AI Governance Toolkit for African Policymakers

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The field of artificial intelligence is rapidly evolving, and regulations, technologies, and best practices continue to develop. The information presented in this Toolkit reflects our understanding as of the publication date (2025) and may require updates as the AI landscape changes.

The examples, case studies, and recommendations provided in this Toolkit are intended to serve as general guidance and may need to be adapted to specific national contexts, legal frameworks, and local circumstances. Users of this Toolkit should consult relevant authorities, legal counsel, and technical experts when developing or implementing AI governance frameworks.

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This Toolkit is intended to be a living document that will be periodically updated to reflect new developments in AI governance. Users are encouraged to refer to the most recent version available.

Forewords

H.E. Cina Lawson, Minister of Digital Economy and Transformation, Togo

Artificial Intelligence is reshaping economies, public services, and industries at an unprecedented pace. Across Africa, governments are already integrating AI into sectors such as financial inclusion, digital public services, and infrastructure development. However, the success of these efforts depends on more than just technological adoption—it requires strong governance frameworks that ensure AI serves our economies, businesses, and citizens in an inclusive and sustainable way. AI cannot be a tool for only the few; it must be embedded in a regulatory environment that fosters innovation while protecting public interest. Without clear governance, AI risks reinforcing existing inequalities instead of reducing them.

This AI Governance Toolkit provides African policymakers with the necessary frameworks, principles, and methods to guide the responsible development and deployment of AI. As a continent, we must ensure that AI policy is not dictated to us but rather designed by us, for us—leveraging regional collaboration, private sector investment, and multilateral partnerships. No single country can navigate this transformation alone. Africa's voice in global AI governance must be unified, proactive, and ambitious. This toolkit is an essential step toward ensuring that AI does not shape Africa's future without us at the table—but rather, that we define how AI contributes to our continent's transformation

H.E. Cina Lawson
Minister of Digital Economy and Transformation, Togo

Dr. Shikoh Gitau, CEO, Qhala

Africa stands at a defining moment in its digital transformation journey. As AI rapidly reshapes economies and societies worldwide, African policymakers are actively seeking to establish governance frameworks that will shape how AI is developed and deployed across the continent. However, too often, we find ourselves looking outward—turning to frameworks like the EU's AI Act, the US NIST AI Risk Management Framework, or China's AI policies—despite the fact that these models do not fully reflect our unique challenges, opportunities, and aspirations.

This AI Governance Toolkit for African Policymakers is a response to that gap. It is built in Africa, by Africans, for Africa. It recognizes that Africa cannot rely on external models alone; instead, we must craft regulatory frameworks that are relevant to our own socio-economic realities, cultural contexts, and technological ecosystems.

For policymakers in countries already advancing AI regulations, this toolkit serves as a guide for refining and localizing policies. But for those just beginning their journey, it provides the essential principles, safeguards, and best practices to establish a solid foundation for responsible AI governance. Whether building AI policies from scratch or strengthening existing frameworks, this resource is designed to help African leaders craft governance strategies that work for us, by us—ensuring AI serves the people and economies of this continent.

The decisions we make today will determine Africa's role in the global AI landscape for generations to come. This toolkit is not just about policy—it is about agency, sovereignty, and the power to shape our own technological future.

Dr. Shikoh Gitau
CEO, Qhala

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Glossary of Terms

Agile Governance: A flexible and adaptive approach to regulation that emphasises rapid response to technological changes while maintaining oversight and protection of public interests.

AI Literacy: The ability to understand, use, and critically evaluate artificial intelligence technologies and their impacts on society and daily life.

AI Readiness: A measure of a country's capacity to adopt and benefit from artificial intelligence technologies, including factors like infrastructure, skills, and governance frameworks.

AI Strategy: A comprehensive national plan that outlines how a country intends to develop, deploy, and manage artificial intelligence to achieve specific economic and social goals.

AI Verify: A testing toolkit that allows users and businesses to test AI models against recognized AI Governance principles, as implemented in Singapore.

Algorithmic Bias: Systematic and repeatable errors in computer systems that create unfair outcomes, such as privileging one arbitrary group of users over others. This can stem from biassed training data, flawed algorithm design, or inherent societal prejudices.

Artificial Intelligence (AI): Computer systems capable of performing tasks that typically require human intelligence. These include visual perception, speech recognition, decision-making, language translation, and problem-solving. AI systems can learn from experience, adapt to new inputs, and perform human-like tasks.

Algorithm: A precise set of step-by-step instructions or rules that a computer follows to complete a task or solve a problem. In AI, algorithms form the basis for how systems process data and make decisions.

Algorithmic Impact Assessment: A structured evaluation process to assess the potential effects and risks of algorithmic systems before their implementation. This includes evaluating impacts on human rights, fairness, non-discrimination, privacy, and other social concerns.

Artificial Neural Network: A computing system inspired by biological neural networks that form human brains. It consists of interconnected nodes (artificial neurons) that process and transmit information, enabling machine learning and pattern recognition.

Broadband: High-speed internet access that is always on and faster than traditional dial-up access, crucial for AI system deployment and digital infrastructure.

Cloud Computing: The delivery of computing services—including servers, storage, databases, networking, software, analytics, and intelligence—over the Internet ("the cloud") to offer faster innovation, flexible resources, and economies of scale.

Compute: The processing power and resources required for running AI systems, typically measured in operations per second. This includes both hardware (like processors and memory) and the energy required to power these systems.

Critical Minerals: Raw materials essential for manufacturing modern technologies, including those needed for AI hardware and infrastructure, such as rare earth elements, cobalt, and lithium.

Cyber Sovereignty: A nation's authority and control over its cyber domain, including internet infrastructure, data, and digital systems within its borders.

Cybersecurity: Measures and practices designed to protect networks, devices, programs, and data from attack, damage, or unauthorised access in the context of AI systems.

Data Analytics: The process of examining datasets to draw conclusions about the information they contain. This involves applying statistical analysis and logical reasoning to gain insight and support decision-making.

Data Control: The ability to determine how data is collected, used, shared, and deleted, including mechanisms for meaningful consent and user privacy rights.

Data Governance: The framework of policies, procedures, and standards that ensure the effective management of data throughout its lifecycle. This includes rules about data collection, storage, processing, sharing, and deletion.

Data Localization: The practice of storing data within specific geographic boundaries, typically within the country where it was collected. This often involves legal requirements

that data about a nation's citizens or residents be collected, processed, and/or stored inside the country.

Data Mining: The process of discovering patterns, anomalies, and correlations within large datasets to predict outcomes. This can involve methods from statistics, machine learning, and database systems.

Data Protection: Legal measures and technical safeguards designed to ensure the privacy and security of personal data. This includes regulations about how data can be collected, processed, stored, and shared.

Data Sovereignty: A country's authority and control over data collected within its borders, including its storage, processing, and transfer. This concept relates to national security, economic interests, and citizens' privacy rights.

Data Stewardship: The management and oversight of an organisation's data assets to ensure they are used effectively, efficiently, and in compliance with regulations and ethical standards.

Digital Divide: The gap between individuals, households, businesses, or geographic areas in terms of access to and use of information and communication technologies.

Digital Infrastructure: The fundamental facilities and systems serving a country, including telecommunications networks, internet connectivity, data centres, and computing resources. This forms the backbone for digital services and AI deployment.

Digital Sovereignty: A nation's control and autonomy over its digital destiny, including control over data, hardware, and software infrastructure.

E-waste: Electronic waste, including discarded computers, smartphones, and other electronic devices, which poses environmental challenges in the context of digital infrastructure development.

Ethical AI: The development and use of artificial intelligence systems that adhere to moral principles and values, ensuring fairness, transparency, and accountability. This includes considerations of privacy, bias, safety, and societal impact.

FLOPS (Floating Point Operations Per Second): A measure of computer performance, particularly calculations involving decimal points, commonly used to measure AI system capabilities.

Foundation Model: Large AI models trained on vast amounts of data that can be adapted for various specific tasks through fine-tuning or prompting. These models serve as a base for developing more specialised AI applications.

Human Rights Impact Assessment (HRIA): A process to identify, understand, assess, and address the adverse effects of AI systems on human rights.

Internet Exchange Points (IXPs): Physical infrastructure through which internet service providers and content delivery networks exchange internet traffic between their networks.

Internet of Things (IoT): A network of interconnected devices and sensors that collect and exchange data, often integrated with AI systems for analysis and automation.

Machine Learning: A subset of AI that enables systems to learn and improve from experience without being explicitly programmed. This involves algorithms that can identify patterns in data and make decisions with minimal human intervention.

Open Data: Data that anyone can freely access, use, modify, and share for any purpose, subject to requirements that preserve provenance and openness.

Regulatory Sandbox: A controlled testing environment that allows businesses to test innovative products, services, or business models under regulatory supervision. This enables innovation while ensuring consumer protection and risk management.

Responsible AI: An approach to developing and deploying AI systems that considers ethical implications, societal impact, and potential risks while ensuring transparency and accountability. This includes principles of fairness, privacy, security, and inclusiveness.

Smart Infrastructure: Physical and digital infrastructure enhanced with AI, IoT sensors, and data analytics capabilities to improve efficiency and service delivery. This includes smart cities, intelligent transportation systems, and automated utility networks.

Soft Law: Non-binding guidelines, frameworks, or principles that guide behavior without legal enforcement. In AI governance, this includes ethical guidelines, industry standards, and best practices.

Startup Act: Legislation specifically designed to support and regulate technology startups, including provisions for funding, tax benefits, and regulatory compliance.

Technical Standards: Documented agreements containing technical specifications or other precise criteria to ensure that materials, products, processes, and services are fit for their purpose. In AI, these cover aspects like safety, interoperability, and performance.

Training Data: The dataset used to teach AI models to recognize patterns and make predictions or decisions. The quality and representativeness of training data significantly impact AI system performance and fairness.

Universal Service Obligation: A requirement that telecommunications services be made available to all users in a country, regardless of their geographical location.

Executive Summary

On the continent, organisations and individuals alike are leveraging Artificial Intelligence (AI) to accelerate social progress and spearhead sustainable solutions. Companies like Lima Labs in Kenya employ drones and cutting-edge machine learning to automate data collection for crop monitoring.[1] Their solution allows farmers to use less pesticides and have more accurate production planning to make informed long and short term decisions. Intron Health in Nigeria is tackling clinical documentation with real-time clinical speech-to-text for 200+ African accents, easing the transition to digitised care.[2] And multiple edutech companies are using AI to create personalised learning solutions.

However at the same time, African countries' readiness to adopt AI is lagging behind the rest of the world with Sub-Saharan Africa having the lowest average score of any world region in the Oxford Insights Government AI Readiness Index 2023.[3] These challenges are compounded by the growing inequality in access to compute and developing countries bearing the brunt of the environmental costs of digitalization while reaping fewer benefits.[4]

In its 2024 "Governing AI for Humanity" report, the United Nations AI Advisory body notes that many African countries are not included in major international AI governance initiatives. Out of 7 prominent non-UN AI initiatives analysed, 48 out of 54 African countries were not involved in any of them.[5] This, among other factors, is why we have developed this guide.

The AI Governance Toolkit for African Policymakers is a resource designed to assist African States in developing locally-rooted AI Governance Systems and Frameworks. It addresses AI governance from multiple angles, including national ecosystem building, and policy and regulatory frameworks. It also promotes flexible and responsive governance approaches that can evolve with technological advancements. The first 2 chapters introduce the foundational aspects of the toolkit, namely, the essential components of an AI governance

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[1] Lima Labs. https://www.lima.ag/.

[2] Intron. 2024. "Intron - Real-time Speech-to-Text for 200+ African Accents." Intron » a Medical Record for the Developing World. August 21, 2024. https://www.intron.io/.

[3] "AI Readiness Index - Oxford Insights." 2024. Oxford Insights. February 5, 2024. https://oxfordinsights.com/ai-readiness/ai-readiness-index/.

[4] "Digital Economy Report 2024." 2024. UNCTAD. July 10, 2024. https://unctad.org/publication/digital-economy-report-2024.

[5] United Nations. Governing Artificial Intelligence for Humanity: The Final Report of the High-Level Advisory Body on Artificial Intelligence. New York: United Nations, 2024. https://www.un.org/sites/un2.un.org/files/governing_ai_for_humanity_final_report_en.pdf.

ecosystem for African countries, and the essential tools for developing national AI blueprints or strategies. The rest of the toolkit builds on specific domains that emerge from goals articulated in AI Strategies. This includes aspects relating to establishing a policy and regulatory framework for inclusive AI; development of operational infrastructure; improvement of education and capacity building, and promoting national AI innovation. Finally, the toolkit offers recommendations for ensuring the review and evaluation of AI systems and governance frameworks over time.

1. Introduction

Artificial Intelligence (AI) is rapidly transforming the global landscape, offering unprecedented opportunities for innovation, economic growth, and societal advancement. However, these advancements have not been equally spread out across the globe. There are widespread disparities between AI developments across developed countries such as the US and China, and developing countries such as those in Africa. Similarly, developments surrounding regulation and governance have predominantly focused on the trajectories of developed countries, often with suggestions that such developments serve as global precedents for AI governance elsewhere. While the development of global norms for AI governance are welcome, it is equally important for developing nations to establish their own set of norms in consonant with their varied needs and goals, and to contribute to the global effort to govern AI towards inclusive ends. It is important that each nation comes up with its own set of AI governance tools- ranging from national laws, policies, and regulations that are consonant with the stage of AI development, and the socio-economic context of that development.

The AI ecosystem in Africa is still in its nascent stages, characterised by growing interest in AI-driven solutions to local problems, as well as a burgeoning young population keen on building those solutions. There are also challenges, including the lack of local data sets, and infrastructure, which are prerequisites to the development of an AI ecosystem. African governments have begun to take an interest in promoting the development and adoption of AI for equitable and sustainable growth, and in crafting governance policies that are rooted in local contexts. The recent passing of the Continental AI Strategy by the African Union is a testament to this commitment.[6] However, within the continent, there are huge disparities in the level of AI policy development, and capacities for the development of

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[6] African Union, *Continental Artificial Intelligence Strategy: Harnessing AI for Africa's Development and Prosperity*, (July 2024), https://au.int/sites/default/files/documents/44004-doc-EN-_Continental_AI_Strategy_July_2024.pdf

such. As of now, only seven (7) countries have an AI Strategy to guide the development, deployment and governance of AI technologies.

The purpose of this toolkit is to assist African countries in their journey towards developing locally-rooted AI Governance Systems and Frameworks, that advance the goal of creating an equitable and sustainable AI ecosystem. The toolkit is essentially a resource for African governments that are in the process of developing an AI ecosystem and governance framework or are thinking of developing one. It equips policy makers with all the tools they need to guide these processes. It also fills a potential knowledge and capacity gap surrounding the development of AI Governance Frameworks in Africa.

The toolkit covers the essential components of an AI governance framework for emerging AI ecosystems in Africa. The first 2 chapters introduce the foundational aspects of the toolkit, namely, the essential components of an AI governance ecosystem, and the essential tools for developing national AI blueprints or strategies. The rest of the toolkit builds on specific domains that emerge from goals articulated in AI Strategies. This includes aspects relating to establishing a policy and regulatory framework for inclusive AI; development of operational infrastructure; improvement of education and capacity building, and promoting national AI innovation. Finally, the toolkit offers recommendations for ensuring the review and evaluation of AI systems and governance frameworks over time.

We have made our best attempts to keep the toolkit simple and precise, in the hope that it can serve as a practical starting point for any policymaker that is working to build Africa's AI ecosystem and to establish a governance framework to bring it to fruition. Throughout the document, we use case studies or examples from all around the world to show the institutional innovations that other countries have implemented to support their AI ecosystems. We intend for these examples to serve as inspiration for the range of possibilities that exist when there is a firm and coordinated commitment to build an inclusive AI ecosystem.

2. An Overview of the AI Governance Ecosystem

AI Governance refers to the set of policies, laws, institutions, strategies, and processes that guide the development, deployment, and use of AI. The term has predominantly been used in the context of ethical guidelines and legislation for ensuring AI is developed in a safe, and transparent manner, and that AI deployment leads to outcomes that promote inclusion, equity and justice, as opposed to replicating societal harms such as discrimination on the basis of gender, race, nationality, class, religion, disability sexual identity, ethnicity etc.

Current global trends in AI Governance essentially prioritise this goal of preventing harms and biases. A variety of governance approaches such as EU's rights-based and risk-based frameworks are beginning to shape the design of AI Governance frameworks worldwide. This is legitimate given the number of cases where minority groups have suffered because of AI systems that have been built on low quality data, or biassed data. For instance, biassed facial recognition systems have led to wrongful arrests of people of colour, replicating existing discriminatory practices in policing.[7]

In the African context where the AI ecosystem is still developing, an AI Governance Framework must also address the present processes and challenges of developing an AI ecosystem in the first place, while at the same time ensuring that such AI developments occur in an inclusive and equitable manner. Thus, AI Governance must not only deal with the prevention of harms and biases after the fact, it must also contribute to the creation of a substantive AI ecosystem in Africa. The lack of an ecosystem of local data production and local AI systems actually contributes to bias when systems designed for Africans are built on data from abroad.[8] Lack of adequate data, especially of minority groups such as women excludes them from basic services such as access to financial services, or health care.[9]

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[7]Irene Benedicto, "Detroit Woman Sues City Police After Being Wrongfully Arrested Due to AI Facial Recognition," *Forbes*, August 7, 2023, https://www.forbes.com/sites/irenebenedicto/2023/08/07/detroit-woman-sues-city-police-after-being-wrongfully-arrested-due-to-ai-facial-recognition/

[8] "Lack of Data Makes AI More Biased in African Countries, Says Former Tech Official," n.d., https://therecord.media/lack-of-data-makes-ai-more-biased-in-africa.

