenges, promote sustainable growth, and drive technological empowerment through foreign investment among others. The strategy is structured around five pillars:

- Building foundational AI infrastructure.
- Creating a world-class AI ecosystem.
- Accelerating sector transformation through AI adoption.
- Ensuring responsible AI development.
- Developing a robust governance framework.

3.3.5. Summary considerations

3.3.5.1. Strengths

Economic potential

Nigeria's large population and natural resources offer it significant economic opportunities. In addition, its young population, with a median age of 18.6 years, provides a potential workforce and consumer base for technological innovation. This is evident in the significant growth it has witnessed in the tech start-up space, with Nigeria being one of four countries attracting 92 percent of Africa's tech investment. [142]

Regulatory advances

Nigeria has continued to keep pace in establishing regulations to meet societal needs. This is demonstrated in its comprehensive data protection legislation with the Nigeria Data Protection Act (NDPA) of 2023.

The introduction of laws like the Cybercrimes Act and institutions—like CBN, the Federal Competition and Consumer Protection Commission (FCCPC), and NITDA—provide a foundation for regulatory governance and demonstrate progress in governance. Nigeria has also continued to keep pace with the international community by signing and ratifying international policies and regulatory frameworks in key areas such as cybersecurity, counterterrorism, consumer protection, and trade.

Lastly, Nigeria's proactive steps in creating statutory and policy frameworks for emerging technologies, such as the National Digital Economy Policy and Strategy (2020–2030) and its recent development of a National Artificial Intelligence Strategy demonstrates its commitment to ensure the right regulatory environment for innovation.

Multistakeholder collaboration

Nigeria has successfully continued to explore multistakeholder collaboration to drive the implementation of some of its policies. For example, as part of its energy transition plan, the

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[138] National Identity Management Commission Act, 2007, National Identity Management Commission, May 2007, https://www.nimc.gov.ng/docs/reports/nimc_act.pdf.

[139] National Information Technology Development Agency, *National Blockchain Policy for Nigeria*, May 2023, https://nitda.gov.ng/wp-content/uploads/2023/05/National-Blockchain-Policy.pdf.

[140] Adams, *Global Index on Responsible AI 2024*.

[141] *National Artificial Intelligence Strategy*, National Center for Artificial intelligence & Robotics and the National Information Technology Development Agency, Government of Nigeria, August, 2024, https://ncair.nitda.gov.ng/wp-content/uploads/2024/08/National-AI-Strategy_01082024-copy.pdf.

[142] Aimée Dushime, "These Four Countries Are Leading Africa's Start-up Scene—Here's Why," World Economic Forum, August 24, 2022, https://www.weforum.org/stories/2022/08/africa-start-up-nigeria-egypt-kenya-south-africa/#:~:text=92%25%20of%20Africa's%20investment%20in,them%20attractive%20destinations%20for%20investment.

Nigerian government developed the Nigeria Distributed Access through Renewable Energy Scale-up (DARES) project in collaboration with the World Bank, private-sector investors, and development partners like the United States Agency for International Development (USAID), GIZ, Sustainable Energy for All (SEforAll), and the African Development Bank. The project is financed by the International Development Association (IDA) with $750 million in credit, about $1 billion of private capital, $100 million from the Global Energy Alliance for People and Planet, and $200 million from Japan International Cooperation Agency—with the goal of providing about 17.5 million Nigerians with access to electricity through renewable energy solutions.[143]

3.3.5.2. Weaknesses and (potential) threats

Enforcement challenges and regulatory lag

Despite the existence of broad sectoral laws and regulations, enforcement remains weak, leading to issues such as corruption and impunity. In some cases, there is little to no public awareness of the existence of regulatory policies or laws, or the statutory institutions meant to enforce the laws.

With the rapid pace of technological development, Nigeria often still lags in setting up the requisite regulatory frameworks and policies to match emerging trends and challenges.

Digital literacy gap

Nigeria still has both a digital literacy and digital skill gap among its population, making participation in the digital economy a tall order. To address this, the National Information Technology Development Agency of Nigeria (NITDA) released a National Digital Literacy Framework in July 2023 with a goal of achieving a 95 percent digital literacy rate by 2030 across all states and local governments.[144] This goal has, however, been criticized for being unrealistic, given that internet penetration in Nigeria is at a staggering low level of less than 50 percent.

Infrastructure gap

Participating in the digital economy requires having the requisite technological infrastructure. Nigeria currently experiences an infrastructure gap in access to broadband and internet connectivity. With broadband penetration of about 42 percent and 92.19 million subscribers (as of January 2024),[145] there is a significant deficit given that Nigeria's population exceeds 220 million people.

Also, the country still battles with a lack of access to consistent and uninterrupted power supply,[146] which affects productivity. At present, Nigeria only supplies an average of about 4,000 megawatts of electricity,[147] leaving a lot of its population in darkness, with an installed capacity of 12,500 MW. To address this issue, the country in 2024 committed to settling its $2.16 billion in outstanding debts to energy producers and to tackle gas supply shortages.[148] Additionally, it put together an elaborate and well-planned energy transition plan to support its move to clean and renewable energy.

3.3.5.3. Opportunities and recommendations

Diversify the economy

Although Nigeria seems to understand the need to key into the digital economy, continued efforts to diversify the economy, particularly in ICT and manufacturing, can reduce its dependence on oil. Diversifying the economy by promoting technology-driven sectors such as fintech, agricultural tech, and health tech is critical, as is developing forward-thinking, sector-specific policies that incentivize and attract both local and foreign investment in these areas.

Foster the digital economy through policies and incentives

Leveraging the growing digital economy offers opportunities for innovation, job creation, and economic growth. Nigeria can capitalize on the growing tech start-up ecosystem by creating more favorable policies for innovation hubs, incubators, and accelerators. Additional incentives like tax credits or deductions, and grants for start-ups in key technology sectors could help grow the country's economic base. Nigeria can also leverage the new National AI Strategy to position itself as an AI leader in Africa. This can be done by investing in AI research and development, and creating partnerships between academia, industry, and government to drive AI innovation.

Furthermore, there is a need to accelerate the implementation of the *Nigerian National Broadband Plan 2020–2025* to improve internet connectivity and access; this can be done by

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143. "Nigeria to Expand Access to Clean Energy for 17.5 Million People," Press Release, World Bank Group, December 15, 2023, https://www.worldbank.org/en/news/press-release/2023/12/15/nigeria-to-expand-access-to-clean-energy-for-17-5-million-people.

144. *National Digital Literacy Framework*, National Information Technology Development Agency of Nigeria, July 2023, https://nitda.gov.ng/wp-content/uploads/2023/07/Digital-Literacy-Framework.pdf.

145. "$461m Investment Gap Slows Nigeria's Internet Coverage," Internet Society Pulse, April 19, 2024, https://pulse.internetsociety.org/blog/461m-investment-gap-slows-nigerias-internet-coverage.

146. Emmanuel Addeh, "Nigeria Faces Another Total Blackout as National Grid Collapses Fourth Time In 2024," *Arise News,* July 7, 2024, https://www.arise.tv/nigeria-faces-another-total-blackout-as-national-grid-collapses-fourth-time-in-2024/.

147. Taiwo Adebayo, "Millions in Nigeria Have Little to No Electricity. It's Straining Businesses and Public Services," Associated Press, July 1, 2024, https://apnews.com/article/nigeria-electricity-poverty-solar-access-55b5cd3935447bfbeffc32220009e2cd.

148. Camillus Eboh, "Nigeria to Clear Debt, Fix Gas Shortages in Plan to End Power Woes," Reuters, February 14, 2024, https://www.reuters.com/business/energy/nigeria-clear-debt-fix-gas-shortages-plan-end-power-woes-2024-02-14/.

partnering with private-sector companies to invest in last-mile connectivity solutions.

Harness youth demographics

Nigeria is not only Africa's most populous country but also the sixth most populous in the world with over 230 million people as of 2024.[149] It has a very young and vibrant population with a median age of 18.6 years, which is 0.6 year lower than the median age in Africa currently (at 19.2 years). Nigeria's large youth population presents opportunities for economic growth—if effectively harnessed through education and job creation. Nigeria can leverage its young population by intensifying efforts to improve digital literacy and skills, which will require accelerating the implementation of the National Digital Literacy Framework to achieve the digital-literacy goal of 95 percent by 2030 or sooner.

Strengthen enforcement mechanisms

Perhaps the biggest opportunity for technology policy regulation in Nigeria is enhancing the capacity of institutions to enforce laws and regulations effectively, particularly in areas such as IP, data protection, and consumer rights. There also is a need to develop a more robust and flexible regulatory framework that can quickly adapt to emerging technologies; this might require establishing a task force to monitor global tech trends and proposing timely regulatory updates to extant policies or laws.

Enhance public awareness

There is a need to raise public awareness through debates and education about existing policies, the legal rights and responsibilities of citizens, and the government's effort to prioritize citizen's rights, particularly in emerging areas such as data protection and consumer rights.

3.4. Ghana

3.4.1. Country context

Ghana is a West African country located on the Gulf of Guinea. It has a population of about 34.5 million people,[150] making it the second most-populous country in West Africa, with a median age of 21.4 years.[151] Ghana has one of West Africa's most stable economies, with a diverse economy that includes agriculture, mining, oil, and services.[152] Its GDP is about US$75.24 billion, according to the International Monetary Fund.[153]

Ghana's unemployment rate was 3.6 percent as of 2023, according to International Labour Organization (ILO) data.[154] Ghana is a member of the World Trade Organization (WTO) and a signatory to its Trade Facilitation Agreement; it is one of the fifteen members of the ECOWAS, and a major economic contributor to the bloc. It has ratified AfCFTA and its capital, Accra, is home to the AfCFTA secretariat.[155]

Ghana is party to the bilateral Economic Partnership Agreement (EPA) with the European Union and is a party to an Interim Trade Partnership Agreement with the United Kingdom.[156] It has continued to experience steady economic growth in recent years, although it faces challenges such as public debt, inflation, and a trade deficit.