[9] Lillian Olivia, "The Gender Equality Mirage: From Human Bias to AI Bias in Digital ID Systems in Africa" *CIPIT*, May 17, 2023, https://cipit.strathmore.edu/the-gender-equality-mirage-from-human-bias-to-ai-bias-in-digital-id-systems-in-africa-2/

See also, Musajja, "Meet Charlette N'Guessan: She and Her Team Have Innovated Facial Recognition Technology Designed to Identify Black Africans," The Habari Network, October 14, 2020,

The goals of an AI Governance Framework for Africa are therefore:

a) To guide the development of the core components of an AI ecosystem, namely: Data Sets and Data Systems, Digital Infrastructure, Talent, and AI Markets.[10]

b) To ensure that the development, deployment, and use of AI in Africa is one that promotes an inclusive, and equitable society nationally and regionally.

These goals should be pursued within a framework that defines the key policies, strategies, actors, laws and institutions that will structure the process. For later- I think we should have an overview of these 5 things-policies, strategies, actors, laws and institutions- well defined and largely based on the content of this toolkit. It would also be nice if these 5 things are illustrated in a diagram or other visual.

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https://www.thehabarinetwork.com/meet-charlette-nguessan-she-and-her-team-have-innovated-facial-recognition-technology-designed-to-identify-black-africans.

[10] *Made in Africa: An African Perspective to the Design, Deployment and Governance of AI* (Qubit Hub, 2024) https://qbit.africa/research/made-in-africa/

3. Setting Goals/Developing a Strategy

A national AI strategy is a comprehensive plan that outlines how a government, or country intends to develop, deploy, and manage artificial intelligence to achieve certain specified goals. The process of developing a strategy can involve several steps including research, and consultations with various stakeholders. In this chapter, we delve into the strategies behind the development of an AI Strategy.

3.1. Assessing the state of play

It is important to assess the current state of play pertaining to AI in the country. The assessment could relate to core aspects of AI capabilities i.e., the prerequisites for a functioning AI ecosystem. In this part, we refer specifically to the key operational infrastructure i.e., data sets and systems, and infrastructure such as data centers and connectivity infrastructure. We also refer to the technical skills of AI systems personnel, as well as the array of actors present in the nation's ecosystem and the range of institutions that can serve as initial policy coordinators.

In assessing the extent to which the core components of an AI ecosystem are present, one might consider the following questions:

a. What is the rate of internet connectivity in the country? Is internet connectivity spread evenly across the country? What is the divide as among rural, low-income urban regions, women, and youth? What are the barriers to affordable, high quality internet access in the country?

b. What is the extent of local data production in the country, and who is collecting it? What are the barriers? Are there guidelines for data protection, privacy, and cybersecurity to govern collection of data?

c. Is there a data centre in the country? If not, where is data collected from the nation's citizens stored, and under what terms?

d. In what ways is AI already in use in the country, and which actors are leading such uses? How is it impacting the economy and the people?

e. What is the composition of the actors of the AI ecosystem in the country? Is there a local class of skilled individuals in AI systems? (skills)

f. Are there any existing institution(s) that can lead the AI Strategy development process?

3.2. Defining Objectives

With a good assessment of the current AI capabilities in the country, one can then set the objectives of the forthcoming AI strategy. These objectives could be drawn directly from the AI capabilities assessment i.e., by identifying what the ecosystem needs are, and setting goals to meet those needs. We call these "*ecosystem-building objectives.*" They relate to: skills development, institutional development; infrastructural development, research development etc. These ecosystem-building objectives are typically longer-term objectives; they can be defined to reach specific targets over definite periods and should be monitored/reviewed periodically. For instance, a goal to increase internet connectivity by a given percentage every year must be monitored and adjusted accordingly every year.

Objectives could also be informed by the country's broader development needs and objectives, and an examination of how AI technologies can support those broader pre-existing objectives. We call these "*socio-economic development objectives.*" Policymakers may consider concrete ways in which AI technologies can enhance productivity and social transformation across various sectors, with the caveat that AI technologies need human input and often should be accompanied by institutional changes. Human input and institutions are important to reduce the negative consequences that may result from technical solutions only. For instance, use of AI has been known to lead to bias, discrimination, and loss of jobs in other societies. At this stage, one may consider the ways in which such negative consequences may manifest in the particular nation.

One may evaluate the following: what are the potential challenges that might accompany adoption of AI in certain identified sectors? Are those challenges surmountable/what are the institutional and policy proposals that should ideally accompany the adoption of AI in those sectors? For instance, if one were to consider the use of AI in classrooms or in hospitals, potential policy proposals that could precede this adoption include not only reskilling of teachers and hospital staff but potentially, co-development with the people who would use such technologies. The crucial point to note here is that the setting of socio-economic development objectives should leave room for institutional interventions that can accompany AI deployment.

Case study: United States of America (USA)

The federal government encourages responsible AI innovation by investing in its research and development. This has been clearly defined in The National Artificial Intelligence Research and Development Strategic Plan.[11] It includes a nine strategy plan that strives to harness opportunities presented by AI while mitigating risk. The strategies are:

1. Make long-term investments in fundamental and responsible AI research.
2. Develop effective methods for human-AI collaboration.
3. Understand and address the ethical, legal, and societal implications of AI.
4. Ensure the safety and security of AI systems.
5. Develop shared public datasets and environments for AI training and testing.
6. Measure and evaluate AI systems through standards and benchmarks.
7. Better understand the national AI R&D workforce needs.
8. Expand public-private partnerships to accelerate advances in AI.
9. Establish a principled and coordinated approach to international collaboration in AI research.

Case study: Mauritius

Mauritius' economy faces challenges such as an ageing workforce, limited resources and slow growth rate. Realising the possibilities of the advancement of technology, the Government of Mauritius has deliberately positioned artificial intelligence (AI) at the centre of its larger development goal. The primary focus areas of the AI strategy are:[12]

1. Prioritisation of sectors and identification of national projects.
2. Skills attraction and capacity building.
3. Incentives to catalyse implementation.
4. Ethical considerations of AI.
5. Development of strategic alliances in emerging technologies.
6. Sensitization campaigns.

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[11] National Science and Technology Council (US). Select Committee on Artificial Intelligence. The National Artificial Intelligence Research and Development Strategic Plan: 2023 Update. National Science and Technology Council (US), Select Committee on Artificial Intelligence, 2019. https://www.whitehouse.gov/wp-content/uploads/2023/05/National-Artificial-Intelligence-Research-and-Development-Strategic-Plan-2023-Update.pdf.
[12] Mauritius Artificial Intelligence Strategy (2018) https://ncb.govmu.org/ncb/strategicplans/MauritiusAIStrategy2018.pdf

7. Adoption of new technologies for improved public services delivery.

In order to meet these demands, the Mauritius Artificial Intelligence Strategy aims to boost social inclusion, increase productivity, and encourage innovation in important sectors like manufacturing, healthcare, fintech, agriculture, and the ocean economy. These sectors have been chosen based on their current economic impact and growth potential as a result of AI integration.

For example, in the manufacturing sector, AI can be used to automate routine activities thus saving on time and cost. However, policy makers emphasise on the benefit of AI integration should be accompanied by institutional reforms such as establishing an AI council in order to mitigate risks such as job displacement.

3.3. Engaging Stakeholders

3.3.1. Expert Groups

The successful development and implementation of an AI strategy requires engaging a variety of stakeholders in a collaborative process. Various stakeholders bring in different views and perspectives. Policy makers might engage the following different types of stakeholders:

a. **Industry i.e., the private sector can offer practical insights on the ecosystem and its needs.** However, it's also important to recognize that the umbrella term "industry" encompasses a range of different companies, and could have different interests, different views, and different challenges. Industry can include: local startup companies, startup associations, big local companies, foreign companies, and there should be stakeholders representing each of these views.

b. **Academia can provide insights pertaining to cutting edge research on AI developments locally and around the world.** Overtime, academia may also serve as a useful entity for helping the government track the effectiveness of its plans. They can also conduct empirical research on the effectiveness of AI technologies for development in the country as well as the effectiveness of government implementation plans generally. The range of academics involved can range from many disciplines including computer scientists, legal scholars, development studies, social studies, gender studies etc.

c. **Civil society organisations can also provide useful insights on behalf of the public.** Their insights may especially inform approaches to ethical AI development, human rights impacts, privacy concerns, and general societal concerns that should be taken into account in AI policy development.

d. **Range of expertise:** Due to the multidisciplinary nature of AI deployment especially in the development context, policy makers should engage stakeholders with the range of expertise befitting this multidisciplinary aspect. Such expertise includes: technologists, lawyers, development advisers, and industry experts whenever specific industries are the point of focus e.g., when AI technologies are considered in relation to agriculture, finance, health, education etc.

e. **Equal representation:** While identifying various stakeholders above, it's important to ensure the representation of groups that are often left out of policy making processes i.e., women, youth, persons with disabilities, ethnic minorities etc.

3.3.2. Public Participation and Strategic Communication

The development of an AI Strategy, as well as subsequent policy-making processes, should actively engage the general population, in order to foster trust. Public participation ensures that the strategy incorporates diverse input, fostering early buy-in and support. There are numerous instances where government policies or initiatives are rejected by the public due to perceptions of harm to society or a lack of sufficient information on the benefits of the initiatives. This can result in project delays, shutdowns, and significant waste of resources. To mitigate such risks, it is essential to carry on a transparent, democratic process in which communication channels with the public remain open. Governments can encourage public participation through various mechanisms such as surveys, polls, online and offline workshops, public comment periods, and "town hall" meetings- whether online or offline.

Equally important is the need to implement strategic communication with the public, ensuring they are informed about government objectives and policy developments as they unfold. This communication can serve to not only explain the goals but also to articulate the rationale behind them and highlight their potential benefits. Such proactive engagement would help to build public support. Effective channels for maintaining public awareness include social media platforms, news articles, strategic partnerships with influential figures, interviews on radio and television, advertisements, and billboards.

3.4. Creating an Enabling Policy Framework

An AI Strategy must be supported by a comprehensive policy and regulatory framework that provides clear, systematic guidelines for achieving its stated goals and objectives. Since these goals span multiple policy areas, it necessitates collaboration across interconnected policy domains. The remainder of this document outlines the key domains that must work in unison to support the implementation of the Strategy. We address the following policy areas:

- AI Ethics and Regulation.
- Data Systems and Data Governance.
- Infrastructure Requirements.
- Enhancing Innovation Systems.
- Education and Capacity Building.
- Implementation, Review, Monitoring and Evaluation through Institutions.

4. Establishing an AI Policy and Regulatory Framework

An AI policy and regulatory formulation framework is important for ensuring that AI innovation thrives in an environment that promotes ethical development, mitigates risks, ensures accountability and transparency, and safeguards societal interests while fostering technological progress. Such a framework should be guided by a normative approach that prioritises ethical considerations, and human rights, and devices legal rules and principles that steer the trajectory of innovation towards these ends.

4.1. General Guidelines for Policy Formulation

Effective regulation of technological innovation requires that regulators consider several key factors;

- A comprehensive understanding of the technology before creating regulations.

- The transnational nature of information systems and infrastructure.

- The potential for technology to exacerbate inequalities.

- The interplay between law and technological innovation.

a.) Understanding the technology

The current generation of AI is focused on the automation of systems capable of decision-making, operations, creation and real-time learning among other developments. In order to develop responsive regulation, it is important to understand the manner in which AI systems are created, the problems they are poised to solve/efficiencies they are poised to create, as well as other forms of technology that will be integrated with certain uses. For instance, AI may be integrated with other technologies such as the internet of things, robotics, vehicles, personal assistants and others.

Such an understanding will assist the policy maker to establish the scope of regulation, potential regulatory overlaps, and the wide cross section of fields, industries and sectors an AI system would be operating under. It will also help to identify the array of stakeholders that should be engaged in policy formulation processes. Notably, the EU's risk-based approach to AI regulation is based on having a firm understanding of AI systems and the levels of risk they pose to society. Regulatory thresholds are in consonant with the perceived levels of risk.

b.) The Transnational Nature of Information Systems and Infrastructure

Information systems and infrastructure cut across geographical boundaries. Hence, while the world is more connected than ever, there are also challenges relating not only to security risks but also jurisdictional conflicts, and regulatory conflicts. Such conflicts show up in battles over cyber-sovereignty/digital sovereignty, which essentially are characterised by struggles to establish national control over the internet, infrastructure and related systems within a state's borders. This raises significant challenges for a policy maker.

The first challenge is to determine how and whether national legislation can uphold a particular country's cyber sovereignty especially in relation to critical areas such as data collection. This is a challenge because cyber or digital sovereignty is a contested idea in theory and practice, and often, there are regulatory overlaps among nations, or transnational application of laws relating to dominant jurisdictions such as the EU or the US. Additionally, there are often power imbalances between states and transnational corporations that provide critical infrastructures; an imbalance that often limits the effectiveness of digital sovereignty of less developed countries.

A second challenge is that attempts to define national boundaries and national legislation are also limited by the transnational nature of technologies, and the centralised control

that has accompanied it. Actions in one place can affect other places and populations regardless of so-called cyber jurisdictions. For instance, on 20th July, 2024 a routine software update by a cyber security firm in America unintentionally affected millions of Microsoft computers around the world. This caused major disruptions in hospitals, grounded flights and affected several other sectors across the globe.[13]

c.) The potential for technologies to exacerbate inequalities.

AI policy frameworks should be cognizant of the potential for AI to exacerbate inequalities in a given society, and therefore, to guide technological development towards fairness, and inclusion for all.

d.) The interplay between law, technological innovation

Law and technology have a mutually constitutive relationship in which law shapes innovation, and innovations in turn shape the content of legal rules. The idea that society is always at the mercy of technological disruption often limits policymakers from recognizing that innovation does not occur in a vacuum, which prevents them from being more proactive in regulation when there are significant harms to the society.

Innovation occurs within a particular set of social, and political dynamics. It also always relies on pre-existing regulation. This is not to say that there is always a regulatory system for any new innovation, as there will be some gaps or areas not previously addressed. Technological innovations could also embody a certain regulatory structure,[14] or demand new legal categories to deal with new risks, which invites further state regulation.

Regulation of emerging technologies often takes two approaches. Some argue for a "wait and see" approach or the procrastination principle, while others are quick to impose regulatory restrictions to ensure the necessary safeguards are put in place. In order to strike a balance, regulators must navigate the challenge of putting in place the necessary safeguards that protect against the risks that come with the development of AI while still giving innovators the flexibility to develop the AI systems.

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[13] https://www.cnn.com/business/live-news/global-outage-intl-hnk/index.html
[14] Lessig, Lawrence. *Code and Other Laws of Cyberspace*, 1999.

4.2. The Place of Existing Legislative Frameworks

AI regulation should take into account existing legal and regulatory frameworks to determine how new policies should align with or diverge from current laws. They must assess how existing law is functioning and the gaps that need to be addressed in new legislation.

Additionally, it will be important to consider both overarching regulatory frameworks as well as sector-specific regulations as AI systems are poised to operate in different sectors, including, agriculture, finance, health, manufacturing, transport, environment, citizen services and government, among others. These sectors already have pre-existing regulatory frameworks that would need to be updated or extended to AI systems.

That said, there are legal areas that cut across all sectors, and that are foundational to the creation of ethical and socially inclusive AI systems. Some African countries have already begun enacting these laws. We examine them briefly below.

a. Data Protection and Privacy law
AI systems are reliant on data. It is therefore important to have guidelines for creating robust data protection laws that ensure that data used in machine learning and other systems is obtained lawfully and ethically. This set of laws seek to regulate the collection, use and storage of personal data.

b. Cybersecurity Law
AI systems carry out critical functions that are relied on by individuals, businesses, governments and society as a whole. Any attacks to the network could carry huge risks, ranging from individual privacy, to economic stability and national security. It is therefore important to ensure that networks and AI systems are built with safeguards against data breaches, theft, and other security risks. Cybersecurity laws establish standards and best practices for securing networks and handling data, ensuring accountability and compliance across sectors, and for holding perpetrators accountable.

c. Intellectual Property Law
Intellectual property rights such as copyright, trademark, patent, and trade secrets are granted to creators and inventors as rewards for innovation, and to ensure that they retain control over the use, distribution, and commercialization of their creations. AI significantly complicates the ways in which these rights are created and invoked to prevent infringement. The development of AI systems typically relies on training data sets which

can sometimes include copyrighted material, thus raising questions of infringement and whether such uses should be legally permissible. Many countries are currently considering amendments to Copyrights laws in light of these issues. Additionally, countries are also considering questions on whether AI can be named as inventors/granted patent rights.

d. Consumer Protection Law

This body of law exists to protect consumers from unfair, unlawful or harmful practices, and will become increasingly important as automated systems are used for service delivery in different sectors.

e. Labour and Employment Law

Every country has systems of laws regulating the labour relations of employers and employees. With the rise of automation, it is necessary to put in place legal safeguards to ensure fair work and to promote labour-enhancing technologies, especially in industries/sectors that employ a big fraction of the African population e.g., in agriculture and manufacturing.

f. Trade and international law

These laws relate to the cross-border aspects of trade in technology related goods. Due to the transnational nature of technologies, countries are beginning to consider harmonising not only the rules on digital trade, but also development of international standards and approaches to AI governance.[15] These rules, standards, and governance mechanisms will have an impact on national laws touching on a range of issues such as data protection for cross-border digital flows, labour laws, intellectual property laws, AI legislation etc.

Case study: Japan

Japan's approach to AI regulation can be characterised as "agile governance," which emphasises flexibility and adaptability in response to rapidly evolving AI technologies.[16] This approach involves:

1. Continuous cycle of environment and risk analysis
2. Goal setting
3. System design

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[15] "United Nations System White Paper on AI Governance | United Nations - CEB," n.d. https://unsceb.org/united-nations-system-white-paper-ai-governance.
[16] White & Case LLP. 2024. "AI Watch: Global Regulatory Tracker - Japan." July 1, 2024. https://www.whitecase.com/insight-our-thinking/ai-watch-global-regulatory-tracker-japan.