The country is a multiparty democratic state, recognized for its political stability and strong democratic institutions, having experienced peaceful transitions of power since its return to civilian rule in 1992. The country has a free press, independent judiciary, and an active civil society.[157] Despite these strengths, challenges such as corruption and regional inequalities persist.

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149. "Nigeria Population (Live)," World Population Review, accessed August 14, 2024, https://worldpopulationreview.com/countries/nigeria.
150. "Ghana Population," Worldometer, accessed August 14, 2024, https://www.worldometers.info/world-population/ghana-population/.
151. "Ghana Population (Live)," World Population Review, accessed August 14, 2024, https://worldpopulationreview.com/countries/ghana.
152. Donna J. Maier and John D. Fage, "Ghana," Encyclopædia Britannica, August 22, 2024, https://www.britannica.com/place/Ghana.
153. "World Economic Outlook: Ghana," Datasets, International Monetary Fund, April 2024, https://www.imf.org/external/datamapper/profile/GHA.
154. "Ghana Unemployment Rate," Trading Economics, accessed August 21, 2024, https://tradingeconomics.com/ghana/unemployment-rate.
155. "African Continental Free Trade Area Resources," International Trade Administration, accessed August 21, 2024, https://www.trade.gov/african-continental-free-trade-area-afcfta-resources.
156. "Ghana-Country Commercial Guide," International Trade Administration, November 26, 2023, https://www.trade.gov/country-commercial-guides/ghana-trade-agreements.
157. US Agency for International Development (USAID), *Ghana Democracy Fact Sheet*, July 2023, https://www.usaid.gov/sites/default/files/2023-09/USAID-Ghana-Democracy-Fact-Sheet-230705.pdf.

3.4.2. Overview of regulatory and governance environment

Ghana's statutory framework includes a broad range of laws that govern economic, social, political, and technological activities. Key statutes include the 1992 Constitution,[158] the Companies Act, 2019 (Act 992),[159] the Data Protection Act (2012),[160] and sector-specific regulations such as the Electronic Communications Act of Ghana, 2008 (Act 775).[161]

Ghana's policy environment is guided by national development plans, such as the Beyond Aid agenda,[162] which seeks to reduce dependency on foreign aid by promoting sustainable economic growth in areas such as manufacturing, technology, etc. Other key policies include the National Industrial Policy,[163] which is designed to promote competitiveness and enhance industrial productivity, and the National Cybersecurity Policy.

Several institutions play a crucial role in Ghana's governance and regulatory environment. These include the National Communications Authority (NCA) and the Data Protection Commission (DPC). These institutions are responsible for implementing laws, regulating industries, and ensuring compliance with statutory requirements (and are discussed below).

3.4.3. Foundational laws and policies

This section focuses on key sectoral frameworks and policies that have direct or adjacent impact on emerging technologies in Ghana. In addition, it identifies the institutions responsible for crafting and regulating these policies and recommendations.

3.4.3.1. Data protection

The Data Protection Act, 2012 (Act 843)[164] is Ghana's primary legal framework for data protection covering the establishment of a Data Protection Commission (DPC), administration, the application of data protection principles, rights of data subjects, processing of special personal data, a data protection register, exemptions (such as national security, crime, and taxation), enforcement, and data subject rights. The DPC is responsible for enforcing Ghana's data protection regulations, ensuring that personal data is collected and processed in compliance with the law.

However, ample exemptions on the enforceability of the act apply in cases related to national security, public order, safety, public morality, and public interest. As with many other data protection frameworks, the conditions for exemptions are discussed in limited terms and give room for governmental violation of individual privacy rights. Precedents in that regard exist in Ghana, as well as in other African countries. For instance, following the COVID-19 pandemic, the High Court of Ghana ruled[165] that the National Communications Authority's invocation of the Electronic Communications Act (of 2008) to order mobile telecommunications providers to intercept users' communications to aid law enforcement in managing the pandemic was illegal.

3.4.3.2. Cybersecurity

Ghana has made strides in cybersecurity with the introduction of the Cybersecurity Act, 2020 (Act 1038).[166] The law covers the establishment of a governing authority, a cybersecurity fund, critical information infrastructure, national and sectoral computer emergency response teams, a cybersecurity incident reporting guide, licensing of cybersecurity service, accreditation and certification, cybersecurity standards, enforcement and education, protection of children online, other online sexual offenses, cybersecurity and investigatory powers, and miscellaneous provisions.

The Cybersecurity Act is enforced by the Cyber Security Authority (CSA), which is responsible for overseeing cybersecurity initiatives and protecting critical infrastructure. The CSA was established by provisions of the act in 2020.

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[158] Constitution of the Republic of Ghana 1992, Judiciary, Republic of Ghana, accessed November 26, 2024, https://judicial.gov.gh/index.php/the-constitution.

[159] "The Companies Act 2019 (Act 992) and its Financial Reporting Implications," Deloitte, accessed November 26, 2024, https://www.deloitte.com/gh/en/services/tax/services/companies-act-2019-financial-reporting-implications.html.

[160] Data Protection Act, Data Protection Commission, Government of Ghana, October 16, 2012, https://www.dataprotection.org.gh/data-protection/data-protection-acts-2012.

[161] Electronic Communications Act of Ghana, 2008 (Act 775), National Communication Authority, 2008, https://nca.org.gh/wp-content/uploads/2023/04/NCA-Electronic-Communications-Act-775.pdf.

[162] Government of Ghana, *Ghana Beyond Aid Charter and Strategy Document*, April 2019, http://osm.gov.gh/images/GBYA/ghana_beyond_aid_charter_new.pdf.

[163] UNIDO, *The Industrial Policy Process*, February 2013, https://downloads.unido.org/ot/99/29/9929467/WP2.pdf.

[164] The Data Protection Act, 2012 (Act 843), Data Protection Commission of Ghana, May 2012, https://www.dataprotection.org.gh/media/attachments/2021/11/05/data-protection-act-2012-act-843.pdf.

[165] "Ghana: MFWA Welcomes High Court Ruling Ordering Government to Stop Collecting Personal Data," Media Foundation for West Africa, August 2, 2021, https://mfwa.org/ghana-mfwas-welcome-high-court-ruling-ordering-government-to-stop-collecting-personal-data/.

[166] Cybersecurity Act, 2020 (ACT 1038), Parliament of Ghana, November 6, 2020, https://ir.parliament.gh/bitstream/handle/123456789/1800/CYBERSECURITY%20ACT,%202020%20(ACT%201038).pdf?sequence=1.

As part of the country's National Cybersecurity Policy & Strategy[167] of March 2014, the country outlined some key initiatives, which have now been implemented, to ensure it embraces global cybersecurity best practices. These include the National Cyber Security Center (NCSC), which is responsible for the development and enforcement of Ghana's policies and strategies on cybersecurity; and a National Cyber Security Awareness Program, with the month of October earmarked as Ghana's National Cybersecurity Awareness Month (NCSAM).[168] The other statutory institution is the National Computer Emergency Response Team (CERT-GH), which was established by the Ministry of Communications in August 2014 with the goal of protecting the country's e-government projects and industrial and control systems (ICS) infrastructure.

Due to a recent rise in cyberbullying and other cyber threats prevalent on social media platforms, the Cyber Security Authority is currently in the process of developing a framework to guide online behavior.[169]

3.4.4. Technology policies

3.4.4.1. Connectivity

Ghana's broadband policy and implementation strategy works in parallel with the Ghana ICT for Accelerated Development (ICT4AD) Policy,[170] which aims to make the country an ICT knowledge-based society and economy. The country's policy on broadband access, which is contained in the 2012 *Broadband Policy and Implementation Strategy,* is designed to promote the development and maintenance of broadband infrastructure and networks to drive the affordability and accessibility of broadband for all citizens. The policy set the following goals: to facilitate the accessibility of affordable broadband infrastructure to corporate spaces by 2015, foster last mile connectivity to local communities and homes by 2020, and ensure that the broadband policy is effectively implemented by 2015 in relation to the Universal Access/Service policy.[171]

Although Ghana does not have a separate policy framework for 5G technology for cellular networks, the National Communications Authority's *Five-year Strategic Plan 2024–2028*[172] notes that as part of its regulatory scope, it will manage all radio frequency spectrum that will promote and support the rollout of 5G and 6G telecom networks. Furthermore, in May, the country's minister of communications and digitalization shared Ghana's plans to increase 4G penetration from 15 percent to 80 percent by 2027,[173] and establish an additional 4,400 4G and 5G sites to ensure access to high speed internet for its citizens.[174] To achieve this, the country has granted a 5G license to Next Gen Infraco (NGIC), a major Network-as-a-Service (NaaS) operator in the country.[175]

3.4.4.2. Digital public infrastructure

Ghana's key DPI initiatives include the Ghana.gov platform for streamlining government services online, the Ghana Integrated Financial Management Information System (GIFMIS), which streamlines financial processes including mobile money transfers, and the National Identification Authority's digital ID system and its Ghana card, a national digital ID.

The Ghana card holds citizens' biometric information. It can host different applications, including the ECOWAS passport. The Ghanaian government aims to make a person's card identification number serve as a tax identification number and link it to health and social security databases. The National Identity Register Regulations (2012) mandates the use of the national ID in transactions such as applying for a passport, driver's license, voter's ID, bank account, and national health insurance; registration of land; purchasing a SIM card; payment of taxes; transactions with social security implications; and applications for public and government services.

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[167] *Ghana National Cybersecurity Policy & Strategy*, Ministry of Communications, Republic of Ghana, March 2014, https://afyonluoglu.org/PublicWebFiles/strategies/Africa/Ghana%202014%20National%20Cyber%20Security%20Policy%20and%20Strategy-EN.pdf.

[168] "2023 National Cyber Security Awareness Month (NCSAM) Launched," Cyber Security Authority (CSA) of Ghana, accessed October 21, 2024, https://www.csa.gov.gh/national-cybersecurity-awareness-month-2023-launched.php.

[169] "CSA Develops Framework to Guide Online Behaviour," CSA, accessed October 15, 2024, https://www.csa.gov.gh/csa-develops-framework-to-monitor-online-behaviour.php.