4. Operation and evaluation

The aim is to allow multiple stakeholders to rapidly adapt governance systems across various sectors, including companies, regulations, infrastructure, and social codes.

Soft Law Approach

Until recently, Japan has primarily relied on a "soft law" approach to AI governance:

1. **Guidelines instead of binding regulations**: In April 2024, the Japanese government published the AI Guidelines for Business Version 1.0, which consolidated and replaced three previously existing guidelines.[17]
2. **Voluntary compliance**: These guidelines are not legally binding but are expected to support and induce voluntary efforts by AI developers, providers, and business users.
3. **Risk-based approach**: The guidelines promote a risk-based approach to AI governance, encouraging stakeholders to assess and mitigate potential risks associated with AI systems.

Existing Legislative Framework

Japan has been leveraging and updating its existing legislative framework to address AI-related concerns:

1. **Sector-specific regulations**: While no laws specifically prohibit AI use, sector-specific regulations have been updated to require businesses to take appropriate measures and disclose information about AI-related risks.
2. **Existing laws**: AI development, deployment, and use are subject to existing laws such as the Copyright Act, Personal Information Protection Law, Unfair Competition Prevention Act, and Anti Monopoly Law.
3. **Regulatory reform**: Japan has used regulatory reform to promote AI use in various contexts. For example, the Instalment Sales Act was revised in 2020 to enable the use of AI in determining credit amounts.[18]

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[17] Ministry of Economy, Trade and Industry (METI). *9th AI Society Implementation Meeting Material*. 19 April 2024. Available at: https://www.meti.go.jp/shingikai/mono_info_service/ai_shakai_jisso/pdf/20240419_9.pdf.
[18] Habuka, Hiroki. 2024. "Japan's Approach to AI Regulation and Its Impact on the 2023 G7 Presidency." https://www.csis.org/analysis/japans-approach-ai-regulation-and-its-impact-2023-g7-presidency.

4.3. Regulation for Socially Inclusive AI

Whereas existing laws will need to be updated or amended where necessary in light of AI developments, new legislation may also be needed in order to steer AI towards socially inclusive ends and to enhance the accountability of developers. In this section, we examine some approaches to the development of socially inclusive AI, and focus specifically on 1) establishing ethical AI principles and guidelines i.e., soft law norms, and 2) embedding such principles within binding AI legislation.

4.3.1. Ethical AI Principles

The United Nations Educational, Scientific and Cultural Organisation (UNESCO) ethical AI principles represent one of the first global efforts to define the values and principles that should guide countries in developing legislation that ensures AI is deployed for the common good.[19]

These principles are:[20]

- Proportionality and Do no Harm

- Safety and Security

- Right to Privacy and Data protection

- Responsibility and Accountability

- Transparency and Explainability

- Multi-stakeholder and Adaptive governance and collaboration

- Human oversight and Determination,

- Sustainability, Awareness and Literacy

- Fairness and Non-discrimination.

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[19] "UNESCO Adopts First Global Standard on the Ethics of Artificial Intelligence," UNESCO, August 31, 2023, https://www.unesco.org/en/articles/unesco-adopts-first-global-standard-ethics-artificial-intelligence.
[20] "Ethics of Artificial Intelligence," UNESC, September 26, 2024, https://www.unesco.org/en/artificial-intelligence/recommendation-ethics.

These principles borrow from the United Nations (UN) Charter of Fundamental Rights as well as general constitutional principles captured in the bill of rights of countries across the globe. While these principles have been endorsed globally, including by the African Union, their manifestation within the African context should inform further development of the ethics and principles of AI development in Africa. As AI development and usage takes off in the continent, such principles can be gradually developed through the collaboration of stakeholders such as AI researchers, developers, and regulators.

4.3.2. Embedding Ethical Principles in Legislation

Aside from defining and mandating the use of ethical principles in AI development, AI policy makers can also introduce legislation to enhance the accountability of AI developers. Legislation also provides more specific measures on how to reduce biased and discriminatory outcomes, increasing accountability of developers and private entities, and laying out processes for redress in the instance of harm.

Regulation should address a variety of areas, including: bias, non-discrimination, equality; freedom of expression, disinformation and fake news; privacy, freedom from mass surveillance and targeting; data protection and agency; competition/anti-competitive behaviour; labour/work, and consumer protection among other issues. While these issues are widely known as key regulatory issues for AI, their manifestation within the African context should further inform the key issues for regulation. For instance, there should be further exposition of how bias and non-discrimination might manifest within the domestic political economy of each African country. With closer examination of these issues, one might see that bias and non-discrimination should cover not only the widely accepted lenses/categories of gender, race, sexual orientation, and disability but should also endorse the intersectionality of these categories alongside ethnicity, class, and geography within the context of an African country.

Regulators can collaborate with AI researchers and users to better understand the specific ways AI is reshaping society, enabling them to adopt more context-specific regulations. While they may draw insights from other jurisdictions, regulators must remain mindful of the differences in national systems that shape AI economies and the societal variations that influence the potential effects of AI across countries.

For example, the EU AI Act adopts a risk-based approach to AI regulation and promotes the use of regulatory sandboxes to develop and test innovative AI systems under strict national

oversight.[21] The Act's primary goal is to protect against violations of fundamental rights outlined in the EU Charter and to mitigate systemic risks. It classifies AI risks into categories: prohibited, high-risk, transparency risk, minimal risk, and General Purpose AI, with different regulatory requirements applied based on the risk level.[22] By focusing on areas that pose systemic risks to society, the EU AI Act represents a "hard-law" approach to AI regulation.

While the EU has been a frontrunner in enacting comprehensive AI legislation, other countries have also taken action. Singapore introduced its Model AI Governance Framework (2019, updated in 2020),[23] and the United States has published the Blueprint for an AI Bill of Rights[24] and the US Executive Order 2023.[25] Singapore's framework emphasises guiding principles such as internal governance, operational management, stakeholder interaction, and determining the appropriate level of human involvement in AI-augmented decision-making. The framework helps developers assess their AI systems' compliance with AI ethics principles set by Singapore's Personal Data Protection Authority (PDPA), which include transparency, explainability, reproducibility, safety, fairness, accountability, and societal well-being.[26] This approach can be viewed as a "soft-law" method for AI governance.

More specific regulatory interventions that have been suggested in relation to AI systems include:

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[21] "EU AI Act: First Regulation on Artificial Intelligence" European Parliament, August 6, 2023, https://www.europarl.europa.eu/topics/en/article/20230601STO93804/eu-ai-act-first-regulation-on-artificial-intelligence; "EU Artificial Intelligence Act | Up-to-date Developments and Analyses of the EU AI Act," https://artificialintelligenceact.eu/.

[22] Ibid.

[23] Singapore Model AI Governance Framework, https://www.pdpc.gov.sg/-/media/files/pdpc/pdf-files/resource-for-organisation/ai/sgmodelaigovframework2.pdf

[24] The White House. "Blueprint for an AI Bill of Rights" November 22, 2023. https://www.whitehouse.gov/ostp/ai-bill-of-rights/.

[25] "Executive Order on the Safe, Secure, and Trustworthy Development and Use of ArtificialIntelligence,"October30,2023, https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/.

[26] Singapore Model AI Governance Framework. https://www.pdpc.gov.sg/-/media/files/pdpc/pdf-files/resource-for-organisation/ai/sgmodelaigovframework2.pdf

Algorithmic impact assessments

Impact assessments for AI systems are beneficial for purposes of identifying and mitigating potential risks. Human Rights Impact Assessments (HRIA) are an example. In undertaking such assessments, policy makers should take note of several key elements.

They must ensure participation by engaging directly with those actually or potentially affected by the AI systems, and in a non-discriminatory manner by fostering inclusive engagement processes. They should also focus on empowerment by building capacity for marginalised or vulnerable groups to effectively participate in the assessment. Transparency is crucial, requiring clear and open communication throughout the process. The benchmark for the assessment should be international human rights standards, guiding the analysis and mitigation of impact. There must also be accessible remedy mechanisms allowing affected individuals to raise grievances about the AI system, its products, or the assessment process itself.[27]

Policymakers can also consider conducting public consultations to integrate diverse perspectives in the development of public AI systems. While public AI systems may more easily incorporate community input through public consultations, private AI developments often face challenges related to proprietary technologies and commercial confidentiality. However, private companies should not be exempt from accountability. A balanced approach can be achieved by mandating impact assessments for private-sector AI systems, with specific requirements for transparency and stakeholder engagement.

Audits and regulatory inspection

One of the mandates of a national AI regulatory body could be to conduct regular audits of AI systems in order to ensure compliance with legal and ethical standards. The regulatory body should also ideally have the power to conduct an inspection of AI systems at any stage of the life cycle.[28]

These audits must evaluate whether AI systems operate within the established guidelines and whether risks are effectively mitigated. A compliance rating or standard could be established as a clear indication of adherence to societal and ethical standards.

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[27]The Danish Institute for Human Rights, "Key Principles for HRIA of Digital Business Activities" 2023, https://www.humanrights.dk/files/media/document/Key%20Principles%20for%20HRIA%20of%20digital%20business%20activities.pdf.
[28] AI Now Institute, "Algorithmic Accountability: Moving Beyond Audits" April 11, 2023, https://ainowinstitute.org/publication/algorithmic-accountability

Regulatory sandboxes could be introduced to allow developers to first test technology in a controlled environment, closely monitored by the authority prior to launching in the market.[29] This would enable innovation while ensuring that the AI systems are ethically compliant prior to deployment.

The authority should have the power to enforce corrective measures including fines and suspensions. Businesses and Individuals that fail to meet the standards identified through audits should face penalties. These could include fines, mandatory revisions of their AI systems, or even withdrawal of the system from the market in cases of non-compliance. Such enforcement measures are essential to ensuring that AI systems remain accountable over time.

Transparency requirements

To promote accountability and public trust in AI systems, regulators may impose transparency requirements on developers. This could include the provision of documentation to the Authority detailing how their AI systems function, including the purpose, risks, data used for training, the algorithms employed, and the criteria for decision-making processes.[30]

Accessible channels should also be provided to enable external stakeholders such as civil society organisations, consumers, and government agencies to review and challenge AI systems when necessary.

Standards

An industry standard should be implemented to ensure that AI systems are developed and deployed effectively. These standards should be aligned with international standardisation, including ISO. The national regulatory body should work with international standardisation bodies to establish an applicable standard that guarantees safety, fairness and human rights protection.[31] The standards should also ensure that AI systems comply with the principles of transparency, non discrimination, privacy protection and data protection. An example of a standard is ISO/IEC 23894 on risk management which was published in 2023 and offers strategic guidance to organisations for managing risks connected to the

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[29] AI Now Institute, "Algorithmic Impact Assessments Report: A Practical Framework for Public Agency Accountability" April 9, 2018, https://ainowinstitute.org/publication/algorithmic-impact-assessments-report-2
[30] AI Now Institute, "Algorithmic Accountability Policy Toolkit", October 2018, https://ainowinstitute.org/publication/algorithmic-accountability-policy-toolkit
[31] ISO/IEC, ISO/IEC 23894: AI Risk Management Standards (Geneva: ISO/IEC, 2020).

development and use of AI.[32] Compliance with such standards should be enforced through audits and independent assessments.

Moratoria and bans

Given the potential risks of AI in specific contexts, moratoria and bans on certain high-risk AI applications should be considered. For example, facial recognition technology has raised significant ethical concerns due to the potential to infringe on privacy and exacerbate racial and gender biases.[33] In such cases, a temporary moratorium may be necessary to halt the deployment of these technologies until comprehensive regulations are in place to address their risks. However, while moratoria serve as critical safeguards, they should not completely stifle innovation in areas where potential risks can be responsibly managed. This is where the implementation of regulatory sandboxes becomes essential as such applications could be assessed and refined prior to deployment.

Additionally, outright bans should be enforced for AI systems that pose unacceptable threats to human rights, such as lethal autonomous weapons or AI tools that enable mass surveillance.

Data protection

AI systems rely on personal data for training and operation. Data protection regulations must be enforced to safeguard privacy. AI developers must ensure that the systems adhere to the data protection policies which provide guidelines for data collection, processing, storage and deletion. Furthermore, security measures must protect personal data from breaches, and developers must be accountable through regular audits and risk assessments. Violations of key principles of data protection should result in penalties to ensure compliance.

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[32] Ibid.
[33] Amnesty International, Ban the Scan: Facial Recognition Technology in Public Spaces (London: Amnesty International, 2021).

5. Building the Backbone: Operational Requirements for AI Systems

For AI systems to function effectively, two key foundational elements are required: **data** and **compute**.[34] Data provides the information that fuels the creation and training of AI models while computational power (or compute) enables the processing of this data, by applying algorithms, and drawing insights through logical operations. It is enhanced through the provision of adequate digital infrastructure. These two have been the building blocks of the current artificial intelligence boom, making it possible to develop advanced algorithms that can process language and visual inputs in a more natural expression. We shall examine each of these in turn.

5.1. Data & Data Systems

In the simplest terms, data is information. As the AU's Data Policy Framework suggests, data is "a strategic asset, integral to policy-making, private and public sector innovation and performance management, and creating new entrepreneurial opportunities for businesses and individuals." [35]

AI systems learn by combining large volumes of data, identifying patterns and thereafter making decisions or performing tasks. However, data collection and the algorithmic systems that arise from it are not neutral. Plenty of issues can arise from data collection- from data protection and privacy; to the treatment of sensitive data, to data accuracy, to biassed data and algorithmic systems et al.[36]

These issues necessitate the creation of a comprehensive data governance framework to oversee the collection, management, security, integrity, and accountability of data processes. While countries must create frameworks that safeguard the integrity of data collection, they should also be cognizant of the potential to raise costs for compliance for small businesses, especially when data collection concerned is not sensitive in nature. For

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[34]S.2714, CREATE AI Act of 2023, available at https://www.congress.gov/bill/118th-congress/senate-bill/2714/text

[35] African Union. "African Union Data Policy Framework." African Union, 2021. Available at: https://au.int/en/documents/20220728/au-data-policy-framework.

[36] For example, if you train a recruitment algorithm on data from past hiring decisions that overwhelmingly excluded women, the resultant AI will be more likely to continue to perpetuate these discriminations.Goodman, Rachel. 2023. "Why Amazon's Automated Hiring Tool Discriminated Against Women | ACLU." American Civil Liberties Union, February 27, 2023. https://www.aclu.org/news/womens-rights/why-amazons-automated-hiring-tool-discriminated-against.

instance, overlapping regulations in drone operation in Kenya have made it difficult for small businesses to use drones for agriculture monitoring. The prohibitive costs to acquire a drone, a licence to operate the drone, and permits each time one flies the drone, make it expensive to collect data that is used to train artificial intelligence models that would significantly increase productivity in agriculture.[37]

Several countries, ministries, and regional bodies like the African Union already have Data Governance Frameworks. The AU's Data Policy Framework, for instance, effectively addresses key principles such as cooperation, integration, fairness, and inclusiveness, which are relevant to our case. Therefore, rather than replacing these documents, our goal is to complement them by focusing on data governance in AI systems. Our framework offers a reference architecture to support implementation in the national context.

Defining Data Governance, Management and Stewardship

These 3 terms overlap in meaning, and there is no general agreement as to their usage. We define them in the following ways:

1. **Data governance** is a set of rules, methods, roles, and duties that give power to control data. It's an important part of digital control. It sets out who can do what with which information, when, why, and how.

2. **Data management** puts these rules and methods into practice. It handles data throughout its life and looks after information assets.

3. **Data stewardship** means using, gathering, and handling data in a way that includes everyone and protects rights. Data stewards make sure data sharing, storage, privacy, and control are done well across different groups. This helps those who collect data get more steady and trustworthy information. Data stewards do four main things:

   a. Find ways to unlock the value of data
   b. Handle data to make sure it represents everyone, is easy to use, and is high quality
   c. Set guidelines for quality, ease of use, safety, and openness
   d. Help protect the rights of people and groups

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[37] Kasenzu, B. (2024). Role of Precision Agriculture Technologies in Enhancing Farm Productivity in Kenya. American Journal of Agriculture, 6(2), 1–12. https://doi.org/10.47672/aja.2118

In response to the need for data governance policies, we offer insights in defining control, sovereignty, localisation, and development of a governance framework in this section. For a deeper exploration of the latter two concepts, resources like the *DAMA-DMBOK: Data Management Body of Knowledge*[38] and *Data Stewardship: An Actionable Guide to Effective Data Management and Data Governance*[39] offer more comprehensive perspectives.

5.1.1. Data Governance Framework

A Data Governance Framework establishes in an organisation, institution, or State, the necessary capabilities to exercise consensual and communicated decision making, authority, and control over the management of data assets and defines how people and processes are expected to behave in relation to data.[40]

Several organisations and governments have developed comprehensive data governance frameworks that can serve as useful references. These include the African Union Data Policy Framework, which aims to harmonise data policies across member states and promote data-driven innovation while protecting privacy and security.[41] The Republic of Kenya's Ministry of Agriculture framework focuses on managing farmers' registration data through clear policies and protocols.[42] Other examples like New Zealand's Operational Data Governance Framework[43] and PwC's Enterprise Data Governance Framework[44] offer additional models for establishing data ownership, quality management, and compliance processes.

A well-rounded data governance framework should include:

1. **Principles:** These are a set of guidelines and practices used to ensure the proper management, quality, security, and compliance of data assets throughout their

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[38] DAMA International. DAMA-DMBOK: Data Management Body of Knowledge (2nd Edition). https://books.google.co.ke/books/about/DAMA_DMBOK.html?id=YMBt0AEACAAJ.

[39] Plotkin, David. Data Stewardship: An Actionable Guide to Effective Data Management and Data Governance. 2nd ed. Elsevier, 2021. https://shop.elsevier.com/books/data-stewardship/plotkin/978-0-12-822132-7.

[40] Khatri, Vijay, and Carol V. Brown. 2010. "Designing Data Governance." Communications of the ACM 53 (1): 148–52. https://doi.org/10.1145/1629175.1629210.

[41] African Union. "African Union Data Policy Framework." African Union, 2021. Available at: https://au.int/en/documents/20220728/au-data-policy-framework.

[42] Ministry of Agriculture, Livestock, Fisheries and Cooperatives (MoALFC). Data Governance Framework for Farmers' Registration Data. 2022.

[43] "Operational Data Governance - data.govt.nz." n.d. https://www.data.govt.nz/toolkit/data-governance/odgf/.

[44] PricewaterhouseCoopers. n.d. "Global and Industry Frameworks for Data Governance." PwC. https://www.pwc.in/consulting/technology/data-and-analytics/govern-your-data/insights/global-and-industry-frameworks-for-data-governance.html.

lifecycle. These must be oriented towards a data-centric architecture and be aligned with a nation's overall goals and objectives as well as those of the data governance framework.

2. **Governance:** The framework should define 1) the strategic alignment requirements, including goals, objectives, and strategies 2) organisational requirements for data collection i.e., clear roles assignment, including those relating to outsourced tasks such as external security audits, and 3) administration requirements such as those relating to policies documentation, compliance with laws, regulations, and standards that affect data governance.

3. **Management:** In operationalizing the data governance framework, it should contain a glossary of key terms in a way that it facilitates the understanding of the context of application and establish a common language and reference model to address the wide variety of data. Additionally, data quality requirements and their requisite measurements - accuracy, reliability, completeness, etc. should be defined. One must also identify sensitive data and establish security classifications. This will support the data's and data system's confidentiality, and integrity, while also making such data available. Finally in management, the data governance framework should define the data lifecycle requirements from planning and design to permanent deletion of data.

4. **Monitoring:** The data governance framework should also spell out supervision and evaluation requirements that monitor the performance of data use. This can equally be done using advanced analytics privacy-preserving AI/ML integrations to pick out patterns and potential security issues.

Finally, a data governance framework should not be a static document. It should be continuously updated along with the changing environment in cybersecurity, AI considerations, and societal norms. For example with training AI models, there should be additional thoughtfulness applied to potential bias in data. This could be either in the form of overrepresentation or under representation of groups in datasets.[45]

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[45] "What Is AI Bias? | IBM." n.d. https://www.ibm.com/topics/ai-bias.

5.1.2. Data Control

Data control is crucial for efficient and responsible data markets. Data governance frameworks or laws should clarify who controls data - including who can access it, under what terms, and for what purposes.

And at the heart of this control is meaningful consent for individuals and groups, otherwise known as "data subjects." In designing data governance structures, it is important that there includes:[46]

1. **Informed consent** - Users must be provided with clear and complete disclosure about data collection and usage practices before giving consent.

2. **Freely given** - Consent must be given voluntarily, without pressure or coercion.

3. **Specific** - Consent should be for specific purposes, not a blanket agreement for all data usage.

4. **Prior consent** - For push advertising, consent must be obtained before sending messages (opt-in approach).

5. **Easy withdrawal** - Users must be able to easily withdraw consent at any time.

6. **Granular control** - Users should be able to choose what types of data are collected and how they are used.

7. **Verifiable** - Methods like confirmed opt-in should be used to verify consent was intentionally given.

8. **Ongoing access and control** - Users should have continued access to view, correct, and delete their personal data.

9. **Limited scope** - Consent for one purpose (e.g. services) does not imply consent for unrelated advertising.

10. **Clear disclosure** - The terms of consent must be clearly explained, despite limitations of mobile interfaces.

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[46] Cleff, Evelyne Beatrix. 2007. "Implementing the Legal Criteria of Meaningful Consent in the Concept of Mobile Advertising." Computer Law & Security Review 23 (3): 262–69. https://doi.org/10.1016/j.clsr.2007.03.005.

11. **Revocable** - Users must be able to revoke consent for both data processing and receiving further communications.

5.1.3. Data Sovereignty

The concept of data control extends to the national level through data sovereignty, which is rooted in the idea of sovereign nation-states.[47] Data sovereignty suggests that data generated within or passing through a country's internet infrastructure should be under that nation's protection and control. This concept is part of another - "cyber sovereignty," which aims to bring the global cyber domain under local jurisdiction.

There are two approaches to data sovereignty: weak and strong. The weak approach is led by the private sector and emphasises digital rights, while the strong approach is state-led and prioritises national security. [48]

International transfer of personal data is typically permitted only under specific conditions, such as when the receiving country has laws ensuring adequate data protection. Nations often implement data sovereignty to safeguard their citizens' rights through data protection regulations that govern cross-border data flows. These regulations often involve agreements that set data protection standards and ensure reciprocal protection of exchanged data.

For these agreements to work, countries need both sufficient legal standards and the practical ability to enforce them. Establishing robust data governance practices is crucial for achieving data sovereignty.

In asserting data sovereignty, policy development should contain the following key traits:

- **Categorization**: States should enhance clarity in data policies by implementing well-defined categorization systems. For example, they can establish security classifications or designate various levels of data sensitivity. It's crucial that these categorization methods are applied uniformly across all data and information policies.

- **Protection**: This establishes the core principles of data sharing by emphasising essential rights, such as data ownership. It creates a framework that safeguards

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[47] Floridi, Luciano. 2020. "The Fight for Digital Sovereignty: What It Is, and Why It Matters, Especially for the EU." Philosophy & Technology 33 (3): 369–78. https://doi.org/10.1007/s13347-020-00423-6.
[48] Ibid.

individuals' and organisations' interests in their data, setting the groundwork for ethical and lawful data practices. This includes defining who has primary control over data and under what circumstances it can be accessed or used by others.

- **Participation**: Through clearly defined responsibility divisions, this facet guides the implementation of provision aspects. It outlines how different stakeholders - including data subjects, controllers, and processors - should engage in the data ecosystem. This element ensures that all parties understand their roles, rights, and obligations in data sharing processes, promoting accountability and transparency.

- **Operationalisation**: This component encompasses crucial facets such as control mechanisms, security protocols, and compliance frameworks. It focuses on the practical aspects of data sharing, ensuring that the foundational rights established under the protection facet are preserved throughout the entire data lifecycle. This includes implementing robust data governance structures, encryption methods, access controls, and audit trails to maintain data integrity and confidentiality during and after sharing activities.

5.1.4. Data Localisation

Data localization refers to the practice of requiring data to be stored within a specific geographical location such as the country where data is collected. While it is often viewed as an assertion of national sovereignty, data localization requires careful evaluation of its costs and benefits as a policy option. This approach can present practical challenges and may not always align with its intended purpose of protecting data subjects, as it can also apply to non-personal data.[49] Therefore, it's crucial to consider data localization within the context of control, emphasising policy mechanisms that support effective sovereignty.

The implementation of data localization creates artificial legal barriers to data flows, typically through requirements for local data storage or residency.[50] However, stringent localization rules mandating exclusive local storage, rather than just maintaining local copies, can inadvertently increase vulnerability to security threats such as cyber-attacks and foreign surveillance.

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[49] Bauer, Matthias, Hosuk Lee-Makiyama, Van Der Marel Erik, and Bert Verschelde. 2014. "The Costs of Data Localisation: Friendly Fire on Economic Recovery." 2014. https://www.econstor.eu/handle/10419/174726.

[50] Selby, John. 2017. "Data Localization Laws: Trade Barriers or Legitimate Responses to Cybersecurity Risks, or Both?" International Journal of Law and Information Technology 25 (3): 213–32. https://doi.org/10.1093/ijlit/eax010.

For many African nations, technological limitations pose significant obstacles to data localization. The required capacity for local data storage often far exceeds the capabilities of existing national data centres. Additionally, mandates for maintaining duplicate data copies can impose considerable financial burdens on local businesses.

For data localisation policies, the following key factors should be considered:

- **Politically Neutral Alliances:** African nations should focus on forming alliances that remain politically neutral, respecting each country's sovereignty and national control to prevent foreign influence that could compromise their national security, economic interests, and digital advancements.

- **Local Data Infrastructure Investment:** The development of local data infrastructure should be considered as a way to maintain control but must be evaluated with respect to environmental impact, safety and security measures, potential redundancy costs for local data communities, and overall expenses.

5.1.5. Data Policies & Regulations

Within the African continent, 37 out of 54 have enacted a data protection law as of May 2024.[51]Regionally, the African Union (AU) adopted the African Union Convention on Cyber Security and Personal Data Protection (the Malabo Convention) in 2014 a framework aimed at bolstering cybersecurity and protecting personal data across Africa. This convention came into force in June 2023 after having been ratified by 15 countries and sets out measures for establishing legal, policy, and regulatory frameworks to enhance the security of electronic transactions, protect privacy, and combat cybercrime. It encourages member states to develop national cybersecurity strategies, establish cybercrime laws, and create independent data protection authorities. In 2024, the African Union Peace and Security Council also issued the Common African Position on the Application of International Law to the Use of Information and Communication Technologies in Cyberspace, an instrument that was negotiated and adopted by 55 AU member states. The developments demonstrated Africa's interest and determination in ensuring cyber security, adequate protection of personal data, and the creation of a safe cyberspace.

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[51] Mureithi, Carlos. "The State of Data Protection Legislation in Africa." Tech Policy Press, May 31, 2024. https://www.techpolicy.press/the-state-of-data-protection-legislation-in-africa/.

Data policies and legislation should reinforce the core principles outlined above. This includes ensuring proper consent and control for data subjects, establishing clear compliance requirements aligned with data governance framework mandates, and defining how a nation upholds data sovereignty. In addition, these policies should address issues such as data security, privacy, and cross-border data flows. A significant number of regions globally lack data policies.

As we have covered core issues relating to data governance above, we now turn to three policy areas that need to be addressed further in their relation to AI development: cross-border data and digital flows policies; cybersecurity, and copyright laws.

a. Cross–border Data & Digital Flows Policies

Trade policies can affect cross-border data flows and localisation important to the development and adoption of AI tools. The interplay of these elements can create a conducive or prohibitive environment for data-driven innovations and economic growth. Various factors, including geopolitical influences, resources, and institutional capabilities across Africa, can impact individual countries' approaches to digital trade and efforts to harmonise regional policies. The chosen cross-border data strategy will require specific institutional capabilities, depend on existing data ecosystem resources, influence data value creation or extraction within and between African nations, and determine who benefits most from the data value cycle at both domestic and regional levels.

Trade policies such as the African Continental Free Trade Area (AfCFTA) which aims to establish a single continental market, can significantly benefit from harmonised trade regulations. By reducing trade barriers and promoting the free flow of data, AfCFTA can facilitate AI adoption by enabling businesses to access a larger market and share data across borders more efficiently.[52] This integration can lead to enhanced collaboration among African nations, fostering innovation and competitiveness in the AI sector.

However at the same time, various African countries have implemented restrictions on cross-border data transfers.[53] In some nations, like Ethiopia, Nigeria, Rwanda, and Uganda, these limitations are part of financial services and cybersecurity laws. For instance, Rwanda

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[52] Hlomani, Hanani, and Caroline B. Ncube. 2023. "Data Regulation in Africa: Free Flow of Data, Open Data Regimes and Cybersecurity." In Springer eBooks, 97–130. https://doi.org/10.1007/978-3-031-24498-8_5.
[53] Cipesa. 2024. "Advancing Sustainable Cross-border Data Transfer Policies and Practices in Africa." Collaboration on International ICT Policy for East and Southern Africa (CIPESA). April 30, 2024. https://cipesa.org/2024/04/advancing-sustainable-cross-border-data-transfer-policies-and-practices-in-africa/.

requires banks to keep their primary data within the country,[54]while Uganda mandates electronic money issuers to maintain their primary data centres for payment systems locally.[55] Other countries, including Kenya, Nigeria, South Africa, Tunisia, and Uganda, have incorporated these restrictions into their data protection laws. Kenya's legislation prohibits transferring personal data to countries without adequate security measures[56]. South Africa's law requires either the data subject's consent or assurance of sufficient safeguards in the receiving country for cross-border transfers.[57] Nigeria's recent Data Protection Act outlines specific conditions for such transfers, including adequate protection in the destination country and consent from the data subject.[58]

Three primary models govern cross-border data flows: open, conditional, and limited transfer models. Each presents distinct advantages and disadvantages.

- **Open Transfer Model:** This model, championed by the US and APEC members, minimises regulatory oversight, relying primarily on voluntary industry standards. While fostering flexibility and potentially stimulating innovation, it risks inconsistent standards, potentially jeopardising personal data protection and necessitating robust ex-post accountability mechanisms. This model's success hinges on strong preconditions, including interoperable data systems and high levels of human, technical, and institutional capacity, often lacking in developing economies.

- **Limited Transfer Model:** Countries like China and Russia exemplify this approach, characterised by stringent data localization requirements and government control over data flows. While potentially addressing national security and data sovereignty concerns, it can stifle innovation, limit access to global markets, and create barriers to international collaboration. The associated costs of establishing and maintaining local data infrastructure can also be substantial, particularly for smaller economies.

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[54] "Rwanda - Data Protection Overview." 2024. DataGuidance. June 19, 2024. https://www.dataguidance.com/notes/rwanda-data-protection-overview.

[55] "National Payment Systems Act, 2020." 2020. September 4, 2020. https://ulii.org/akn/ug/act/2020/15/eng@2020-09-04#part_V__sec_68.

[56] Meshack Masibo. 2023. "What Does the Data Protection Act Say About Cross Border Data Transfers | KICTANet Think Tank." KICTANet Think Tank - All Rights Reserved. June 4, 2023. https://www.kictanet.or.ke/what-does-the-data-protection-act-say-about-cross-border-data-transfers/.

[57] Team, Alt, and Alt Team. 2022. "Data Without Borders: How to Manage Cross-Border Data Transfers in South Africa." ALT Advisory | Make. Change. Possible. March 17, 2022. https://altadvisory.africa/2017/11/07/data-without-borders-manage-cross-border-data-transfers-south-africa/.

[58] "Transfer in Nigeria - DLA Piper Global Data Protection Laws of the World." n.d. https://www.dlapiperdataprotection.com/index.html?c=NG&t=transfer.

- **Conditional Transfer Model:** This model represents a middle ground, allowing cross-border data flows under specific conditions, often tied to data protection standards and reciprocal agreements. The EU's GDPR exemplifies this approach, emphasising data subject rights and requiring adequate data protection levels in recipient countries. This model empowers nations to safeguard their citizens' data while still participating in the global digital economy. It also encourages the development of robust domestic data protection frameworks, strengthening national data governance capacity.

Regulatory options	Limited transfers model			Conditional transfers model	Open transfers model
	Domestic storage	Domestic processing	Government approval	Regulatory safeguards	Private standards
Key features	• Broad requirements to use domestic servers for data storage	• Broad requirements to use domestic servers for data processing	• Prior approval required for data transfers	• Consent • Adequacy findings • Private sector assessment (for example, codes of conduct, binding corporate rules, contractual arrangements)	• No a priori mandatory requirements • Private sector accountability based on voluntary standards
Examples	• China: certain personal data • US states: government data • Australia and United Kingdom: health data • Russian Federation: telecommunications data	• Russian Federation: processing of personal data	• China: Cybersecurity Law	• European Union: General Data Protection Regulation	• US federal rules • APEC Privacy Framework

Source: World Bank Development Report 2021 Cross Border Data and Digital Trade

A 2021 study by Marel and Ferracne[59] found that more restrictive data policies, particularly those limiting cross-border data transfers, are significantly associated with lower imports of data-intensive services. If countries were to lower cross-border data restrictions to the average level of the three least restrictive countries in the sample, the study estimates services imports could increase by about 5% on average across countries.

However, conditional transfers offer several distinct advantages for African nations:

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[59] Ferracane, Martina, and Erik van der Marel. "Do data policy restrictions inhibit trade in services?." Robert Schuman Centre for Advanced Studies Research Paper No. RSCAS 29 (2019).

- **Balancing Sovereignty and Innovation:** This model allows African countries to assert data sovereignty by setting conditions for cross-border transfers, ensuring alignment with national priorities and legal frameworks. Simultaneously, it avoids the isolationism of a limited transfer model, enabling participation in international data-driven collaborations and fostering innovation.

- **Promoting Data Protection Standards:** By requiring adherence to specific data protection standards for cross-border transfers, this model incentivizes the development of robust domestic data protection frameworks. This strengthens national data governance capacity and protects citizen data rights.

- **Flexibility and Control:** Conditional transfers offer flexibility in determining which data types are subject to restrictions, allowing countries to prioritise sensitive data such as personal information, financial records, and health data while enabling freer flow of less sensitive data for research, innovation, and economic development. For example, raw agricultural data collected by drones could be transferred more freely for analysis and model training, while personally identifiable farmer information would be subject to stricter transfer conditions. Similarly, anonymized health data could be shared for research purposes, while individual patient records would require explicit consent and robust safeguards.

- **Alignment with International Best Practices:** The conditional transfer model aligns with emerging international best practices for data governance, facilitating compatibility with global data protection frameworks like the GDPR and fostering trust in cross-border data exchanges. This can attract foreign investment and promote participation in international research collaborations.

- **Supporting AfCFTA:** The conditional transfer model can support the goals of the African Continental Free Trade Area (AfCFTA) by providing a framework for harmonising data governance across member states. This can facilitate cross-border trade in digital services and promote data sharing for regional economic development. Research by the World Bank[60] indicates that harmonised data governance frameworks, particularly those based on conditional transfers, can significantly boost regional trade and economic integration.