[170] National Information Technology Agency (NITA), *The Ghana ICT for Accelerated Development (ICT4AD) Policy*, Republic of Ghana, 2003, https://nita.gov.gh/theevooc/2017/12/Ghana-ICT4AD-Policy.pdf.

[171] National Communications Authority, *National Broadband Policy and Implementation Strategy*, Ministry of Communications, Republic of Ghana, October 2012, https://nca.org.gh/wp-content/uploads/2020/09/National-Broadband-Policy-and-Implementation-Strategy.pdf.

[172] National Communications Authority, *Five-Year Strategic Plan 2024–2028*, Republic of Ghana, 2024, https://nca.org.gh/wp-content/uploads/2024/01/Five-Year-Strategic-Plan-2024-2028-Abridged.pdf.

[173] "5G Mobile Broadband Services Will Be Transformative and Affordable to All Ghanaians–Communications Minister Has Assured," Ministry of Information, Republic of Ghana, May 30, 2024, https://moi.gov.gh/newsroom/2024/05/5g-mobile-broadband-services-will-be-transformative-and-affordable-to-all-ghanaians-communications-minister-has-assured/.

[174] "Statement by the Minister for Communications and Digitalisation, Mrs Ursula Owusu-Ekuful," Press Briefing on 5G Deployment in Ghana, Ministry of Information, Ministry of Communications and Digitalisation, May 30, 2024, https://moc.gov.gh/wp-content/uploads/2023/03/Ministerial-Briefing-for-5G-Deployment-rev1.pdf.

[175] Abdullah Ajibade, "Ghana to Increase 4G Penetration by Sixty-five Percent, Plans to Build Four Thousand Four Hundred 4G and 5G Sites in Three Years," Techpoint, June 5, 2024, https://techpoint.africa/2024/06/05/ghana-plans-increase-4g-penetration/.

Although the Ghana card is promoted as a tool for development and financial inclusion, mandating its use for essential services could exclude citizens who lack the card. Critics argue that this force-in approach undermines citizens' access to public and private goods and services. They suggest a more inclusive approach would be relying on other existing state-issued IDs, such as passports, driver's licenses, and voter IDs. Additionally, there are concerns about the potential for state surveillance and the need for robust enforcement of data protection laws to protect citizens' privacy and civil rights.[176]

The legal framework governing DPI in Ghana is still pending. The Electronic Transactions Act (2008) provides a foundational legal framework for electronic transactions and digital signatures. The Data Protection Act (2012) provides some safeguards for personal data, but its implementation and enforcement remain unsatisfactory. Specific regulations for data protection and privacy, especially concerning digital identity and biometric data, are lacking as they do not adequately address the unique challenges and complexities of DPI. The existence of the Data Protection Commission to oversee data protection, while a step in the right direction, is not enough. Its effectiveness and independence are questioned, creating a gap in safeguarding citizens' rights and data. The lack of robust data protection laws raises questions about the security and accountability of data handling practices. Ensuring transparency and accountability in data handling practices and establishing independent oversight mechanisms are essential to mitigate risks and safeguard citizens' rights.

In May 2024, Ghana's National Information Technology Agency (NITA) published a regulatory framework for the data center and cloud ecosystem in Ghana called "Regulations for Data Centre Services,"[177] making the NITA the primary regulator for the industry. However, several other policies and legal instruments play a role in regulating cloud computing and the data center market. These other regulations include:

- Registration of Business Names Act (1962)
- Environmental Protection Agency Act (1994)
- Ghana National Fire Service Act (1997) and the Fire Precautions (Premises) Regulation (2003)
- Copyright Act (2005)
- Electronic Communications Act (2008)
- Renewable Energy Act (2011)
- Ghana National Building Code (2018)
- Companies Act (2019)
- Cybersecurity Act (2020)
- Data Protection Act (2012)[178]

3.4.4.3. Artificial intelligence

State-led AI governance mechanisms in Ghana have been limited. This is reflected in its score of 0.00 on government frameworks in the GIRAI.[179] However, the country performs relatively better in terms of government actions (9.39) and nonstate actor efforts (12.5). While it is yet to ratify a national AI policy, earlier government efforts and nonstate actor activities have led to a draft national strategy in 2022.[180] The draft strategy is a collaboration put together by several institutions including the Ministry of Communications and Digitalization, Smart Africa, GIZ FAIR Forward, and the Future Society. The strategy details the country's mission to harness AI for inclusive growth across sectors to improve the lives of citizens and to be at the forefront of AI leadership in Africa and the world. The strategy outlines Ghana's mission and vision for AI, how it would be used for sustainable and inclusive development, a SWOT analysis of Ghana's AI ecosystem, the national AI strategy framework, and an action plan across the eight pillars: education, youth empowerment, digital infrastructure and inclusion, data access and governance, robust AI ecosystem, adoption across sectors, applied AI research, and AI in the public sector.

3.4.5. Summary considerations

3.4.5.1. Strengths

Political stability

Ghana is recognized for its political stability and democratic institutions, which provide a conducive environment for investment and economic growth. With strong institutions, policies around emerging technologies can be effectively implemented and rights protected. For instance, innovators and investors can trust the institutional credibility of the judiciary to ensure the enforcement of the Copyright Act (2005) that protects intellectual property rights and fosters growth and innovation.

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[176] Smith Oduro-Marfo and Teki Akuetteh Falconer, *Buy-in or Force-in to the Ghana Card?* Research ICT Africa, August 6, 2021, https://researchictafrica.net/2021/08/06/buy-in-or-force-in-to-the-ghana-card/.

[177] *Regulatory Framework: Data Centre Services*, Salience Consulting, Prepared for the Government of Ghana, May 2024, https://www.brr.gov.gh/acc/consultation/docs/Regulatory%20Framework%20for%20Data%20Centers.pdf.

[178] Goodman AMC Ltd., *Cloud Computing in Ghana: Data Privacy, Regulatory Framework and Opportunities*, 2015, https://drive.google.com/file/d/0B8S7ODNbOsDZdnpPemtzRDhXSms/view?resourcekey=0-Uf-9UvBnxLXJajnQPuSDqg.

[179] Adams et al., *Global Index on Responsible AI 2024*.

[180] Ministry of Communications and Digitalisation with Smart Africa, GIZ FAIR Forward, and The Future Society (TFS), *Republic of Ghana National Artificial Intelligence Strategy: 2023–2033,* October 2022, https://www.slideshare.net/slideshow/ghana-s-national-artificial-intelligence-strategy-2023-2033-pdf/270928634.

Regulatory Advances

The introduction of frameworks like the Data Protection Act and the National Cybersecurity Policy, Regulations for Data Centre Services, and the like demonstrates progress in governance. Although still lacking in a few dedicated policies for emerging technologies, Ghana has shown tremendous progress in keeping up with technological innovation that might have an impact on its economy and citizens.

Commitment to digital transformation, skills, and capacity building

The government of Ghana has shown a strong commitment to digital transformation, with initiatives like the Ghana Digital Transformation Roadmap, the National Digital Transformation Policy, and the broader ICT for Accelerated Development policy framework. These frameworks emphasize innovation, skill development, and technology adoption, positioning the country at the forefront for embracing new technologies. Furthermore, Ghana has continued to focus on building digital skills among its youth and workforce with initiatives such as the Ghana Digital Centres Ltd., an agency under the Ministry of Communication and Digitization, dedicated to driving digital innovation and upskilling.

Strategic partnerships and collaborations

Ghana actively collaborates with international organizations, tech giants, and development partners to drive the adoption of emerging technologies. To develop the country's AI strategy, the Ministry of Communications and Digitalization partnered with entities like the World Bank, Smart Africa (which supported the NITA to develop a regulatory framework for data centers and cloud computing), GIZ FAIR Forward, and The Future Society. This collaborative approach helps Ghana leverage global expertise and resources, enhancing its capacity to implement technology policies effectively.

3.4.5.2. Weaknesses and (potential) threats

Implementation and enforcement challenges

Despite the existence of laws and regulations, enforcement remains a challenge, leading to issues such as corruption and regulatory inefficiencies. While Ghana has made progress in developing frameworks on emerging technologies, challenges such as limited public awareness and absence of robust frameworks to track progress and ensure accountability create a gap in effective implementation, consequently slowing down technological adoption and innovation.

Poor institutional configuration

The existing regulatory institutions for emerging technologies are poorly interconnected and many of the regulations and policies for these technologies overlap. The responsibilities of the different regulators play a part in the process; however, this is not clearly defined in some of the regulations, leading to innovators needing to register and be regulated by one too many institutions. For instance, the regulation of data centers involves other regulations and regulatory institutions ranging from the Registration of Business Names Act (1962); Environmental Protection Agency Act (1994); Ghana National Fire Service Act (1997) and the Fire Precautions (Premises) Regulation (2003); Electronic Communications Act (2008); Renewable Energy Act (2011); Ghana National Building Code (2018); the Cybersecurity Act (2020), and the Data Protection Act (2012).[181]

Digital skill gap

While there is a growing emphasis on digital skills training, the overall capacity-building efforts in advanced fields like quantum computing, augmented reality/virtual reality (AR/VR), and nanotechnology remain limited. This skills gap constrains the workforce's ability to engage with and drive the implementation of advanced technologies to grow Ghana's economy.

3.4.5.3. Opportunities and recommendations

Boost economic diversification

Ghana's continued efforts to diversify the economy, particularly in manufacturing and ICT, can reduce dependence on traditional export products such as gold, cocoa, and petroleum, enhancing economic resilience. Ghana's growing digital economy presents opportunities for innovation, job creation, and economic growth. As the host of the secretariat of the AfCFTA, Ghana could become a key economic player on the continent while leveraging its investment in digital reskilling, its citizens, and the public sector.

Harness youth demographics

As the second-largest population in West Africa, with a median age of 21.4 years,[182] Ghana's large and youthful population provides opportunities for economic growth—if effectively harnessed through digital education and skills development programs. This thriving, technology-adept population makes Ghana a suitable location for big tech corporations that want to establish a presence in Africa.