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[60] World Bank. 2022. Aligning Data Governance with the Social Contract for Data to Promote Value, Trust, and Equity. Analytical Insights; Note 7. © Washington, DC: World Bank. http://hdl.handle.net/10986/37172 License: CC BY 3.0 IGO.

Regardless of the chosen model, clarity and transparency in data governance regulations are crucial for effective compliance. Clear, predictable rules make it easier for businesses to navigate the regulatory landscape, fostering a conducive environment for investment and innovation. This includes clearly defining data categories, specifying conditions for cross-border transfers, and establishing accessible mechanisms for obtaining necessary approvals. Transparent enforcement processes further enhance trust and encourage compliance. African nations should prioritise developing clear and readily accessible data governance frameworks, regardless of their chosen transfer model, to maximise the benefits of data-driven innovation while protecting citizen rights.

b. Cyber–security Regulations

Cyber-security regulations cover a wide spectrum of laws but are most well-known for policing against unauthorised access. For example if someone hacks your Facebook or email account, cyber security laws would typically make this action illegal and provide a framework for prosecuting the offender. However, for effective cybersecurity regulations for AI, unauthorised access has to be equally paired with integrity of data for AI, and accessibility to services such as those that would be impeded by DDoS (Distributed Denial of Service) attacks. Cyber security regulations protect individuals, businesses and nations, from security breaches, including financial losses in respect of individuals and businesses.

Cyberattacks enhanced by artificial intelligence, sometimes called AI-enabled or offensive AI attacks, utilise AI and machine learning techniques to conduct harmful digital operations. These advanced threats employ AI to automate and improve conventional cyberattack methods, resulting in more refined, precise, and elusive assaults on digital systems. Examples include:

1. Employing voice cloning AI in an impersonation fraud. For example, cybercriminals utilised artificial intelligence software to replicate a company leader's voice, tricking staff into making urgent financial transfers.[61]

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[61] Flitter, Emily, and Stacy Cowley. 2023. "Voice Deepfakes Are the Latest Threat to Your Bank Balance." The New York Times, August 30, 2023. https://www.nytimes.com/2023/08/30/business/voice-deepfakes-bank-scams.html.

2. Generating believable deceptive emails through AI writing tools.[62] While traditional sophisticated email scams demanded extensive preparation, modern attackers can now produce them almost instantaneously.

3. Leveraging AI systems to identify weaknesses in software and circumvent security detection mechanisms.

4. Automated social engineering attacks using conversational AI, where artificial chat agents engage targets in seemingly innocuous discussions to subtly extract sensitive information like personal data or account credentials.

In response to emerging AI-enhanced threats, regulators will need to update cybersecurity regulations in the following ways:

1. **Expand threat modelling requirements:** Regulators will need to mandate that organisations incorporate AI-powered attacks into their threat models and risk assessments. This involves updating security frameworks to account for new AI-enabled vectors and vulnerabilities.

2. **Enhance authentication protocols:** To combat sophisticated AI impersonation attacks, regulators may require stricter multi-factor authentication measures. This could include mandating biometric verification, behavioural analysis, or AI-powered anomaly detection for high-risk transactions or system access.

3. **Increase AI governance and transparency:** Regulators may introduce new rules around the development, deployment, and monitoring of AI systems used in cybersecurity. This could involve requirements for explainable AI, regular audits of AI models for bias or vulnerabilities, and mandatory disclosure of AI use in critical security systems.

These regulatory updates aim to ensure that cybersecurity measures evolve alongside the advancing capabilities of AI-powered threats, while also fostering innovation, maintaining operational efficiency, and preserving individual privacy rights in an increasingly complex digital landscape.

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[62] Krishnan, Ashwin. 2023. "Generative AI Is Making Phishing Attacks More Dangerous." Security. December 18, 2023.
https://www.techtarget.com/searchsecurity/tip/Generative-AI-is-making-phishing-attacks-more-dangerous.

c. Copyright issues generated by AI technologies

AI systems are often trained on large datasets that may include copyrighted material, raising questions about whether this constitutes copyright infringement. For instance, in 2024, The New York Times took ChatGPT owner, OpenAI to court for infringement of its copyright.[63] They argued that the chatbot gave users near-verbatim excerpts of its articles when prompted. However, OpenAI asked that the case be thrown out arguing that the newspaper "hacked" ChatGPT to generate misleading evidence.[64] Tech companies have also said that their AI systems make fair use of copyrighted material and that the lawsuits threaten the growth of the potential multi trillion-dollar industry.

There is an ongoing debate about whether the use of copyrighted works for training AI models violates copyright, or whether it is permissible based on the fair use principle, and whether copyright holders should be compensated or credited when their works are used in this way.[65] The principle of fair use allows limited use of copyrighted material without obtaining permission from the copyright holder. It is intended to balance the rights of creators with the public's interest in accessing and using creative works for purposes such as education, commentary, and research.

Some suggest that clear data-sharing agreements and compensation models could help address these concerns.

Different jurisdictions are approaching the issue in various ways. For example, the European Union has implemented the Text and Data Mining (TDM) exception, which provides some guidance on using copyrighted material for AI training. However, this framework may not fully address the complexities of generative AI systems, and further legal developments are anticipated.[66]

Regulatory / Policy Response

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[63] Grynbaum, Michael M., and Ryan Mac. 2023. "New York Times Sues OpenAI and Microsoft Over Use of Copyrighted Work." The New York Times, December 27, 2023. https://www.nytimes.com/2023/12/27/business/media/new-york-times-open-ai-microsoft-lawsuit.html.

[64] Reporter, Guardian Staff. 2024. "OpenAI Claims New York Times 'Hacked' ChatGPT to Build Copyright Lawsuit." The Guardian, February 28, 2024. https://www.theguardian.com/technology/2024/feb/27/new-york-times-hacked-chatgpt-openai-lawsuit

[65] AI Cases And What They Mean For Copyright Law By Anna Saber, Neda Shaheen and Suzanne Giammalva (January 3, 2024, 3:57 PM EST)

[66] Margoni, Thomas, and Martin Kretschmer. 2022. "A Deeper Look Into the EU Text and Data Mining Exceptions: Harmonisation, Data Ownership, and the Future of Technology." GRUR International 71 (8): 685–701. https://doi.org/10.1093/grurint/ikac054.

Legislators and policy makers can respond to the challenges posed by artificial intelligence (AI) in the context of copyright law through several strategic approaches:

1. **Legislative Reform**

   a. **Transparency Requirements:** Legislators can introduce laws mandating transparency in the use of copyrighted materials for AI training. For instance, the European Union's AI Act proposes that AI providers document and publicly disclose detailed summaries of copyrighted training data used.[67]

   b. **Disclosure Mandates:** In the U.S., the proposed Generative AI Copyright Disclosure Act of 2024 requires creators of generative AI systems to file notices with the Copyright Office, detailing all copyrighted works in their training datasets prior to releasing these systems to consumers.[68]

2. **Human Authorship Clarification**

   a. **Defining Authorship:** Laws can be updated to clarify the requirement of human authorship for copyright protection. For example, the Italian AI Law Proposal specifies that only works with demonstrable human creative intervention are eligible for copyright protection.[69]

3. **Fair Use and Licensing**

   a. **Fair Use Clarification:** Legislators can provide clearer guidelines on the application of fair use in the context of AI, particularly regarding the use of copyrighted works for training AI models. This could involve establishing specific criteria or exceptions for AI-related uses.

   b. **Licensing Models:** Encouraging or mandating licensing agreements between copyright holders and AI developers could ensure that creators are

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[67] "Artificial Intelligence and Copyright — AI: The Washington Report." 2023. Mintz. August 17, 2023. https://www.mintz.com/insights-center/viewpoints/2191/2023-08-17-artificial-intelligence-and-copyright-ai-washington.

[68] Barroso, Ewerton. 2024. "New Generative AI Copyright Disclosure Act of 2024 Introduced." Copyright. April 29, 2024. https://copyright.byu.edu/new-generative-ai-copyright-disclosure-act-of-2024-introduced.

[69] Campus, Gianluca. 2024. "Artificial Intelligence and Copyright: The Italian AI Law Proposal - Kluwer Copyright Blog." Kluwer Copyright Blog. May 28, 2024. https://copyrightblog.kluweriplaw.com/2024/05/28/artificial-intelligence-and-copyright-the-italian-ai-law-proposal/.

compensated for the use of their works in AI training. This could be similar to existing models in other industries, such as music licensing.

4. International Cooperation

Given the global nature of AI development, international cooperation and harmonisation of copyright laws can help address cross-border issues. Countries like Japan have already taken steps to allow the use of copyrighted works for data analysis under certain conditions, which could serve as a model for others.

5. Specialised Legislation

Some experts suggest that current copyright law may not be suitable for AI-generated works and propose the creation of sui generis protections (a special form of protection regime outside the known framework) specifically tailored to address the unique challenges posed by AI.

5.2. Infrastructure

Hard Infrastructure such as transportation systems (roads, bridges, railways, and airports) and utilities (water supply, sewage systems, and electrical grids), have facilitated economic growth and improved quality of life.[70] These capital-intensive investments enable efficient transportation of goods, and services, support industrial activities, and enhance productivity. Similarly, infrastructure makes provision and access to essential services such as clean water, electricity, and healthcare within reach. This in turn improves living standards and supports public health and safety.

> 💡 **Transport vs Digital Infrastructure and Economic Growth**
>
> A recent study[71] found that expanding infrastructure, particularly in power generation and telecommunications, significantly boosts long-term GDP growth. However, these benefits are much less pronounced in the short term. For transportation infrastructure like roads and railways, the immediate impact may even be slightly negative.

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[70] Foster, Vivien, Maria Vagliasindi, and Nisan Gorgulu. 2024. "The Effectiveness of Infrastructure Investment as a Fiscal Stimulus: What We've Learned." World Bank Blogs (blog). March 16, 2024. https://blogs.worldbank.org/en/ppps/effectiveness-infrastructure-investment-fiscal-stimulus-what-weve-learned.

[71] Timilsina, Govinda, David I. Stern, and Debasish K. Das. 2023. "Physical Infrastructure and Economic Growth." Applied Economics, March, 1–16. https://doi.org/10.1080/00036846.2023.2184461.

Additionally, in developing nations, improvements in electricity and communication systems tend to have a greater positive influence on the economy compared to transportation upgrades, when contrasted with industrialised countries.

But what do we mean by infrastructure for AI? In its most basic form it includes systems for collecting input data, a server to process the data and queries, and a client device or terminal from which the end user interacts with the AI. In our AI stack below, we describe it as "What AI needs":
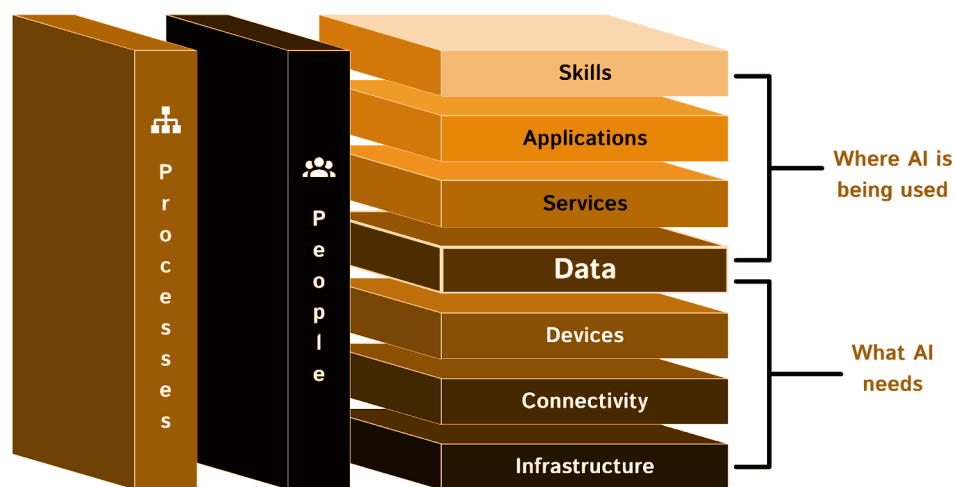
The A.I. Digital Ecosystem Stack by Dr. Shikoh Gitau

Breaking down the infrastructure pieces further, we can see that there are several key components working together. The system starts with **data collection** devices e.g., IoT (Internet of Things) sensors and drones gathering information. This data then travels through various **network** types such as Wi-Fi or 5G to reach a central data centre. Here, powerful **servers** process the information, supported by essential systems for cooling, security, and power. On the other end, users interact with this setup through a range of **devices** from smartphones to desktop computers;
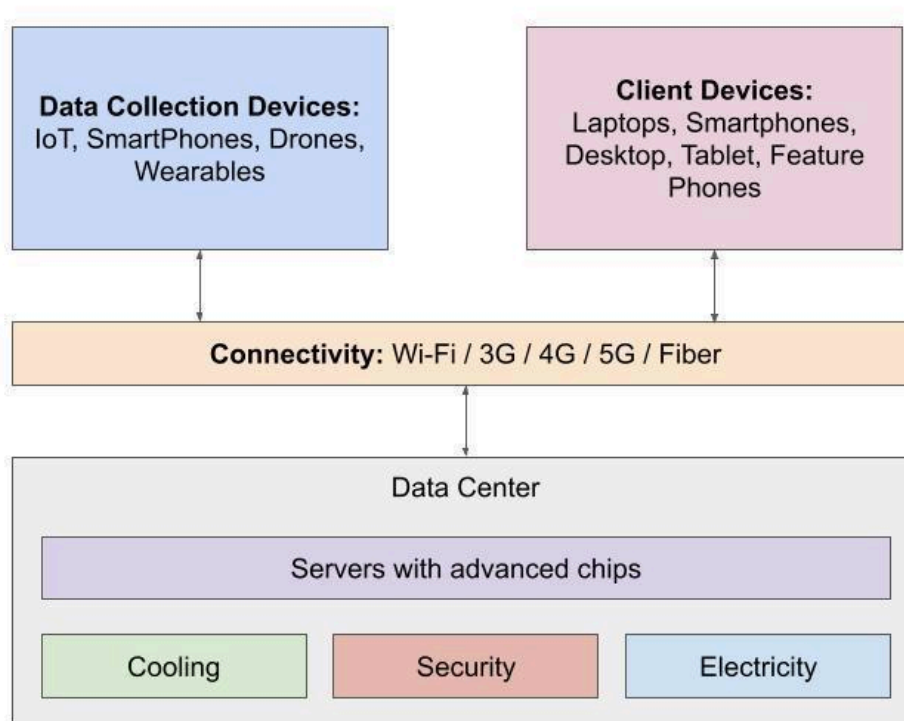
AI Infrastructure and Devices

Our analysis of infrastructure to power AI focuses on 4 key components:

1. Electricity
2. Compute
3. Connectivity
4. Devices

5.2.1. Electricity

Current AI models require significant computing power, and generative AI systems might already use around 33 times more energy[72] to complete a task than task-specific software would. The energy consumption of AI systems can be divided into two main phases: training and deployment (or inference). Training large AI models, such as OpenAI's GPT-3, is particularly energy-intensive. For instance, training GPT-3 is estimated to consume nearly 1,300 megawatt-hours (MWh) of electricity,[73] which is equivalent to the annual power

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[72] Luccioni, Sasha, Yacine Jernite, and Emma Strubell. "Power hungry processing: Watts driving the cost of AI deployment?." In The 2024 ACM Conference on Fairness, Accountability, and Transparency, pp. 85-99. 2024.
[73] Vincent, James. 2024. "How Much Electricity Do AI Generators Consume?" The Verge, February 16, 2024. https://www.theverge.com/24066646/ai-electricity-energy-watts-generative-consumption.

consumption of about 7,000 homes in Sub-Saharan Africa (except South Africa).[74] Deployment, while less energy-intensive than training, still requires significant power, especially for large-scale applications like ChatGPT.

State of Electricity in Africa

Across Africa, over 600 million Africans lack access to electricity, resulting in an electricity access rate of just over 40%—the lowest in the world.[75] This lack of access poses significant barriers to health care, education, and economic productivity, and to achieve Africa's energy and climate goals by 2030, it will require annual investments of over USD 200 billion. Current investments are insufficient at around USD 110 billion set to be invested in 2024, of which nearly USD 70 billion is allocated to fossil fuel supply and power.[76] Compounding this, the continent faces challenges with inefficient grids and insufficient interconnections, which create bottlenecks for new renewable energy projects.

Nonetheless, Africa has vast untapped renewable energy resources, including solar, wind, hydro, and geothermal energy. The continent is focusing on increasing its renewable energy capacity, with significant projects in countries like Egypt, Morocco, and South Africa. Initiatives like Power Africa aim to add 30,000 MW by 2030, with nearly 7,000 MW of projects expected to reach financial close by 2024,[77] and Desert to Power Initiative by the African Development Bank (AfDB) that aims to generate 10 GW of solar power by 2030, providing electricity to 250 million people across 11 Sahel countries.[78]

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[74] African Development Bank and African Development Bank Group. 2019. "Light up and Power Africa – a New Deal on Energy for Africa." African Development Bank Group. July 5, 2019. https://www.afdb.org/en/the-high-5/light-up-and-power-africa-%E2%80%93-a-new-deal-on-energy-for-africa.

[75] World Bank Group. 2024. "New Partnership Aims to Connect 300 Million to Electricity by 2030." World Bank, June 17, 2024. https://www.worldbank.org/en/news/press-release/2024/04/17/new-partnership-aims-to-connect-300-million-to-electricity-by-2030.

[76] International Energy Agency. "World Energy Investment 2024: Africa." Accessed August 31, 2024. https://www.iea.org/reports/world-energy-investment-2024/africa.