Strengthen enforcement mechanisms

There is a need to enhance the capacity of regulatory institutions to enforce laws and regulations effectively, particularly in areas such as IP, data protection, and consumer rights. A framework detailing how regulatory institutions interact with each other and the extent to which they play a part in regulating an industry is needed. For instance, the Ministry of Communications and Digitalisation is putting together a national data strategy,[183] which will seek to leverage data for socioeconomic development while aligning with Ghana's Long-term National Development Plan (2018–2057) and the National Medium-Term Development Policy Framework (2022–2025).[184]

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[181] Goodman AMC, *Cloud Computing in Ghana*.

[182] "Ghana Population (Live)," World Population Review.

Enhance public awareness

Public awareness of legal rights and responsibilities, particularly in emerging areas such as data protection and consumer rights, is necessary. A budget allocation will facilitate execution of such public awareness campaigns. Also, a central repository of all regulations and frameworks pertaining to emerging technologies would be important, creating easy access for researchers, innovators, and citizens to search and access these policies, frameworks, and regulations.

3.5. Zambia

3.5.1. Country context

Zambia is pursuing a long-term development strategy, *Vision 2030*, aspiring toward an information and knowledge-based society to be a "prosperous middle-income nation" by 2030.[185] The government established the Ministry of Technology and Science in 2021,[186] and the subsequent *Eighth National Development Plan 2022–2026* (8NDP) underscores enhancing the national digital capacity as a key national agenda to transform Zambia into a digital economy through infrastructure development, digital innovation, and entrepreneurship, enhancing digital skills and promoting digital services.[187] The National Information and Communication Technology Policy offers strategic guidance for coordinating efforts to leverage ICTs; it focuses on building citizens' digital skills, developing responsive regulatory and policy frameworks, and establishing an efficient ICT sector to be integrated across all sectors of the economy.[188]

Zambia ranks ninety-second on the GIRAI[189] among 138 countries assessed for this index on its commitment to the responsible development of AI from a human-rights perspective.

The *Zambia Inclusive Digital Economy Status Report 2022* highlighted a 47 percent digital divide, with a gender gap of 34 percent and a significant rural disparity of 56 percent, indicating that a large portion of Zambians do not have digital access.[190] Moreover, less than twelve percent of rural households have any kind of electricity, with load shedding being a persistent challenge.[191] However, Zambia has also shown significant progress in extending critical infrastructure, for instance supporting digital financial services, and substantially updated legislation in the digital and AI policy domains with a strong emphasis on innovation and the mainstreaming of technologies in education and local products and services. Zambia illustrated its embrace of AI technologies, for example, by hosting Deep Learning Indaba, the annual meeting of the African machine learning and AI community, in 2023 at the University of Zambia.

On a regional scale, Zambia is among the seventeen countries that implemented the Digital Economy for Africa (DE4A) flagship initiative in collaboration with the World Bank, which supports the AU's digital transformation strategy.[192]

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[183] "A Two-day National Data Strategy Validation Workshop Held in Accra," Ministry of Communications and Digitalisation, Republic of Ghana, June 28, 2024, https://moc.gov.gh/2024/06/28/a-two-day-national-data-strategy-validation-workshop-held-in-accra/.

[184] Anthony Deen, Ivette Yáñez Soria, and Talla Ndiaye, "DPA's Just Digital Transformations Director Facilitates Dynamic Validation Workshop for Ghana's National Data Strategy in Accra," Data-Pop Alliance, July 2, 2024, https://datapopalliance.org/dpas-just-digital-transformations-director-facilitates-workshop-for-ghanas-data-strategy/.

[185] Republic of Zambia, *Vision 2030: A Prosperous Middle-income Nation by 2030,* December 2006, https://www.mndp.gov.zm/?wpfb_dl=60.

[186] Michael Malakata, "Zambia's New President Has High Hopes for the Newly Formed Tech Ministry," IT Web Africa, September 8, 2021, https://itweb.africa/content/nWJad7bebEevbjO1.

[187] Republic of Zambia, *Eighth National Development Plan 2022–2026,* May 2022, https://www.sh.gov.zm/wp-content/uploads/2022/09/EIGHTH-NATIONAL-DEVELOPMENT-PLAN-2022-2026-05-07-2022.pdf.

[188] Ministry of Technology and Science, *National ITC Policy 2023: Implementation Plan 2022-2026*, Republic of Zambia, 2023, https://www.mots.gov.zm/wp-content/uploads/2023/10/National-ICT-Policy-2023-Implimentation-Plan.pdf.

[189] Adams et al., *Global Index on Responsible AI 2024*.

[190] See UN Capital Development Fund, "Zambia's Digital Transformation Will Strengthen the Economy and Create More Equitable Society," April 21, 2022, https://www.uncdf.org/article/7656/zambias-digital-transformation-will-strengthen-the-economy-and-create-more-equitable-society.

[191] See "Zambia: Access to Electricity Changes Lives," World Bank video, February 16, 2024, https://www.worldbank.org/en/news/video/2024/02/16/zambia-afe-access-to-electricity-changes-lives#:~:text=Zambia's%20overall%20electrification%20rate%20remains,have%20any%20kind%20of%20electricity.

[192] "The Digital Economy for Africa Initiative," World Bank Group, accessed October 9, 2024, https://www.worldbank.org/en/programs/all-africa-digital-transformation.

3.5.2. Overview of regulatory and governance environment

The National Science, Technology and Innovation Policy (2022)[193] aims to strengthen the policy, legal, institutional, and operational framework for STI, develop and enhance human-resource capacity, enhance the commercialization, transfer, and diffusion of technologies, utilize Indigenous knowledge systems (IKS) for national development, improve investment and funding, ensure quality assurance, and promote and raise awareness of STI. The policy indicates that the legal and regulatory frameworks for STI will be established following an institutional assessment, but specific details on these frameworks are not yet provided.

Zambia's *National Digital Transformation Strategy 2023–2027*[194] focuses on digital infrastructure, platforms, services, literacy and skills, innovation, and entrepreneurship. It also provides a multistakeholder implementation framework, with the Ministry of Technology and Science to provide quarterly monitoring reports.

The "National Information & Communication Technology Policy 2023,"[195] was adopted with the rationale that rapid changes in the ICT sector—including artificial intelligence, big data, machine learning and robotics, and nanotechnology as well as the changes in the business models adopted by ICT service providers—present new opportunities for economic and human development. The policy is aligned with *Vision 2030* and offers strategic guidance for coordinated efforts to leverage ICTs in key sectors of the economy while ensuring inclusivity, efficiency and competitiveness. The policy is centred around the following thematic areas: enhancing citizens' ICT capacities, building an effective and responsive regulatory and policy framework, establishing an efficient ICT sector, and streamlining ICT in all sectors of the economy.

The Zambian government has various strategies and charters that outline the country's plans to utilize digital technologies for public services. The Service Delivery Charter for Digital Services (2023) outlines the Zambian government's aspirations to streamline efficient and transparent public services using digital technologies that respond to its citizens' needs. The country also has a Digital Transformation Change Management Strategy for the Public Service (2023–2026), which recognizes emerging technologies as enablers for the provision of government services. To align training with the needs of the labor market, the National Technical Education Vocational and Entrepreneurship Training Policy (2022) seeks to promote innovation, research, and development within the TVET system, including advancing the training of learners in high-level skills such as AI.

Digital health is recognized as a priority area by SMART Zambia, with the Digital Health Strategy 2022–2026 largely focused on ensuring interoperability and standardization of fragmented digital health initiatives. The strategy is broadly aligned with the World Health Organization's digital health framework, and much like other countries, was established after the COVID-19 global pandemic demonstrated the potentials of advanced technology to monitor and respond to future healthcare crises. It has an overall goal of improving Zambians' health outcomes through a seamlessly operating sustainable, secure, and innovative digital ecosystem. The current data privacy laws in Zambia—which are covered in the Data Protection Act of 2021, the Cyber Security and Cyber Crimes Act of 2021, and the Electronic Communications and Transaction Act 2021—do not make adequate provisions for issues related to medical data governance, such as accessing and protecting health records and patient confidentiality.

Zambia's Electronic Government Act of 2021 makes provisions for how government departments may conduct a "joint automated procedure" and share data, and it also determines the use and reuse of data open in a machine-readable format. Importantly, the act requires transparency on behalf of the entities involved in these procedures regarding the guidelines associated with the data-sharing and -processing arrangement.

3.5.3. Foundational laws and policies

3.5.3.1. Data protection

Zambia's Data Protection Act of 2021 defines the rights related to interactions between natural persons and programmed or data-driven systems, establishing, for instance, that there may be no legal or similar effects based on information that is solely grounded on automatic data processing. It also specifies that data controllers ought to "implement suitable measures to safeguard the data subject's rights and freedoms and legitimate interests, including the right to obtain human intervention on the part of the data controller for purposes of enabling the data subject to express the data subject's point of view and contest the decision."[196] The act also prohibits certain activities related to the processing of personal data, such as profiling, using child data, and processing without prior registration.

The act also establishes the Office of the Data Protection Commissioner to provide an effective system for the collection, use, transmission, storage, and processing of personal data, regulate data controllers and processors, and license data auditors. However, the act lacks any specific provisions on how emerging technologies would be governed within the framework.

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[193] Ministry of Technology and Science, *National Science, Technology, and Innovation Policy*, Republic of Zambia, 2022, https://www.mots.gov.zm/wp-content/uploads/2022/06/National-ScienceTechnology-and-Innovation-Policy-A4_Print-Ready.pdf.

[194] Ministry of Technology and Science, *National Digital Transformation Strategy 2023-2027*, Republic of Zambia, 2023, https://www.mots.gov.zm/wp-content/uploads/2023/10/National-Digital-Transformation-Strategy.pdf.

[195] Ministry of Technology and Science, "National Information & Communication Technology Policy 2023," Republic of Zambia, https://www.mots.gov.zm/wp-content/uploads/2023/10/National-ICT-Policy-2023.pdf.

[196] Zambia Data Protection Act No. 3 of 2021, Part IX, Clause 62 (3).