[77] U.S. Agency for International Development. Power Africa: Annual Report to Congress 2024. Accessed August 31, 2024. https://www.usaid.gov/sites/default/files/2024-07/508_PowerAfrica-Congress-Report-2024_Interactive_Pages.pdf.

[78] African Development Bank and African Development Bank Group. 2024. "The African Development Bank's Desert to Power Initiative." African Development Bank Group. June 1, 2024. https://www.afdb.org/en/news-and-events/african-development-banks-desert-power-initiative-71072.
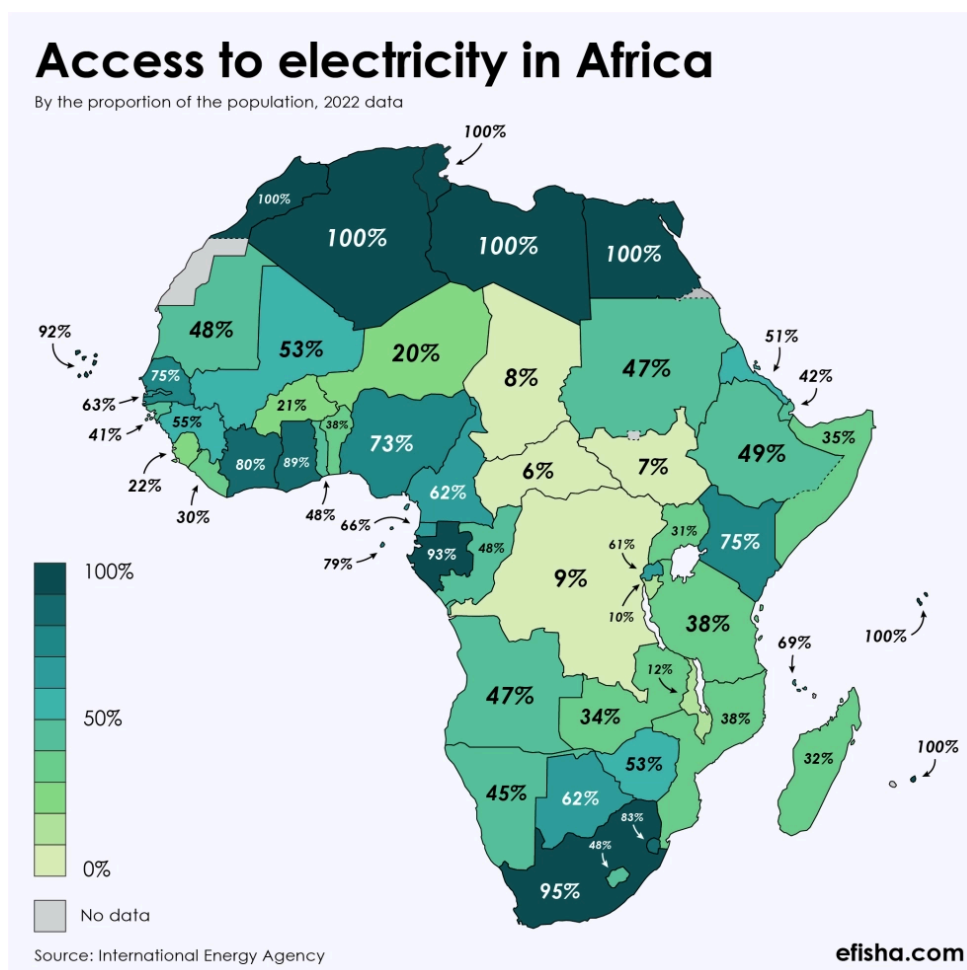
Emissions & Digital Waste

Even as African countries pursue measures to improve access to cheap and reliable electricity, it is important to recognize the environmental impact of AI infrastructure developments. According to its latest environmental report, Google's greenhouse gas emissions in 2023 were 48% higher than in 2019 primarily driven by growth in AI.[79] UNCTAD's Digital Economy Report 2024[80] paint a similar picture across the ecosystem — digital technologies are contributing to escalating energy and water usage, which poses a growing environmental concern. Additionally the UNCTAD report highlighted that generation of digital waste has increased significantly, with developing countries

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[79] Rahman-Jones, Imran. 2024. "AI Means Google's Greenhouse Gas Emissions up 48% in 5 Years." July 3, 2024. https://www.bbc.com/news/articles/c51yvz51k2xo.

[80] "Digital Economy Report 2024." 2024. UNCTAD. July 10, 2024. https://unctad.org/publication/digital-economy-report-2024.

disproportionately affected by these environmental costs while reaping fewer economic benefits.

In the US, the Artificial Intelligence Environmental Impacts Act of 2024[81] was introduced to assess and mitigate the environmental impacts of AI technologies. It emphasises transparency and accountability in AI development and usage. The Act mandates the National Institute of Standards and Technology (NIST) to oversee the measurement and reporting of AI's environmental impacts, promoting sustainable practices. Meanwhile, the EU has extended the EcoDesign Directive[82] to include servers and data storage products, setting minimum energy efficiency requirements to reduce the environmental impact of AI infrastructure. Additionally, the Waste Electrical and Electronic Equipment (WEEE) Directive[83] ensures responsible management of electronic waste, including AI hardware, promoting recycling and reducing pollution.

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[81] "Text - S.3732 - 118th Congress (2023-2024): Artificial Intelligence Environmental Impacts Act of 2024." n.d. Congress.Gov | Library of Congress. https://www.congress.gov/bill/118th-congress/senate-bill/3732/text.
[82] "Ecodesign for Sustainable Products Regulation." n.d. European Commission. https://commission.europa.eu/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/sustainable-products/ecodesign-sustainable-products-regulation_en.
[83] "Waste From Electrical and Electronic Equipment (WEEE)." n.d. Environment. https://environment.ec.europa.eu/topics/waste-and-recycling/waste-electrical-and-electronic-equipment-weee_en.

World
7.8
1.75 ⟳ 22.3%

Europe
17.6
7.53 ⟳ 42.8%

Oceania
16.1
6.66 ⟳ 41.4%

Americas
14.1
4.2 ⟳ 30%

Asia
6.4
0.76 ⟳ 11.8%

Africa
2.5
0.018 ⟳ 0.7%

2022

E−waste generation per capita in kg

■ E-waste generated per capita in kg ■ E-waste documented to be collected and recycled per capita in kg
⟳ Annual average formal collection and recycling rate
Minor inconsistencies may have occurred due to rounding of values during the calculations.

Source: The Global E-waste Monitor 2024

Source: ITU

What should African countries do?

Currently, 13 African countries have formal e-waste policies, legislation, or regulations in place. However, the continent generates about 2.9 million tonnes of e-waste annually, with only 1% formally documented as collected or recycled.[84] Informal recycling practices are widespread in Africa, leading to environmental pollution and health risks due to improper handling of hazardous substances.[85]

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[84] "E-waste Policy Toolkit." n.d. ITU.
https://www.itu.int/en/ITU-D/Environment/Pages/Toolbox/WEEE-Africa-Toolkit.aspx.
[85] Andeobu, Lynda, Santoso Wibowo, and Srimannarayana Grandhi. 2023. "Informal E-waste Recycling Practices and Environmental Pollution in Africa: What Is the Way Forward?" International Journal of Hygiene and Environmental Health 252 (July): 114192. https://doi.org/10.1016/j.ijheh.2023.114192.

To address these issues effectively in adoption of AI tools, African countries can engage in the following interventions:

1. **E-Waste Regulations:** African countries should adopt and enforce regulations in line with the Bamako Convention,[86] which bans the import of hazardous waste, including e-waste, into Africa. This would help manage the illegal transboundary movement of e-waste from developed countries to Africa.

2. **Strengthening E-Waste Management:** Countries need to develop comprehensive e-waste management policies that include formal recycling systems to replace informal recycling practices that pose health and environmental risks.

3. **International Partnerships and Accountability:** African countries should leverage international platforms and agreements to hold developed nations accountable for their contributions to global emissions and digital waste. This can be achieved by advocating for stronger global regulations and equitable resource distribution.

4. **Use of Green Energy:** Governments can promote the use of renewable energy for AI in Africa through: subsidies and tax rebates for electric vehicles (EVs), solar panels, and other green products, as well as tax rebates for meeting energy efficiency and emission standards;[87]developing green certification schemes to incentivize environmentally friendly practices in the AI sector,[88] and exploring digital twin technologies to simulate energy supply and demand scenarios. A digital twin is a digital model of a potential or actual physical product or system. It could help to optimise data-centre siting for renewable energy access and inform strategic decisions around grid development.

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[86] "The Bamako Convention." n.d. UNEP - UN Environment Programme.
https://www.unep.org/explore-topics/environmental-rights-and-governance/what-we-do/meeting-international-environmental.
[87] EY. "Six Ways That Governments Can Drive the Green Transition." EY Insights. Accessed August 31, 2024.
https://www.ey.com/en_gl/insights/government-public-sector/six-ways-that-governments-can-drive-the-green-transition.
[88] Chan, Kenddrick, Devorah West, Marie Teo, Harriet Brown, Tom Westgarth, and Thomas Smith. 2024.
"Greening AI: A Policy Agenda for the Artificial Intelligence and Energy Revolutions." May 29, 2024.
https://www.institute.global/insights/climate-and-energy/greening-ai-a-policy-agenda-for-the-artificial-intelligence-and-energy-revolutions.

5.2.2. Compute

Compute, at its core, refers to the process of calculation or determination through mathematical or logical methods. In modern usage, it often involves using computers or other electronic devices to perform these calculations. AI systems need to process vast amounts of data to learn and perform tasks and complex AI algorithms require significant computational resources to run effectively. To measure computing power, we measure the capacity of a system to perform computation; the amount of work a computer system can perform in a given time. This is often measured in floating-point operations per second (FLOPS) for scientific computing.[89]

The 2021-2022 Global Computing Index Assessment Report[90] highlights that on average, for every 1-point increase in the Computing Index of the 15 key countries, the national digital economy and GDP will increase by 3.5% and 1.8%, respectively, and that trend is expected to continue through 2025.
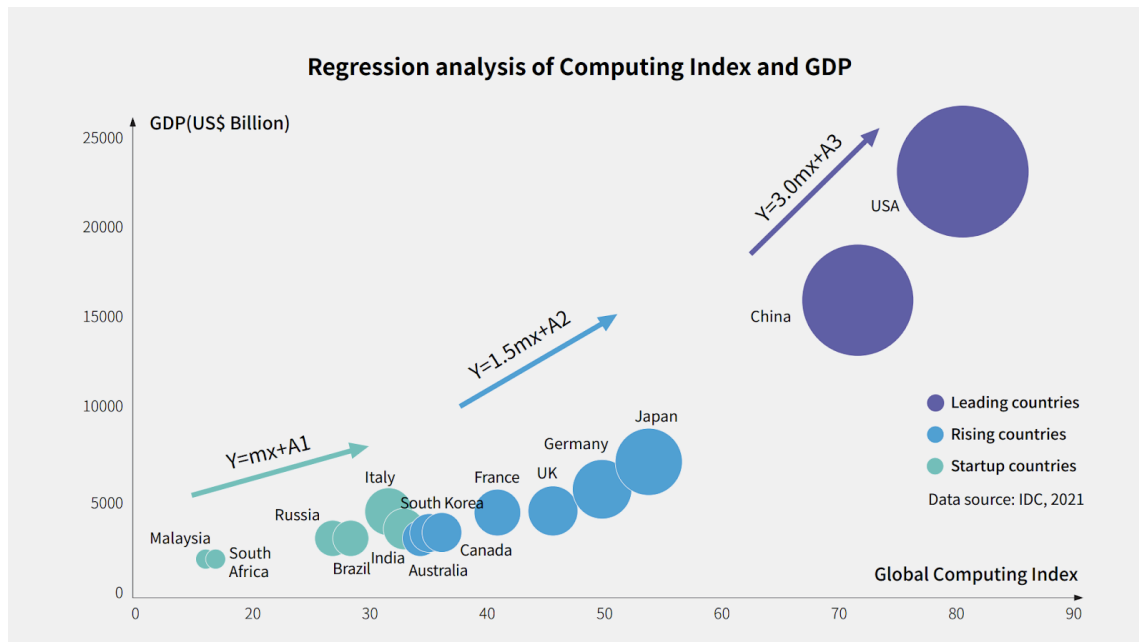
Regression analysis of Computing Index and GDP. Source: 2021-2022 Global Computing Index Assessment Report

The growth of the global computing index is primarily driven by advancements in emerging technologies, both in terms of their computing capabilities and practical applications. This

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[89] Dalrymple, Tate, and Saif M. Khan. "A Primer on Compute." Carnegie Endowment for International Peace, April 2024. https://carnegieendowment.org/posts/2024/04/a-primer-on-compute?lang=en.
[90] IDC. "2021-2022 Global Computing Index Assessment Report." 2022.

creates a symbiotic relationship: investments in computing power lay the groundwork for developing new technology applications, while the demand for these applications, in turn, spurs further computing advancements. This cyclical process amplifies the overall impact on economic growth.

At the same time, according to the EU Artificial Intelligence Act (EU AI Act),[91] if the cumulative compute power used to train a model exceeds 10^{25} floating point operations (FLOPs), the model is considered to have "high-impact capabilities" and is classified as posing a systemic risk. This threshold is significant because models that meet or exceed this level of compute power are subject to additional regulatory requirements due to their potential to cause serious, far-reaching impacts on public health, safety, or fundamental rights.[92] In comparison, President Biden's Executive Order 14110[93] on the Safe, Secure and Trustworthy Development and Use of Artificial Intelligence (Executive Order) specifies 10^{26} FLOPs as the threshold for triggering certain reporting obligations to the Federal Government (Section 4.2(b)(i)) and being deemed a dual-use foundation model capable of malicious cyber-enabled activity (Section 4.2(c)(iii)).

In Africa, the most powerful computer is the Toubkal, located at the African Supercomputing Center (ASCC) in Morocco.[94] Toubkal has a peak performance of 5.02 petaflops which is equivalent to 5.02×10^{15} FLOPs — 240 times smaller than the most powerful (known) supercomputer, Frontier, located at Oak Ridge National Laboratory in Tennessee, USA, with 1.206 exaflops.[95]

To improve compute capacity in their countries, policymakers can implement a range of policies, regulations, and governance structures. Here are some key strategies:

1. **Investment in Infrastructure:** Governments should prioritise investment in digital infrastructure, including data centres and high-speed internet, to support increased

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[91] "What Is the EU AI Act? | IBM." n.d. https://www.ibm.com/topics/eu-ai-act.

[92] Fenwick. 2024. "Technological Challenges for Regulatory Thresholds of AI Compute." Fenwick. August 20,2024. https://www.fenwick.com/insights/publications/interesting-developments-for-regulatory-thresholds-of-ai-compute.

[93] House, White. 2023. "Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence." The White House. October 30, 2023. https://www.whitehouse.gov/briefing-room/presidential-actions/2023/10/30/executive-order-on-the-safe-secure-and-trustworthy-development-and-use-of-artificial-intelligence/.

[94] "Africa Launches Powerful Supercomputer." n.d. University World News. https://www.universityworldnews.com/post.php?story=20210228193908881.

[95] "June 2024 | TOP500." n.d. https://top500.org/lists/top500/2024/06/.

compute capacity.[96] This could include shared regional infrastructure and leveraging distributed computing techniques. For example, in May 2024, China set up Big Fund III, US$47.5 billion for semiconductor (chips) development to build a self-sufficient semiconductor industry and overcome US export restrictions that have handicapped the sector.[97]

2. **Coordinating Entity:** Establish strong national and regional coordinating bodies to facilitate access to computing resources, promote shared investment plans, and provide necessary training. This entity can help streamline efforts and ensure efficient use of resources. For example, the Gauss Centre for Supercomputing (GCS)[98] is Germany's main organising body for high-performance computing. It was created through a partnership between the German federal and state governments. GCS brings together the three biggest computing facilities in the country. Its goal is to improve scientific research and new ideas by making powerful computers more available to researchers. GCS helps scientists get access to these computers, offers help to users, and provides training. The centre also works with other countries as part of PRACE, an international supercomputing group. In this role, GCS speaks for Germany and shares its computing power and know-how with other PRACE members.

3. **Lower Barriers to Access:** Facilitate greater uptake of computing resources by lowering barriers to access, such as providing cloud access and targeted support for users. This can help increase the use of computing technologies across different sectors. For example, in the US the STRIDES program[99] helps scientists use cloud computing for medical studies, while CloudBank[100] assists computer experts with cloud access for their work and teaching. They are also creating a new system called the National AI Research Resource, which will combine different types of advanced computing to give AI researchers the tools and information they need. Some

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[96] Boakye, Bridget, Melanie Garson, Benedict Macon-Cooney, Tom Westgarth, and Kevin Luca Zandermann. 2023. "State of Compute Access: How to Bridge the New Digital Divide." December 7, 2023. https://www.institute.global/insights/tech-and-digitalisation/state-of-compute-access-how-to-bridge-the-new-digital-divide.

[97] Pan, Che, and Che Pan. 2024. "Tech War: China's Big Fund III Brings US$47.5 Billion in Fresh Outlay for Nation's Semiconductor Supply Chain, Analysts Say." South China Morning Post, May 29, 2024. https://www.scmp.com/tech/tech-war/article/3264612/tech-war-chinas-big-fund-iii-brings-us475-billion-fresh-outlay-nations-semiconductor-supply-chain.

[98] Gauss Centre for Supercomputing. "Gauss Centre for Supercomputing." Accessed August 31, 2024. https://www.gauss-centre.eu/.

[99] "STRIDES Initiative | Data Science at NIH." n.d. https://datascience.nih.gov/strides.