3.5.3.2. Cybersecurity

The Cyber Security and Cyber Crimes Act (2021) established the Zambia Computer Incident Response Team and the National Cyber Security Advisory and Coordinating Council and continues the Central Monitoring and Coordination Centre to protect against cybercrime. It also ensures child online protection, secures critical information infrastructure, preserves evidence of cybercrime, facilitates the admission of electronic evidence in criminal cases, and requires registration of cybersecurity service providers.

3.5.4. Technology policies

Emerging technology policies in Zambia have been limited. According to the Zambian Information and Communications Technology Authority, it is “yet to make meaningful progress in facilitating new and emerging technologies such as 5G, Artificial Intelligence (AI), Internet of Things (IoT), Machine to Machine applications and big data applications.”[197] Nonetheless, some of the government efforts in each technology area are worth highlighting.

3.5.4.1. Connectivity

National policies on broadband and 5G are absent, but discussions about both feature in the *Smart Zambia Electronic Government Master Plan 2018–2030*[198] and the *National Electronic Government Plan 2023–2026*, or NEGP,[199] (see the next section) as part of the government’s plans to invest in digital infrastructure and deploy broadband access in public spaces through a partnership with private-sector players such as Starlink.

3.5.4.2. Digital public infrastructure

The *SMART Zambia Electronic Government Master Plan* was developed in accordance with the African Union Agenda 2063 and its pan-African vision to attain technological transformation on the continent that is led by Africans by centering ICT for socioeconomic development. Established in 2015, it outlines the government’s priorities for implementing an e-government to achieve *National Vision 2030* goals by establishing systems that respond to emerging technologies and challenges. A key objective for the plan’s foundation phase from 2018 to 2021 was strengthening the legal, regulatory, and policy framework of ICTs as well as building human and institutional capacities. The plan’s integration phase from 2022 to 2026 is focused on increasing ICT infrastructure and streamlining systems and services in the cloud computing environment and on the integrated government transactional web portal. The impending final phase from 2027 to 2030 aims for more intensive integration and provision of value-added services for achieving nationwide e-government services.

Zambia’s NEGP 2023–2026 has a strategic focus of transforming the public sector through the adoption and application of digital technologies. The plan aims to conduct capacity building in new and emerging technologies such as AI, big data, robotics, and blockchain, and underscores that doing so requires significant investments. The NEGP also aims to standardize public-sector digital platforms and services, and its implementation activities include establishing guidelines for the adoption of emerging technologies and developing a public-sector emerging technologies framework. The Electronic Government Act No. 41, of 2021, established the Electronic Government Division in the Office of the President and enhanced the management and promotion of e-government services and processes for improved service delivery, administrative functions, and productivity. The Zambian government seems focused on overall infrastructure progress for big data and cloud computing rather than specific technology-driven strategies.[200]

Zambia now has three tier-three highly reliable national data centers that can be maintained while operating, are owned by the government corporation INFRATEL, but were built by Huawei using its own equipment and technology systems. Previous research has documented the risks of this sort of arrangement, including, for instance, reports of outdated equipment; limited knowledge transfer by this Chinese digital communications technology conglomerate regarding its customized technology systems, which sometimes leads to delays in deploying the infrastructure for critical usage; and poor documentation procedures as most of the technical support documents are in Mandarin.[201] The 2023 e-government plan outlines the government’s ambitions to create a government cloud service hosted on an additional tier-three national data center.[202]

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[197] See Zambia Information and Communications Technology Authority (ZICTA), *Corporate Strategic Plan 2022–2024,* September 11, 2023, 15, https://www.zicta.zm/resources/strategic-plans.

[198] E-Government Division, *Smart Zambia Electronic Government Master Plan 2018–2030*, Office of the President, Republic of Zambia, 2019, https://www.szi.gov.zm/wp-content/uploads/2022/01/eGOVERNMENT_Masterplan_v3.0.pdf.

[199] E-Government Division, *National Electronic Government Plan 2023–2026*, Republic of Zambia, 2023, https://www.szi.gov.zm/wp-content/uploads/2023/08/Final-National_e-Government_Plan_-2023-Final-17.08.2023.pdf.

[200] GSMA, *Driving Digitalisation of the Economy in Zambia: Leveraging Policy Reforms*, October 2024, https://www.gsma.com/about-us/regions/sub-saharan-africa/wp-content/uploads/2024/10/GSMA_Zambia-Report_Oct-2024_Final.pdf.

[201] USAID, *Digital Ecosystem Country Assessment: Zambia*, July 2022, https://pdf.usaid.gov/pdf_docs/PA00ZK6B.pdf.

Zambia has ambitious goals to develop smart cities, for instance, as outlined in the Lusaka Renewable Energy Project—Chongwe Smart City, which seeks to provide affordable solar-generated electricity to a rural community near the capital city of Lusaka.[203] There are even grander projects planned in collaboration with massive private investors. For instance, the government of Zambia signed an agreement with Huawei to construct one hundred smart villages in the country.[204] Meanwhile, Zambia's Industrial Development Corporation signed a deal with Kenyan tycoon Julius Mwale[205] to support the development of smart cities, mining, infrastructure, and agriculture. The signing came even as KoBold Metals, which is backed by Bill Gates, Jeff Bezos and other billionaires, discovered large copper deposits and raised funds for mineral exploration and processing.[206] Little is known about the details of this deal and the potential impact it could have on Zambian society, especially the host communities where key mining projects would be carried out.

The Zambian Integrated National Registration Information System (INRIS) is a biometric national identification system designed for civil registration and identity management processes. Its primary functions include:

- Centralized database: INRIS creates a database of Zambian citizens and noncitizens, storing biometric and demographic information.
- Biometric identification: The system utilizes biometric technology to verify individual identities.
- Issuance of national identity cards: INRIS enables the issuance of biometric-enabled national identity cards to citizens.
- Integration with government agencies: The system integrates with various government agencies to facilitate data sharing and verification processes.

While INRIS aims to modernize Zambia's identification system, civil society organizations have raised several criticisms including:

- Privacy and data protection: Critics worry about potentially misusing personal data stored within the INRIS system, including biometric information. They question the security measures to protect this sensitive data and the government's commitment to transparency and accountability.
- Lack of transparency: Civil society groups have called for greater transparency regarding data collection, storage, and usage practices—advocating for clear guidelines and accountability mechanisms to ensure responsible data handling.
- Forced adoption: Critics highlight the risk of digital exclusion for marginalized groups lacking access to technology or the necessary skills to utilize INRIS. Some argue that the government has been too aggressive in pushing for the adoption of INRIS, making it mandatory for accessing essential services. This raises concerns about digital exclusion for those unable or unwilling to enroll.
- Surveillance: Stakeholders have raised concerns about the mandatory collection of biometric data and the potential misuse of the system to suppress and target dissent.[207]

3.5.4.3. Artificial intelligence

Insights from GIRAI show Zambia's limited progress in responsible AI governance, with government frameworks showing the lowest performance (2.60) across the three key pillars measured for this global index.[208]

The government has since launched its National AI Strategy in November 2024, but the document is yet to be publicly available at the time of writing. However, reports from the launch event indicate that the strategy, developed in collaboration with the Tony Blair Institute for Global Change and consultations from local and international stakeholders, outlines five key components: to enhance connectivity, "reliable data" for efficiency and sustainability; "trust and confidence" to safeguard cyberspace; "innovation, entrepreneurship;" and a "partnership and collaboration" platform to exchange ideas and support innovation.[209] The National AI Strategy aims to enhance public service provision, support education, promote the mining sector, enable innovative solutions and advanced services, foster an AI ecosystem as well as promote inclusivity for rural populations, women and girls, and older populations.[210]

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[202] Arnold Mulenga, "Zambia Gets Ready to Build a Tier-3 Data Centre," IT Web Africa, December 20, 2023, https://itweb.africa/content/kLgB17ezWlNM59N4.

[203] "The Strength of Partnerships: Zambia's Renewable Energy Initiative," NDC Partnership, February 13, 2024, https://ndcpartnership.org/news/strength-partnerships-zambias-renewable-energy-initiative.

[204] "Smart Village Brings Inclusive Connectivity to Rural and Remote Area," Huawei, July 17, 2024, https://www.huawei.com/en/news/2024/7/smart-village-inclusive-connectivity.

[205] Suleiman Yeri, "Kenyan Investor Signs Mining Deal with Zambian Government," *Standard Kenya*, June 4, 2024, https://www.standardmedia.co.ke/business/business/article/2001496525/kenyan-investor-signs-mining-deal-with-zambian-government.

[206] "Zambia: Government Launches Initiative to Boost Digital Literacy in Rural Areas," Capital Digital Media via AllAfrica (platform), June 4, 2024, https://allafrica.com/stories/202406040284.html.

[207] Sam Phiri and Kiss Abraham, "Mapping the Supply of Surveillance Technologies to Africa: Zambia Country Report," Institute of Development Studies, September 2023, 120-135, DOI: 10.19088/IDS.2023.027.

[208] Adams et al., *Global Index on Responsible AI 2024*.

3.5.5. Summary considerations

While its approach to emerging technologies governance is weak, Zambia's current focus is to establish its ICT sector and transform its digital economy by leveraging its strengths and improving key areas of weaknesses.

3.5.5.1. Strengths

Proactive government engagement

There is strong political will from the Zambian government to develop and implement legislative and governance frameworks as well as capacity building to leverage emerging technologies for socioeconomic development. The government is engaging with a technology-sector working group to foster business-friendly regulations to help make Zambia "the Estonia or Singapore of Africa."[211] In April 2021, Zambia's Securities and Exchange Commission and central bank introduced a regulatory sandbox that was intended to enable testing of emerging fintech in the country.[212] The live testing of the first cohort of four sandbox innovators has been completed, with a comprehensive review and evaluation to test performance and facilitate exiting the sandbox environment.[213]

Growing infrastructure

Zambia's ICT sector has experienced significant competition and increased mobile geographical coverage due to the liberalization of the industry.[214] In terms of population coverage, the country has nearly 100 percent for 2G, about 85 percent for 3G, and 83 percent for 4G;[215] meanwhile, the price of mobile internet access is decreasing.[216] This foundational infrastructure enables the expansion of 5G networks—first launched in 2022 for commercial use—and the integration into advancing the country's digital economy.[217] However, relative to the comparator countries examined (with the exception of Ghana), Zambia's progress in this regard remains limited (see figure 2), and government policies to enable this ecosystem have been limited.[218]

Young and growing demographic

The country's fast-growing and youthful population, with 48 percent under the age of fourteen and only 3 percent over sixty-five, is anticipated to be receptive to the country's digital transformation efforts for strengthening its economy and creating a more equitable society.[219]

3.5.5.2. Weaknesses and (potential) threats

Limited capacity

There are limited technical skills in emerging technologies such as blockchain, cyber security, AI, robotics, big data analytics, and machine learning.[220] Although there have been major investments in digital infrastructures, the fiber network

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[209] "Zambia Unveils AI Strategy to Drive Economic Transformation and Job Creation," *Efficacy News* (news platform), November 22, 2024, https://efficacynews.africa/?s=Zambia+Unveils+AI+Strategy+to+Drive+Economic+Transformation+and+Job+Creation.

[210] Carrington Malin, "Zambia Launches AI Strategy to Boost Jobs & Economy," *Africa AI News*, November 21, 2024, https://www.africaainews.com/p/zambia-launches-ai-strategy-to-boost.

[211] "Why Zambia? Here's Why We Picked Lusaka to Host the 10th Africa Fintech Summit," Africa Fintech Summit, accessed September 2, 2024, https://africafintechsummit.com/why-zambia-heres-why-we-picked-lusaka-to-host-the-10th-africa-fintech-summit/.

[212] "Zambia's Securities Exchange Commission Launches a Regulatory Sandbox," UN Capital Development Fund, March 25, 2021, https://www.uncdf.org/article/6614/zambias-securities-exchange-commission-launches-a-regulatory-sandbox.

[213] Bumba Mulenga, "SEC Completes Live Testing for Four Sandbox Innovators," *Zambia Monitor*, July 17, 2024, https://www.zambia-monitor.com/sec-completes-live-testing-for-four-sandbox-innovators/.

[214] E-Government Division, *National Electronic Government Plan 2023-2026.*

[215] Global System of Mobile Telecommunications Association (GSMA), "Mobile Connectivity Index," Dataset, accessed October 23, 2024, https://www.mobileconnectivityindex.com/index.html#year=2023&dataSet=indicator.

[216] USAID, *Digital Ecosystem Country Assessment (DECA) Report for Zambia*, 2021, https://www.usaid.gov/sites/default/files/2022-12/USAID_Zambia_DECA.pdf.

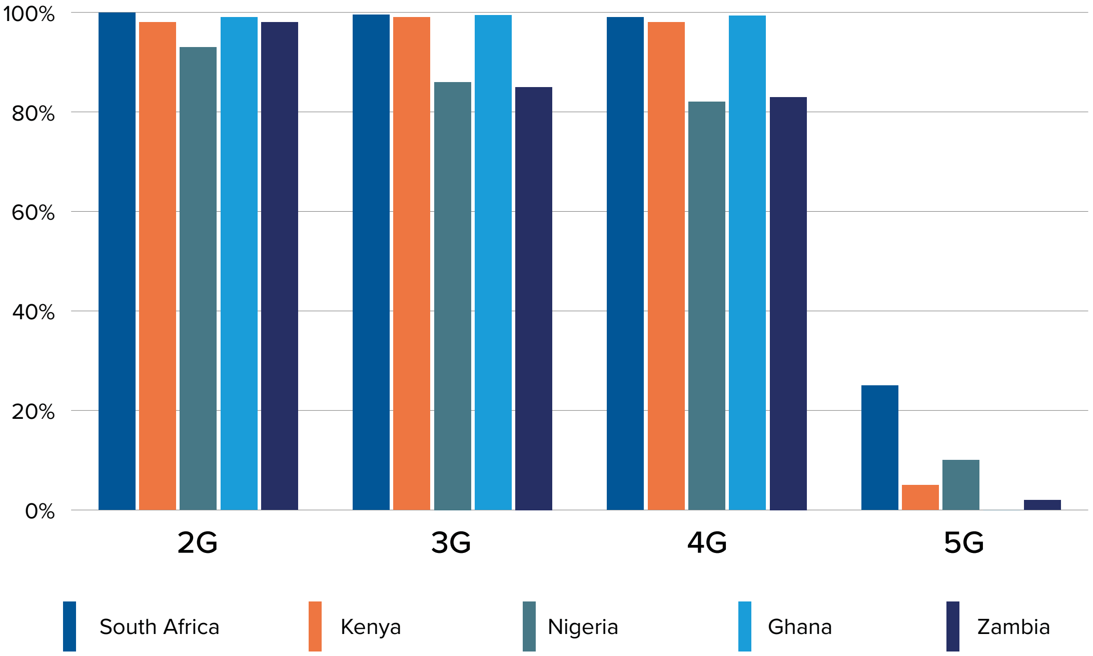
[217] "MTN Zambia Launches the Country's First 5G Network," MTN Group, December 1, 2022, https://www.mtn.com/mtn-zambia-launches-the-countrys-first-5g-network/.

[218] As of November 2023, the Minister of Technology was still talking about the government's plans to phase out 2G and move toward 4G services. See Samira Njoya, "Zambia to Phase Out 2G Technology to Fully Connect its Population," WeAreTech.Africa, December 12, 2023, https://www.wearetech.africa/en/fils-uk/news/tech/zambia-to-phase-out-2g-technology-to-fully-connect-its-population.

[219] Ministry of Technology and Science, *National Digital Transformation Strategy 2023–2027.*

[220] E-Government Division, *National Electronic Government Plan 2023–2026*.

Figure 2: Mobile network connectivity: Percentage of population covered in South Africa, Kenya, Nigeria, Ghana, and Zambia (2023)



Source: Global System of Mobile Telecommunications Association (GSMA), Mobile Connectivity Index, dataset accessed October 23, 2024, https://www.mobileconnectivityindex.com/index.html#year=2023&dataSet=indicator.

connecting the national provincial centers remains relatively unreliable due to fiber cuts caused by development construction without procedural guidelines and poor installation, electricity grid failure, and maintenance issues.[221] Notable, too, is the limited access to financial services required for the information and technology sector.[222] Lack of coordination has led to duplicative infrastructure deployment in some areas; additionally, the existing lower-grade infrastructure does not support emerging technologies such as blockchain, IoT, machine learning, and AI.[223]

Mobile phone and internet penetration

Zambia recorded notable improvements in access and usage of ICTs with the total number of active mobile telephone subscriptions increasing from 13.4 million in 2017 to 19.7 million in 2021, leading to a rise in the mobile telephone subscription penetration rate from 81.9 per 100 inhabitants to 107 per 100 inhabitants. Internet subscriptions also experienced an uptick from 7.8 million subscriptions in 2017 to 10.4 million in 2021. However, this growth has been attributed to a positive uptake of digital financial services (in particular), and the extensive use of machine-to-machine connections such as point of sale machines. According to the Zambia Information and Communications Technology Authority (ZICTA), the uptake of ICT services among Zambians is still low: Only 14.3 percent of the adult population actively uses the internet, and just over half (53.5 percent) of the adult population has access to mobile cellular telephones. This number further drops with smartphone ownership of just 29.6 percent of mobile phone owners. This low uptake features gender and rural-urban divides.

Skills and education

A key limitation in the use of emerging technologies is the lack of skills within the citizenry. According to the Zambian government, only 39.4 percent of schools have computers and only 5.9 percent of them have access to the internet. [224]

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[221] World Bank, *Accelerating Digital Transformation in Zambia: Digital Economy Diagnostic Report*, 2020, http://hdl.handle.net/10986/33806.

[222] See E-Government Division, *Smart Zambia Electronic Government Master Plan 2018–2030*.

[223] Ministry of Technology and Science, "National Information & Communication Technology Policy 2023."

[224] Republic of Zambia, *National Information & Communication Technology Policy 2023,* Ministry of Technology and Science, 2023, https://www.mots.gov.zm/wp-content/uploads/2023/10/National-ICT-Policy-2023.pdf.

3.5.5.3. Opportunities and recommendations

Implement Freedom of Information Act

On December 15, 2023, Zambia officially signed its long-awaited Access to Information Act into law, following years of public debate and advocacy after the Freedom of Information Bill, originally drafted in 2002, was abandoned. While this legislation marks a crucial step toward information freedom, its effective implementation now relies on authorities establishing adequate mechanisms to facilitate the law's effective implementation. What is more, a notable shortcoming of the act is that it restricts the right to access information to citizens and residents with valid residence permits and, therefore, is limited in its inclusivity.

Continue digitization with focus on AI

Zambia stands out for its rapid and strategic strides toward digitization with a strong emphasis on AI, attempting to mitigate existing divides in terms of digital access.

Address digital disparities

There are consistent gender and rural disparities in access to electricity, digital skills, and the internet: For example, ZICTA recognized that between 2020 and 2021 only 5.8 percent of female Zambians were computer literate.[225] Internet access among Zambian households was 33.4 percent in 2022, with urban households making up 59 percent of those with access, compared to just 14.6 percent in rural areas. Regarding the gender disparity in access and use of ICTs in the country, men are 4.5 percentage points higher in smartphone ownership and 5.9 percentage points higher in smartphone-usage knowledge compared to women. Furthermore, the proportion of active internet users is higher among men, with a gender gap of five percentage points.[226] This may exacerbate inequalities, limiting rural Zambians' and women's access to essential public services, and worsening rural Zambian women's socioeconomic conditions.