[100] "Welcome to CloudBank | CloudBank." n.d. https://www.cloudbank.org/.

programs are open to businesses too, like the Department of Energy's INCITE[101] and HPC4EI.[102] These offer access to high-performance computers and expert help for projects that aim to reduce environmental damage in manufacturing, materials, and energy industries.

4. **Procurement Models:** Adopt effective and innovative procurement models that lower costs and mitigate technological risks. Joint procurement at national or international levels can offer economic and technological advantages. For example, the US, through its Exascale Computing Initiative,[103]US Department of Energy (DOE) labs are now working together to buy systems. As they aim to improve their abilities, the US is looking into changing from buying whole systems at once to a step-by-step upgrade approach. New systems will be part of a larger, more connected setup that works with other DOE facilities.

Case Study: US Chips Act
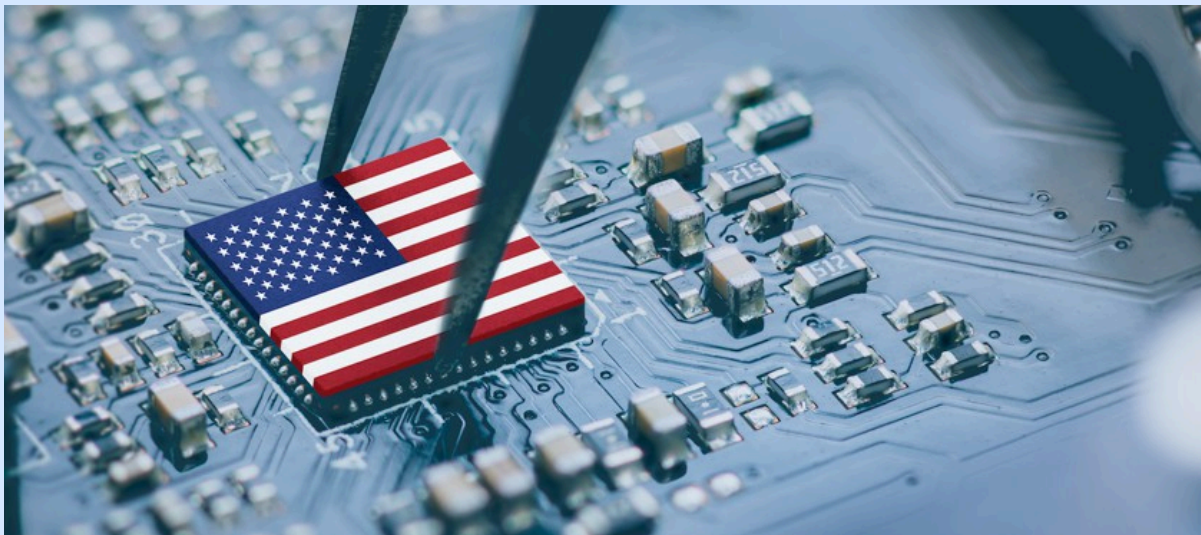
The **CHIPS and Science Act** is a significant piece of legislation enacted in August 2022, aimed at revitalising the semiconductor industry in the United States. Officially known as the *Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act*, it is designed to address the decline in domestic semiconductor manufacturing and bolster

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[101] Argonne Leadership Computing Facility. "INCITE Allocation Program." Accessed August 31, 2024. https://www.alcf.anl.gov/science/incite-allocation-program.
[102] Lawrence Livermore National Laboratory. "HPC4 Energy Innovation." Accessed August 31, 2024. https://hpc4energyinnovation.llnl.gov/.
[103] Exascale Computing Project. 2024. "Home Page - Exascale Computing Project." May 3, 2024. https://www.exascaleproject.org/.

U.S. competitiveness in this critical sector.

Objectives and Funding

The CHIPS Act allocates $52.7 billion in federal funding to support semiconductor manufacturing, research, and development in the U.S. This includes:

- **$39 billion** for manufacturing incentives, which covers the construction and expansion of semiconductor fabrication facilities (fabs).

- **$13.2 billion** for research and development and workforce development.

- A **25% investment tax credit** for capital expenses related to semiconductor manufacturing.

Strategic Goals

The Act aims to:

- **Increase U.S. Semiconductor Production**: The U.S. share of global semiconductor manufacturing has dropped from 37% in 1990 to 12% today. The Act seeks to reverse this trend by incentivizing domestic production.

- **Enhance National Security**: By reducing reliance on foreign semiconductor sources, particularly from countries like China, the Act aims to strengthen national security.

- **Create Jobs and Spur Economic Growth**: The legislation is expected to create thousands of high-skilled manufacturing jobs and catalyse private sector investments amounting to hundreds of billions of dollars.

Restrictions and Conditions

The funding comes with certain restrictions, notably prohibiting recipients from expanding semiconductor manufacturing in China and other countries deemed as national security threats for a period of ten years. This is intended to ensure that the benefits of the Act support U.S. interests.

Challenges and Criticisms

Despite its ambitious goals, the CHIPS Act faces several challenges:

- **High Costs and Delays**: Building new semiconductor facilities is extremely costly,

with projects often exceeding $5 billion. Companies like Intel and TSMC have already faced delays due to construction costs and supply chain issues.

- **Workforce Development**: There is a recognized shortage of trained workers in the semiconductor industry, which could hinder the rapid expansion of domestic manufacturing.

- **Geopolitical Concerns**: The Act's restrictions on manufacturing in certain countries could lead to geopolitical tensions and require companies to carefully evaluate their global strategies.

Overall, the CHIPS and Science Act represents a major federal effort to secure the United States' position in the global semiconductor industry, addressing both economic and strategic imperatives.

Africa's Takeaway

African nations can use the CHIPS Act as a model to develop their own legislation, frameworks and supplier networks to support value addition in semiconductor-related activities. This could include processing of raw materials, chip design, quality control, backend manufacturing functions, flash memory or electric battery production.[104] Rather than simply exporting raw materials, African countries can aim to move up the value chain.

5.2.3. Connectivity

There are four general types of connectivity that facilitate access to Artificial Intelligence technologies and systems — broadband, mobile, satellite, and dial-up. As of 2021, only 0.4% of the African population had fixed-broadband access with high cost remaining a significant barrier to adoption.[105] Meanwhile, mobile connectivity remains the primary means of internet access in Africa, driven by the widespread adoption of mobile technology. By 2024, Africa is expected to have around 1.2 billion mobile connections. [106]

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[104] Jcookson. 2023. "How The US Can Build Better Strategic Partnerships in Africa to Secure Critical Minerals." Atlantic Council. October 12, 2023. https://www.atlanticcouncil.org/blogs/new-atlanticist/how-the-us-can-build-better-strategic-partnerships-in-africa-to-secure-critical-minerals/.

[105] Karen. 2024. "Assessing the Progress of Internet Activity in Africa." Telecom Review Africa. April 18, 2024. https://www.telecomreviewafrica.com/articles/features/4206-assessing-the-progress-of-internet-activity-in-africa/.

[106] Admin. 2024. "State of Broadband Report 2024: 1.2 Billion Mobile Connections in Africa by 2024." Extensia Ltd. June 21, 2024. https://extensia.tech/state-of-broadband-report-2024-1-2-billion-mobile-connections-in-africa-by-2024/.

However, the region still faces substantial coverage and usage gaps, with affordability, once more, being a major barrier to wider adoption.[107]

Satellite internet is emerging as a promising solution to connectivity challenges in Africa, especially in remote areas. Starlink, for example, has expanded its services to several African countries, providing high-speed, low-latency internet.[108] The introduction of satellite internet is expected to lower data costs and improve access in underserved regions, although regulatory challenges and the high cost of satellite hardware remain issues.

The ITU Broadband Commission reports[109] that connecting 1.1 billion new users to achieve universal, affordable, high-quality internet by 2030 would require an additional $100 billion investment over the next decade. Despite these obstacles and other contextual limitations, Africa is uniquely positioned to develop an innovative AI ecosystem. The continent's advantage lies in its relative freedom from outdated digital infrastructure and lower levels of spectrum use and congestion. While fixed broadband adoption remains below 1% in Africa, mobile internet is more widespread and cost-effective. Consequently, the growth of Africa's AI landscape will likely be driven primarily by mobile broadband networks.

To address connectivity opportunities and challenges, African States can do the following;

1. **Network Infrastructure Sharing**: Encouraging telecom operators to share infrastructure can reduce costs and expand coverage. For instance, Spain's regulatory framework mandates infrastructure sharing to eliminate bottlenecks and promote competition.[110]Since 2009, Telefónica, a major operator, is required to provide access to its ducts and conduits (MARCO offer) to other operators. This

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[107] GSMA. 2024. "Despite Improvements, Sub-Saharan Africa Has the Widest Usage and Coverage Gaps Worldwide." Mobile for Development. August 13, 2024.
https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/blog/despite-improvements-sub-saharan-africa-has-the-widest-usage-and-coverage-gaps-worldwide/.
[108] Agbetiloye, Adekunle. 2024. "List of African Countries Where Starlink Is Operational in 2024." Business Insider Africa, September 2, 2024.
https://africa.businessinsider.com/local/markets/list-of-african-countries-where-starlink-is-operational-in-2024/9gklgg9.
[109] ITU/UNESCO Broadband Commission for Sustainable Development. 2022. "Connecting Africa Through Broadband: A Strategy for Doubling Connectivity by 2021 and Reaching Universal Access by 2030 - Broadband Commission." Broadband Commission. June 30, 2022.
https://www.broadbandcommission.org/publication/connecting-africa-through-broadband/.
[110] ITU/UN tech agency. 2021. "Infrastructure Sharing and Network Competition in Spain – Regulating for Network Competition." ITU. November 30, 2021.
https://www.itu.int/hub/2020/05/infrastructure-sharing-and-network-competition-in-spain-regulating-for-network-competition/.

regulation aims to reduce deployment costs and enhance competition in service offerings.

2. **Investment in Undersea Cables**: Strengthening undersea cable networks can mitigate disruptions and improve internet access. Africa has seen significant developments in this area, with projects like Google's Equiano cable and Meta's 2Africa cable enhancing connectivity.

3. **Enhancing Competition**: Implementing policies that foster competition among internet service providers (ISPs) can lead to better services and lower prices. Regulatory bodies can ensure fair competition by preventing monopolistic practices and encouraging new entrants into the market.

4. **Operationalizing Regional Internet Exchange Points (RIXPs)**: RIXPs can reduce costs and improve internet speed by keeping local traffic within the region, thus reducing dependency on international bandwidth.[111]

5. **Universal Service Obligations:** Governments can mandate ISPs to provide affordable internet access to rural and underserved areas, ensuring that all citizens benefit from digital connectivity. Many countries establish funds to subsidise the cost of providing universal services. For instance, India has the Universal Service Obligation Fund (USOF),[112] which supports the expansion of telecommunication services to rural and underserved areas

5.2.4. Devices

In a 2020 paper, GSMA found that a 10% increase in the adoption of (any) mobile technology increases GDP between 0.5 and 1.2 percent worldwide.[113] However, the digital divide — the gap between individuals, communities, and regions that have access to modern information and communication technology (ICT) and those that do not — still remains persistent across Africa. The main hindrance to ICT access is due to their high cost. Research shows that device affordability (the ratio between the price of a device and a person's income). A device is deemed unaffordable if the price represents an excessive

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[111] "The Importance of Regional Internet Exchanges | Datum Datacentres." 2024. Datum. February 14, 2024. https://www.datum.co.uk/insights/blog/the-importance-of-regional-internet-exchanges/.
[112] Universal Service Obligation Fund. "Universal Service Obligation Fund." Accessed August 31, 2024. https://usof.gov.in/en/home.
[113] GSMA Intelligence. Mobile Technology and Economic Growth: A Working Paper. Accessed August 31, 2024. https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=54165922&file=121120-working-paper.pdf.

share of a person's income. In addition to the high cost of ICT across Africa, this divide is exacerbated by the low digital literacy rate i.e., the ability to effectively use computers, smartphones, and internet connectivity more generally. these technologies due to differences in digital literacy.[114]

Africa as a Source of Critical Minerals

Africa is a major source of minerals used in smartphones, laptops, and other electronic devices. The continent holds large reserves of critical minerals like cobalt, tantalum, graphite, rare earth elements, and platinum group metals. For example, the Democratic Republic of Congo produces over 70% of global cobalt, which is key for lithium-ion batteries.[115] Africa also supplies other important minerals for electronics, such as copper from Zambia, bauxite from Guinea, and gold from several countries.[116] These resources put Africa at the centre of the global electronics supply chain, with the continent holding about 30% of the world's mineral reserves.

While Africa's mineral wealth offers big economic opportunities, it also brings challenges. Many African countries export raw materials instead of processed minerals, missing out on added value. There are also worries about environmental damage and poor working conditions in some mining areas.[117] African nations are trying to use their minerals to boost economic growth, but they need to balance this with protecting the environment and people's wellbeing. As demand for these minerals is expected to rise sharply in coming years, Africa's role in supplying them is becoming more important in global politics and trade.

Smartphone Access

The switch from basic mobile phones to smartphones has big effects on users, especially in Africa and developing countries. Smartphones give access to the internet, apps, and many digital services like mobile banking and online education, while basic phones mostly just do calls and texts. This means smartphone users can take part more fully in the digital world and economy. Smartphones also allow for better health apps and services. However,

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[114] GSMA. 2023. "Making Internet-enabled Handsets More Affordable." Mobile for Development. November 30, 2023. https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/blog/making-internet-enabled-handsets-more-affordable/.

[115] "Harnessing Sub-Saharan Africa's Critical Mineral Wealth." 2024. IMF. April 29, 2024. https://www.imf.org/en/News/Articles/2024/04/29/cf-harnessing-sub-saharan-africas-critical-mineral-wealth.

[116] Mo Ibrahim Foundation. Minerals and Resource Governance in Africa: 2022 Report. Accessed August 31, 2024. https://mo.ibrahim.foundation/sites/default/files/2022-11/minerals-resource-governance.pdf.

[117] See e.g., Siddharth Kara, *Cobalt Red: How the Blood of the Congo Powers Our Lives*, 2023.

smartphones cost more and need better phone networks, which can make them harder to get in some areas.[118] They also require more tech know-how to use. Because of this, smartphone ownership often shows differences in income, education, and where people live. Young, educated, city dwellers are more likely to have smartphones, while older and rural people often stick with basic phones.[119] This gap in who owns what kind of phone can lead to some people missing out on digital opportunities. Even so, more people getting smartphones is seen as a sign of tech progress and could help grow the economy in African countries.

Government Response

There are several key actions that regulators and policy makers in Africa can take to help close smartphone ownership gaps and maximise benefits from critical mineral resources used in smartphones, laptops, and other technologies:

1. **Develop local processing and manufacturing capabilities:** African countries should focus on adding value domestically through processing and manufacturing rather than just exporting raw minerals. This would create higher value-added products, generate additional employment, and foster industrial diversification.[120] For example, processing raw bauxite into aluminium can increase its value from $65 per ton to $2,335 per ton.[121]

2. **Implement regional coordination and integration:** African countries should collaborate to create larger regional markets and value chains for critical minerals. The African Continental Free Trade Area (AfCFTA) can play a key role in reducing trade barriers and developing infrastructure to unite fragmented mineral markets. Regional coordination can help pool resources, overcome infrastructure challenges, and promote technology transfer.

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[118] Diallo, Kofi, and Kofi Diallo. 2024. "African Countries With the Highest Number of Mobile Phones." William Kwamba. July 26, 2024. https://williamkamkwamba.com/african-countries-mobile-phones/.

[119] Okano, Justin T, Joan Ponce, Matthias Krönke, and Sally Blower. 2022. "Lack of Ownership of Mobile Phones Could Hinder the Rollout of mHealth Interventions in Africa." eLife 11 (October). https://doi.org/10.7554/elife.79615.

[120] Atripp. 2024. "The Critical-minerals Boom Is Here. Can Africa Take Advantage?" Atlantic Council. March 18, 2024. https://www.atlanticcouncil.org/blogs/africasource/the-critical-minerals-boom-is-here-can-africa-take-advantage/.

[121] "Harnessing Sub-Saharan Africa's Critical Mineral Wealth." 2024. IMF. April 29, 2024. https://www.imf.org/en/News/Articles/2024/04/29/cf-harnessing-sub-saharan-africas-critical-mineral-wealth.

3. **Reduce taxes and import duties on smartphones:** Many African governments impose high taxes and import duties on smartphones, treating them like luxury goods.[122] This significantly increases the final price for consumers. Regulators and policy makers should:

    a. Design tax reforms that consider the economic and social benefits of increased mobile broadband penetration.

    b. Take a long-term, balanced approach to taxation that meets revenue goals while creating an environment conducive to digital inclusion.

    c. Reduce or eliminate taxes for devices below certain price thresholds to incentivize manufacturers to cut prices.

4. **Enable and support device financing initiatives:** For many consumers, the upfront cost of a smartphone is prohibitively expensive. Regulators and Policymakers can:

    a. Create policies and regulations that enable mobile operators and other companies to offer device financing programs.

    b. Support targeted financing programs for marginalised groups like women, rural residents, and low-income individuals.

    c. Allow integration of device financing with mobile money services to support repayments and credit assessments.

5. **Improve distribution channels:** Many rural and remote areas lack access to smartphone retail outlets. Regulators can:

    a. Incentivize partnerships between mobile operators and local retail chains or community organisations to expand distribution.

    b. Support programs to train sales agents on assisting first-time smartphone buyers

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[122] ITU/UNESCO Broadband Commission for Sustainable Development. 2022. "Working Group on Smartphone Access - Broadband Commission." Broadband Commission. November 9, 2022. https://www.broadbandcommission.org/working-groups/smartphone-access/.

6. **Improve governance and transparency:** Implementing reforms for better fiscal administration, good governance of extractive sectors, and responsible mining practices is essential. This includes promoting transparency, accountability, rooting out corruption, and combating illicit financial flows to ensure equitable sharing of benefits.