Pursue public-private partnerships while adhering to responsible labor practices and environmental protection

Zambia is increasingly interested in public-private partnerships to expand its fiber network to cover all the provinces of the country and recently established a national data center as part of the Smart Zambia project to enhance the capacity for data storage services and to support the deployment of e-government services. A recent PPP development is the signing of an MOU with Google Cloud, which will see Zambia welcome the establishment of a Google Center of Excellence as well as benefit from Umoja, Google's fiber network expansion project, which is running through Kenya and South Africa as well.[227] A similar arrangement is being made with Liquid Intelligent Technologies to expand the number of data centers in Zambia.[228] Moreover, Starlink, which started operations with just about one hundred kits in 2023, has increased its device supply to 11,000 kits in 2024, enhancing ultrafast internet connectivity in Zambia.[229] With a 5G and broadband policy still lacking in Zambia, these Starlink developments present an opportunity for the Zambian government to develop governance frameworks around low-earth orbit satellites and community networks.

A key concern, however, is that with the private sector and international tech companies taking a leading role in Zambia's ambitious digital development projects, there could be profound repercussions including dependencies and development trajectories that are predominantly commercially driven. The Zambian economy has been fundamentally dependent on copper mining and there are great ambitions to expand the industry with the help of emerging technologies. Any additional regulations or amendments to existing policies should speak to the profound impacts an AI-accelerated focus on mining might have on labor practices and the environment.

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[225] ZICTA, *National Survey on Access and Usage of Information and Communication Technologies by Households and Individuals: A Demand Side Assessment of Access and Usage of ICTs in Zambia*, 2022, https://www.zicta.zm/2022_report.pdf.

[226] ZICTA, *National Survey on Access and Usage.*

[227] "Zambia to Connect to Global Fiber Network through Google's UMOJA Project," *TechAfrica News*, June 1, 2024, https://www.techafricanews.com/2024/06/21/zambia-to-connect-to-global-fiber-network-through-googles-umoja-project/.

[228] Matshepo Sehloho, "Liquid Intelligent Technologies to Build Data Center in Zambia," *Connecting Africa*, April 6, 2023, https://www.connectingafrica.com/data-centers/liquid-intelligent-technologies-to-build-data-center-in-zambia.

[229] "Tax Waiver Secures $54 Million ICT Investment," Presidential Delivery Unit, Government of Zambia, May 29, 2024, https://www.pdu.gov.zm/blog/tax-waiver-secures-54-million-ict-investment.

4. Conclusion

This report shows the value of intercontinental comparisons (rather than looking toward the global North) in emphasizing the distinctness of regulatory environments—and experiential overlaps within Africa. It highlights the importance of establishing and tracking local benchmarks, as, without them, particularities of social settings might go unacknowledged, focusing only on an evident lack of regulation.

The attractiveness of the employment of emerging technologies to address social problems is evident across the different countries examined in this report. Even in settings that are not considered tech hubs, ambitions are often grand, captured, for instance, in the objective of making Zambia "the Estonia or Singapore of Africa." While regulatory efforts for emerging technologies are underway, they often fall short in their comprehensiveness or strategic coherence. What does stand out across these settings, though, is the fluid state of the regulatory landscape.

Emerging technologies—and AI specifically—are often looked at in isolation, and there are indeed a few important national and regional AI guidelines, strategies, and frameworks being birthed, rendering it an important moment to think about how they sit with the idea of digital democracy. Against this backdrop, it is worth looking at emerging technologies and their regulation as an extension of existing regulatory means, such as intellectual property and privacy laws—and considering the state of public awareness around rights and obligations.

Basic infrastructure and connectivity shortcomings pose a major barrier to technology adoption across the different countries. What is more, the actual usefulness of emerging technologies is challenged by gaps in digital inclusion, literacy, and skills. The report lays bare that the existence of frameworks pertaining to specific emerging technologies and issues related to them only reveal a portion of the overall reality. Where regulations are dispersed and/or inadequately retrofitted—where the public is unaware of their existence or institutions are not well equipped to translate them into lived rights—the notion of digital democracy is compromised.

It is furthermore critical to recognize whether broader technology visions are limited to governmental and private-sector imaginations—or whether they also capture the lived realities and visions of the public. The very means through which emerging technologies are envisioned to leapfrog systemic challenges posits an area of concern, for example through the "smartification" of cities—without sufficient consideration attributed to the threats of data harvesting or mechanisms in place to curb the social impact of private companies. Without foregrounding environmental and labor repercussions, the leveraging of mineral resources also foreshadows significant potential social costs to technological enhancements.

At this crucial stage of understanding how emerging technologies can and should be used on the African continent and how regulation should be shaped and implemented, there are a lot of promising signs and potentials. One lies with the African continent's youth, a large segment of the population that might be able to leverage these technologies very creatively and efficiently. In some places, there also is a strong emphasis on research and stakeholder engagement, with the inclusion of the public holding democratic possibility. Regulatory sandboxes in Kenya and Zambia could prove useful in allowing innovation, while also enabling regulators to assess potential risks and develop appropriate safeguards.

Overall, as the report illustrates, regulatory strategies must be effective if they are to consider the changing landscape of human-technology interactions, allow for ongoing ethical reflections, and, crucially, ensure an informed public dialogue contingent on increased public awareness of rights, risks, and possibilities.

Stakeholder mapping

This section puts together a list of stakeholders for each country analyzed above. It focuses on select emerging technologies, identifying key actors from funders and investment partners; incubators, accelerators, and research/training institutions; civil society and initiatives; government regulators and other agencies; and private-sector players. Certain stakeholders are quite ubiquitous as they operate in these sectors and their mandates can extend across them. A lot more stakeholders could be identified, but for the purpose of this report, we have focused on a select few and note that stakeholders operating within certain emerging technologies might be focused on specific niche areas.

The report groups stakeholders in four categories:

- Engage.
- Keep satisfied.
- Keep informed.
- Monitor.

The four categories represent different levels of stakeholder engagement, ranging from actively involving stakeholders to passively observing their behavior across the selected emerging technologies. This is because certain groups of stakeholders may not be actively involved in the sector or play minimal roles. We recognize the limitations of this classification and recommend that an in-depth country analysis by a country-specific researcher would be necessary to accurately assess the appropriate depth of engagement to propose. Below is a guide to the groups.

Guide for country-level stakeholder groups

Engage	Actively engage with stakeholders who are key players with demonstrated traction in activities, funding, regulation, or research within the specific technology of interest. These stakeholders are crucial for driving progress and should be directly involved in strategic decision-making and collaboration.
Keep satisfied	Maintain strong relationships with stakeholders who are influential and have ongoing or planned activities in the space. Although they may not require constant engagement, ensuring they remain satisfied and supportive is essential for long-term success.
Keep informed	Keep stakeholders informed who may have active or passive involvement but currently show little to no significant traction in activities. Regular updates and communication will ensure they are aware of developments without requiring their direct participation.
Monitor	Regularly monitor stakeholders who are passive players with no current traction or those who may pose potential risks or adverse effects. Maintain awareness of their actions and potential impact but limit active engagement unless necessary.

Source: Authors' analysis.

1. South Africa

	Funders and investment partners	Incubators, accelerators, and research/training	Civil society and initiatives	Government: Regulators and other agencies	Private-sector players
Connectivity	• Huawei • MTN • Nokia • Ericsson • ZTE • Vodacom • Cell C • Telkom SA • Rain	• South African National Broadband Advisory Council (NBAC) • Stellenbosch University LaunchLab • Council of Scientific and Industrial Research (CSIR) • Technology Innovation Lab	• Wireless Access Providers' Association (WAPA) • Internet Society South Africa Chapter • South African ICT Sector Education and Training Authority (MICT SETA)	• Independent Communications Authority of South Africa (ICASA) • Department of Communications and Digital Technologies (DCDT)	• Vodacom • MTN SA • Cell C • Telkom SA • Rain • Huawei • Nokia • Ericsson • ZTE
Data governance	• National Research Foundation (NRF) • Technology Innovation Agency (TIA) • Microsoft Philanthropies	• Cape Innovation and Technology Initiative (CiTi) • The Innovation Hub • LaunchLab • Stellenbosch University African Data Science Academy • Council of Scientific and Industrial Research (CSIR)	• Data Science Africa • The South African Data Science Initiative (SADSI) • The Open Data Institute South Africa (ODI SA) • Open Data and Open Government Partnership South Africa	• Information Regulator (IR) • Department of Communications and Digital Technologies	• Amazon Web Services (AWS) • Microsoft Azure • Google Cloud • IBM South Africa • Dimension Data (NTT) • Oracle • Teraco Data Environments
Artificial intelligence	• The National Research Foundation (SANRF) • Technology Innovation Agency (TIA) • Microsoft Philanthropies • South African National Space Agency (SANSA)	• University of Pretoria's Centre for Artificial Intelligence Research (CAIR) • University of Cape Town's Machine Learning Group • University of the Witwatersrand's Robotics, Autonomous Intelligence and Learning (RAIL) Laboratory • Council for Scientific and Industrial Research (CSIR)	• AI Expo Africa • Data Science South Africa • South African Institute of Electrical Engineers (SAIEE) • Global Center on AI Governance	• Presidential Commission on the Fourth Industrial Revolution (PC4IR) • Information Regulator (IR) • Department of Communications and Digital Technologies (DCDT)	• DataProphet • Google South Africa • Microsoft South Africa • Aerobotics • AI Dialogue • Dimension Data (NTT) • Amazon Web Services (AWS) South Africa • IBM South Africa

2. Kenya

	Funders and investment partners	Incubators, accelerators, and research/training	Civil society and initiatives	Government: Regulators and other agencies	Private-sector players
Connectivity	• Microsoft • World Bank • African Development Bank • USAID	• Konza Technopolis • (in progress) • Huawei Training Center • Nairobi Garage	• GSMA Sub-Saharan Africa • Internet Society Kenya • Kenya ICT Action Network (KICTANet) • A4AI (Alliance for Affordable Internet), Kenya • Kenya Network Operators Group (KENOG)	• Ministry of Information Communications and the Digital Economy • Communications Authority of Kenya (CAK) • National Broadband Council	• Airtel Kenya • Ericsson • Safaricom • Huawei • Microsoft • G42 • Mawingu Networks • Liquid Intelligent Technologies • C-squared • M-KOPA • Kenya Network Information Centre (KeNIC) • Telkom Kenya
Data governance	• World Bank • African Development Bank • US Trade and Development Agency	• Strathmore University's @ iLabAfrica Research Centre • University of Nairobi C4DLab	• Africa Open Data and Internet Research Foundation	• Communications Authority of Kenya (CAK) • Ministry of Information Communications and the Digital Economy • Office of the Data Protection Commissioner (ODPC) • Kenya National Innovation Agency	• Microsoft • G42 • Google • IBM (IBM Research Lab Kenya) • Amazon (AWS & Development Centre) • East Africa Data Centre (EADC) • Cisco Systems • PAIX Kenya • Liquid Intelligent Technologies
Artificial intelligence	• Rockefeller Foundation • Gates Foundation • Luminate • Mastercard Foundation • Intel	• Microsoft Africa Research Institute • Center for Data Science Artificial Intelligence (DSAIL), Dedan Kimathi University of Technology	• Kenya National Innovation Agency • AI Kenya • Women in Machine Learning & Data Science (WiMLDS) Nairobi • AI4D Africa, including the African Observatory on Responsible AI • Global Center on AI Governance	• Communications Authority of Kenya (CAK) • Kenya National Innovation Agency • Office of the Data Protection Commissioner (ODPC) • Ministry of Information Communications and the Digital Economy	• Microsoft (Microsoft Africa Research Institute; Microsoft AI for Good Lab) • Google (Google Innovation Lab) • IBM (IBM Research Lab Kenya) • East Africa Data Centre (EADC) • PAIX Kenya

3. Nigeria

	Funders and investment partners	Incubators, accelerators, and research/training	Civil society and initiatives	Government: Regulators and other agencies	Private-sector players
Connectivity	• Google • Ericsson • Mobile Telephone Network (MTN) • Mafab Communications • MainOne	• GSMA Ecosystem Accelerator Innovation Fund • CcHub (Co-Creation Hub)	• Global System for Mobile Communications • Computer Society of Nigeria • Open Observatory of Network Interference (OONI) • Paradigm Initiative • Digital Rights Lawyers Initiative (DRLI) • Internet Society Nigeria Chapter • Nigeria Internet Governance Forum (NIGF)	• Federal Ministry of Communications and Digital Economy • Nigerian Communications Commission • National Frequency Management Council (NFMC)	• Ericsson • Mobile Telephone Network (MTN) • Mafab Communications • Airtel • Starlink • MainOne • SAT-3 • GLO-2 • Africa Coast to Europe Cable System (ACE) • WACS • Equiano • 2Africa • Nigeria Cameroon Submarine Cable System
Data governance	• African Development Bank • Microsoft Philanthropies • Google.org	• Startupbootcamp AfriTech • CcHub (Co-Creation Hub) • LeadPath Nigeria • Wennovation Hub • L5 Lab	• Mobile Virtual Network Operators (MVNOs) • Data Science Nigeria (DSN) • Nigeria Computer Society (NCS) • Centre for Information Technology and Development (CITAD)	• National Information Technology Development Agency (NITDA)	• AWS • Microsoft Azure • Google Cloud • Oracle • CyberCloud • RackCentre • Nigeria Inter-Bank Settlement System (NIBSS) • Interswitch • MTN Nigeria • Airtel Nigeria • Konga • Access Bank • Zenith Bank
Artificial intelligence	• Gates Foundation • Luminate • Google • NITDA's Nigeria Artificial Intelligence Research Scheme	• Collaborative Center for AI, Cosmopolitan University • EduAI Hub • Robotics and Artificial Intelligence Nigeria (RAIN) • AfriLabs • DSNai • HausaNLP • LanFrica • LangEasy	• Data Science Nigeria (DSN) • Association of Artificial Intelligence and Machine Learning of Nigeria (AAIMLON) • Paradigm Initiative • Citizens Gavel	• National Centre for Artificial Intelligence and Robotics • National Information Technology Development Agency (NITDA) • Nigeria Data Protection Commission	• ZeroComplex • mDoc Healthcare • MyCover.ai • Microsoft • Google • AWS • Open AI • Jamborrow • Moosbu • Seamfix • Ubenwa • Kudi.ai • DSN

4. Ghana

	Funders and investment partners	Incubators, accelerators, and research/training	Civil society and initiatives	Government: Regulators and other agencies	Private-sector players
Connectivity	• IMF • World Bank • African Development Bank	• Vodafone Ghana Foundation's Digital Skills Hub • Kofi Annan Centre of Excellence in ICT (AITI-KACE) • Ghana Tech Lab • MEST Africa	• Internet Society Ghana Chapter (ISOC Ghana) • Alliance for Affordable Internet (A4AI) • Ghana ICT Chamber • Ghana Internet Service Providers Association (GISPA)	• Ghana Investment Fund for Electronic Communications (GIFEC) • Ministry of Communications and Digitalisation • National Communications Authority (NCA)	• Huawei Technologies Ghana • MTN Ghana • Ascend Digital • Surfline Communications • Vodafone Ghana • K-NET • Radisys • Nokia • Tech Mahindra • AT Ghana • Telecel Ghana
Data governance	• Government of Ghana • African Development Bank	• Meltwater Entrepreneurial School of Technology (MEST) • iHub • Ghana-India Kofi Annan Centre of Excellence in ICT (AITI-KACE) • Ghana Tech Lab • Data Science Network Ghana	• Ghana Data Science Summit • African Open Data and Internet Research Foundation (AODIRF) • Ghana Open Data Initiative (GODI) • Internet Society Ghana Chapter • Ghana Computer Society	• National Communications Authority (NCA) • Data Protection Commission (DPC) • National Information Technology Agency (NITA) • Cybersecurity Authority	• AWS • Microsoft Azure • Google Cloud • Oracle • BlueSPACE Africa Technologies
Artificial intelligence	• IMF • World Bank • African Development Bank	• Accra Institute of Technology • Africa AI Accelerator • MEST • Hacklab Foundation	• Smart Africa • GIZ FAIR Forward • Future Society	• Ministry of Communications and Digitalisation • MTN Ghana	• Farmerline • BlueSPACE Africa Technologies • Microsoft • Google • Meta Azure • AWS

5. Zambia

	Funders and investment partners	Incubators, accelerators, and research/training	Civil society and initiatives	Government: Regulators and other agencies	Private-sector players
Connectivity	• African Development Bank • Export-Import Bank of China • USAID		• Internet Society Zambia Chapter • ICT Association of Zambia (ICTAZ) • Internet Service Provider Association of Zambia (ISPAZ) • Network Service Provider Association of Zambia (NSPAZ)	• Zambia Information and Communications Technology Authority (ZICTA) • Ministry of Technology and Science • Zamtel	• Huawei • Ericsson • MTN Zambia • ZTE • Airtel Zambia • Liquid Intelligent Technologies, Zambia • CopperNET Solutions • Microlink Technologies
Data governance	• World Bank • African Development Bank • Common Market of Eastern and Southern Africa (COMESA)	• DataLab Group, University of Zambia	• Open Data Africa, Zambia • ICT Association of Zambia	• Smart Zambia Institute • ZICTA • Ministry of Technology and Science • Zamtel	• Infratel Zambia • Liquid Intelligent Technologies • Huawei • Microsoft
Artificial intelligence	• UN Capital Development Fund • European Union	• BongoHive • Hackers Guild • Innovationbed Africa-AI Mentorship Academy Zambia National Research Education Network (ZAMREN)	• Tony Blair Institute • Information and Communications Technology Association of Zambia (ICTAZ)	• Smart Zambia Institute • ZICTA • Ministry of Technology and Science	• Google (AI & Social Good) • Microsoft • Internews Network Zambia • IBM (IBM Research Africa) • KoBold Metals

Annex: Summary of existing emerging technology policies by country

Emerging technology	Country	Policy/regulatory framework	Other government efforts
Connectivity	South Africa	National Broadband Policy, 2023.	The Independent Communications Authority of South Africa (ICASA) published a report on the state of 5G in the country in 2021.
	Kenya	1. National Roadmap and Strategy for 5G; draft published in 2021. 2. *National Broadband Strategy: 2018–2023*.	
	Nigeria	*National Policy on Fifth Generation (5G) Networks for Nigeria's Digital Economy*, 2022.	
	Ghana	*National Broadband Policy and Implementation Strategy*, 2012.	The National Communications Authority notes in its *Five-year Strategic Plan 2024–2028* that it will manage all radio frequency spectrum that will promote and support the rollout of 5G and 6G telecoms networks. The country also plans to increase 4G penetration from 15 to 80 percent by 2027 and establish an additional 4,400 4G and 5G sites.
	Zambia		
Digital public infrastructure (cloud services, data centers)	South Africa	National Policy on Data and Cloud, 2024.	
	Kenya		In 2023, the ICT Authority of Kenya published the Cloud Computing Standards for government multicriteria decision analyses (MCDAs) as part of the government enterprise architecture (GEA) framework which sets out minimum standards for ICT use by government agencies.
	Nigeria	*Nigeria Cloud Computing Policy*, 2019.	
	Ghana	Regulatory Framework for Data Centre Services, 2024.	
	Zambia		The *National E-government Plan 2023–2026* outlines the Zambian government's ambitions to create a government cloud service hosted on a tier-three national data center, which is planned to be built in 2024.

Emerging technology	Country	Policy/regulatory framework	Other government efforts
Artificial intelligence	South Africa		The Department of Communications and Digital Technologies (DCT) published a discussion document on the National AI Strategy Summit in April 2024.
	Kenya		1. The Draft Information Technology Artificial Intelligence Code of Practice was published for public comments in April 2024. 2. A National AI and Emerging Technologies Strategy is being developed. A stakeholder workshop was held in May 2024.
	Nigeria	National AI strategy draft published in 2022.	
	Ghana	National AI strategy draft published in 2022.	
	Zambia	Launch of National AI strategy in November 2024.	

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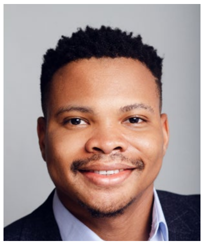

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