Case Study: East Africa Device Assembly Kenya Limited (EADAK)

Source: Safaricom

East Africa Device Assembly Kenya Limited (EADAK) serves as a case study for smartphone ownership and government support in Kenya. This initiative highlights the country's efforts to increase digital access and foster technological growth.

Background

EADAK is a joint venture between local mobile operators Safaricom and Jamii Telecom, and Chinese manufacturer Shenzhen TeleOne Technology[123]. The facility, located in Athi River, Machakos County, was officially opened by Kenyan President William Ruto in late 2023.

Production Capacity and Goals

The EADAK plant has an impressive annual production capacity of up to 3 million mobile phone units. This significant output potential demonstrates Kenya's commitment to becoming a regional leader in smartphone manufacturing and assembly.

Product Offerings

EADAK's initial product lineup includes:

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[123] Gilbert, Paula. 2024. "Kenya Opens Smartphone Assembly Factory." Connecting Africa, April 26, 2024. https://www.connectingafrica.com/author.asp?doc_id=786617§ion_id=761.

1. Neon 5-inch "Smarta" (4G-enabled)

2. 6.5-inch "Ultra" (4G-enabled)

These devices are designed to be affordable while still providing 4G connectivity, which is crucial for digital inclusion. The company also plans to introduce a locally assembled tablet device in the near future.

Pricing and Accessibility

One of the key aspects of EADAK's strategy is to make smartphones more affordable for Kenyan consumers. The devices are priced starting from 7,499 Kenyan shillings (approximately $50). This pricing strategy aligns with the government's goal of increasing smartphone penetration in the country.

Distribution

To ensure wide availability, EADAK's products will be distributed through various channels:

- Faiba shops

- Dealer stores

- Safaricom shops

- Masoko online platform

This multi-channel approach aims to make the devices accessible to a broad range of consumers across Kenya.

Government Support and Vision

The Kenyan government has shown strong support for this initiative, viewing it as a crucial step towards digital transformation and economic growth. President William Ruto emphasised that "going digital on a large scale" will spur Kenya's growth and bring the country closer to realising its development agenda.

The government's involvement is part of a broader strategy to boost digital access in Kenya. This aligns with the Kenya Digital Economy Acceleration Project (KDEAP), supported by a $390 million grant from the World Bank[124]. The project aims to increase access to high-speed internet, develop digital government services, and equip young

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[124] "Kenya Digital Economy Acceleration Project (KDEAP)." 2024. International Trade Administration | Trade.Gov. January 17, 2024. https://www.trade.gov/market-intelligence/kenya-digital-economy-acceleration-project-kdeap.

Kenyans with digital skills.

Impact on Smartphone Penetration

The establishment of EADAK comes at a time when smartphone adoption in Kenya is on the rise. According to the Communications Authority of Kenya, smartphone penetration increased from 54% in June 2022 to 61% in June 2023[125]. The total number of mobile phone devices connected to networks stood at 62.9 million in the fourth quarter of the 2022/23 financial year, with a penetration rate of 124.4%.

Economic and Employment Benefits

Beyond increasing smartphone accessibility, EADAK is expected to generate between 300 and 500 direct jobs. This contribution to employment aligns with the government's broader economic development goals.

Challenges and Future Outlook

While EADAK represents a significant step forward, there are challenges to overcome. Initially, the project aimed to produce phones retailing at around 5,000 Kenyan shillings, but taxes and other factors have pushed the price higher[126]. Addressing these issues will be crucial for achieving the goal of truly affordable smartphones for all Kenyans.

As EADAK continues to develop and potentially expand its product range, it will be interesting to observe its impact on Kenya's digital landscape. The success of this initiative could serve as a model for other African countries looking to boost local manufacturing and increase digital access.

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[125] Obura, Fred. 2023. "Smartphone Penetration in Kenya Rises 61 per Cent to 30.8Million." Kenyan Wall Street - African Business and Global Finance. September 25, 2023. https://kenyanwallstreet.com/smartphone-penetration-in-kenya-rises-61-per-cent-to-30-8million/.

[126] Dennis Musau, "Kenyan Telcos to Set up Smartphone Factory; Devices to Retail From Ksh.11,500," *Citizen Digital*, September 5, 2024, https://www.citizen.digital/business/kenyan-telcos-to-set-up-smartphone-factory-devices-to-retail-from-ksh11500-n320295.

6. Promoting AI Innovation

Technology entrepreneurs in Africa face a myriad of challenges that result in many promising businesses failing to take off, or slowly descending into collapse after a few years of operation. Some of these challenges include: scarce capital, complex regulatory environments that increase cost of doing business or limit access to markets; inadequate or costly infrastructure such as electricity and internet access; low consumer purchasing power; political instability etc.[127]

Governments have a crucial role to play in mitigating these challenges. Through consistent, cohesive and well-informed intervention, governments can make it easier for innovative businesses to emerge and flourish, for the benefit of every country's socio-economic development.

In this chapter, we examine some of the ways in which the government is positioned to champion innovation. Governments can act as: Stewards; Innovators/Entrepreneurs; Pro-Innovation Regulators; User/Clients, and as Fixers. These roles should be seen not as stand-alone but as co-existing, towards building a cohesive and comprehensive AI innovation ecosystem.

6.1. Government as a Steward

a. Vision-setting

As a steward, the Government provides a long-term vision for AI-led social and economic development. Long term visions are best articulated in strategic blueprints that lay out goals/objectives, and a SMART implementation plan and identify the stakeholders who will realise the plans. Visions should also identify the relevant stakeholders and institutions that would oversee implementing various identified objectives in the long-term.

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[127] Fola Odufuwa & Muriuki Mureithi, *Positioning Africa's Tech Startups as Engines of Growth & Development* (Mozilla, 2023, https://mozilla.africa/wp-content/uploads/2023/11/africa-startup-ecosystem-report-1g.pdf; Hamid Maher et al, *Overcoming Africa's Tech Startup Obstacles* (BCG, 2021), https://www.bcg.com/publications/2021/new-strategies-needed-to-help-tech-startups-in-africa; James Falodun, "STARTUPS CHALLENGES FACED BY AFRICANS," *TAGiAfrica^TM*, June 7, 2024, https://www.tagi.africa/startups-challenges-faced-by-africans/#google_vignette; Au-Startups, "How African Tech Startups Can Navigate Regulatory Challenges - AU-Startups," *AU-Startups - The Gateway to Africa's Startup Ecosystem* (blog), May 15, 2024, https://au-startups.com/2024/05/15/how-african-tech-startups-can-navigate-regulatory-challenges/ausjobs/#:~: text=Common%20Regulatory%20Hurdles%20for%20Tech,%27%20cross%2Dborder%20expansion%20efforts.

In articulating its vision, a Government should begin with general/all-encompassing blueprints such as AI Strategies already covered above, and thereafter develop more categorical blueprints that cover specific aspects of the AI Innovation ecosystem, such as: blueprints for improving market access for entrepreneurs.

For example, Singapore created its Smart Nation Strategy in 2018 which outlines the broad vision of a more technologically empowered economy and society.[128] Since then, the government has developed many other more specific blueprints and frameworks that are components of its "Smart Nation" project.[129] One of these is the Digital Enterprise Blueprint (2024) whose goal is to help SMEs and their workers to embrace digitalization, including AI and data analytics.[130]The blueprint also identifies an implementation plan, notably, a stakeholder-driven approach in which government agencies, trade associations, technology-solution providers, business owners and labour unions work collaboratively to address the needs of specific SME sectors.[131]

The Malaysian Government has also made notable strides in articulating its vision for its innovation ecosystem. The government launched the Malaysia Startup Ecosystem Roadmap (SUPER) 2021-2030 to help generate a robust startup ecosystem.[132] The roadmap was developed after consultation with stakeholders including government agencies, startups, investors, corporations, educational institutions, and incubators/accelerators. It identifies the challenges facing startups in Malaysia and develops specific intervention mechanisms for each challenge identified.

b. Steering stakeholders and institutions

Aside from articulating objectives and implementation strategies, long-term and short-term visions, should also identify the relevant stakeholders that will lead implementation. Such stakeholders could include institutions, or government agencies, industry associations,

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[128] Singapore Smart Nation and Digital Government Office, *Smart Nation: The Way Forward*, 2018, https://www.smartnation.gov.sg/files/publications/smart-nation-strategy-nov2018.pdf.

[129] These include: Digital Readiness Blueprint (2018), Digital Economy Framework for Action (2018), Digital Connectivity Blueprint (2023), Singapore Cybersecurity Strategy (2021), Singapore National AI Strategy 2.0 (2023). See "Frameworks and Blueprints," n.d., https://www.smartnation.gov.sg/frameworks-and-blueprints/.

[130] *Singapore's Digital Enterprise Blueprint*, 2024, https://file.go.gov.sg/deb-report-2024.pdf

[131] *Singapore's Digital Enterprise Blueprint*, 2024, 3, https://file.go.gov.sg/deb-report-2024.pdf

[132] Malaysia Ministry of Science, Technology and Innovation, *Malaysia Startup Ecocystem Roadmap 2021-2030* (2021) https://www.mosti.gov.my/wp-content/uploads/repository/penerbitan/2021/(SUPER)%20Malaysia%20Startup%20Ecosystem%20Roadmap%202021-2030.pdf

startup communities, accelerators and incubators, and advisory committees. The implementation framework should have the following:

- Identify the stakeholders; their roles in the plan; how they will work together, and who will take the overall lead. Governments may utilise already established institutions or create new ones, if it is determined that the existing institutions are unable or unfit to take on certain roles.
- Ensure cohesiveness between the institutions in charge of implementation as well as with other existing government agencies.
- Have a mechanism that allows for continuous learning and review through engagement with stakeholders.

Malaysia once again showcases these elements.

Malaysia's Startup Ecosystem Roadmap includes a governance structure with laid out roles and responsibilities for each stakeholder. It identifies

1. the Economic Planning Unit of the National Digital Economy and 4th Industrial Revolution Council to provide strategic leadership and direction
2. the Ministry of Science, Technology and Innovation to provide policy development advice and ensure policy alignment across ministries and agencies
3. an Advisory Committee to include key ministries, agencies, research universities, an industry panel from the private sector (such as regional VCs, accelerators and incubators) to provide expert views on the startup ecosystem, and
4. Programme Management Office (PMO) that coordinates, tracks and monitors the implementation of the interventions under the Roadmap.[133]

6.2. Government as an Innovator/Entrepreneur

States are not merely stewards or regulators of innovation policy; they can also play a proactive role in initiating and directing innovation programs of strategic national importance.[134] The information revolution as we know it today owes much of its success to a US public sector agency—the Defense Advanced Research Projects Agency (DARPA).

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[133] Ibid, 33.
[134] See generally, Mariana Mazzucato, *The Entrepreneurial State: Debunking Public Vs. Private Sector Myths* (Public Affairs, 2015).

DARPA initiated and funded research on communication protocols for computers, which ultimately resulted in the creation of the system of networks we now call the Internet.[135]

By establishing and funding targeted research at public research institutes and universities, and enhancing collaboration with the private sector for commercialization, states can significantly influence the innovation landscape.

As AI innovators, African governments can:

- Identify flagship projects

- Create national policies around them, and involve all relevant stakeholders in the process- from government agencies, to private sector, universities, civil society etc. This is important for building consensus around major issues and directions.

- Allocate budgetary resources for research and development

- Directly fund local innovators through grants, or low-interest loans

- Ensure policy and institutional coherence in implementation

- Encourage AI innovation by funding targeted AI research in universities, the private sector, and civil society.

- Mandate the creation of research labs in universities and existing public research agencies.

- Establish government or public-sector-owned incubators or accelerators for startups pursuing solutions of national strategic interest.

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[135] Vint Cerf, "History of the Internet & Related Networks - Internet Society," December 22, 2023, https://www.internetsociety.org/internet/history-internet/brief-history-internet-related-networks/

6.3. Government as Client/User

Governments have the unique opportunity of boosting local innovation by providing enterprises with access to its large market and purchasing power. They can do this through a variety of ways – buying/licensing technologies (including AI) through government contracts, partnering with local innovators for public projects, and running pilot programs to test the effectiveness of proposed technology solutions.

To do so, governments need to develop programs/initiatives that give small businesses in technology or AI specifically, access to its procurement contracts. Some of these initiatives could include:

a.   **Reform of procurement laws to be more start-up/small business friendly.**
They could introduce flexible measures for assessing pre-qualification and assessment criteria, or simplify the bidding process. They can also be more transparent about procurement opportunities and provide training to startups to help them meet pre-qualification criteria in the future.

Many countries have reformed their procurement laws in favour of small businesses and startups.

💡Korea has an "**Act on facilitation of purchase of small and medium enterprise-manufactured products and support for development of their markets"[136]** whose objective is to ensure that small and medium enterprises are given more opportunities to win a contract.

Of note is that the Act also has specific provisions on tech startups, and requires the Government to establish necessary supporting policies, such as preferential purchase of products developed by "technological innovation-oriented small and medium enterprises."[137]

Moreover, the implementation of the Act is done in partnership with the small business association, known as the Korea Federation of Small and Medium Business. Korea also

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[136] Government of the Republic of Korea, *Act on the Facilitation of Purchase of Small and Medium Enterprise-Manufactured Products and Support and Development of Their Products*, https://elaw.klri.re.kr/eng_mobile/viewer.do?hseq=62151&type=part&key=28
[137] Ibid, Article 13 (Preferential Purchase of Products Manufactured with Technology Developed by Small and Medium Business Proprietors, etc.)

has other specific laws aimed at facilitating purchase of products and services from marginalised groups such as women, and persons with disabilities.[138]

b. Special initiatives/programs in support of local tech startups

Governments can develop new programs to support tech/AI startups. For instance, Canada's Innovative Solutions Program, the government procures and tests products developed by Canadian-owned businesses prior to their market launch.[139]

Programs need not be entirely new but can evolve from existing institutions that support small businesses. For example, Malaysia plans to create a special procurement program for its tech startups, modelled after its existing impact-driven government procurement program for social enterprises.[140] Through this new initiative, the government aims to co-develop technology solutions with startups to enhance public services.

6.4. Government as a Pro–Innovation Regulator

The design of legal rules can influence the creation and exploitation of economic opportunities, by determining the terms and extent to which individuals/groups can access and exploit economic resources. Legal rules can affect the process of innovation by:

- Defining property rights

- Defining the rules of business formation, mergers, acquisitions, and compliance procedures

- Defining the rules on fair competition

- Providing incentives for research and development

- Improving the terms of access to finance

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[138]A full list of laws relating to Korean SMEs is here:
https://www.mss.go.kr/site/eng/02/20203000000002019110618.jsp
[139]Government of Canada, Innovation, Science and Economic Development Canada, Office of the Deputy Minister, "Testing Stream for Innovators,"
https://ised-isde.canada.ca/site/innovative-solutions-canada/en/testing-stream; "Build in Canada Innovation Program (BCIP)" Burnaby Board of Trade, July 10, 2017,
https://bbot.ca/government-program-spotlight-build-canada-innovation-program-bcip/#:~:text=The%20BCIP%20helps%20provide%20businesses,the%20innovations%20intellectual%20property%20rights.
[140] *Malaysia Startup Ecosystem Roadmap 2021-2030* (2021), 29.

- Enabling experimentation of innovative products or processes

- Defining standards and certification processes

> 💡Unclear, complex, inconsistent regulations and excessively bureaucratic compliance procedures can hinder the success of small and big businesses alike. Similarly, rules need to positively target the needs of small business ventures – this requires closer attention to the ways laws create barriers for them, from laws that define the terms of accessing resources such as finance/capital, to laws that enable market concentration, to compliance processes that are too hectic or too expensive for new ventures.

Policymakers are increasingly designing laws that target emergent startup ecosystems in Africa. The Startup Acts of Senegal and Tunisia are examples, with more countries also considering similar frameworks.

We now examine the specific ways legal rules and processes can support innovation and entrepreneurship.

a. Business creation and development support

There needs to be a highly efficient process for setting up and running a company. The process should be relatively *easy, cheap, reliable, and fast*, preferably an online system with minimal red-tape. There should also be considerable human-intervention to help with online mis-haps, general questions, and during internet or electricity outages.

The law also needs to be very clear on the licences and compliance procedures necessary after company formation, and these need to be minimised in number and cost where possible. Standards and certification processes also need to be transparent and concluded in a timely manner. Too many compliance processes increase the cost of doing business, and pose a significant hurdle to startups in Africa.[141]

Support for startups can be significantly enhanced by improving their access to essential information for business development. Governments, for instance, could establish a one-stop shop that provides comprehensive guidance on the legal processes involved in business creation and development. This could include detailed information on the requirements for setting up a company, a checklist of considerations before commencing

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[141] Fola Odufuwa & Muriuki Mureithi, *Positioning Africa's Tech Startups as Engines of Growth & Development* (Mozilla, 2023), 25, https://mozilla.africa/wp-content/uploads/2023/11/africa-startup-ecosystem-report-1g.pdf

operations, such as specific licensing needs, registration of intellectual property, and available funding opportunities. This helps to significantly reduce bureaucratic red-tape.

b. Access to capital/finance

To increase access to finance, governments provide loans at favourable rates, or act as guarantors for loans made to startups.

Alternatively, or in addition, governments can also create legal rules that provide financial incentives for private investment in startups, through tax credits for instance, which are common in many jurisdictions. This could potentially also encourage collaboration between existing large companies in the continent and emerging tech startups.[142]

c. Open-data policies

An open data policy is a commitment by a government to provide access to its data for free. Open data is one that anyone can "freely access, use, re-use and redistribute … for any purpose, without restrictions."[143]

As data is a crucial resource for AI, open-data policies can significantly support innovation by providing information that can help inform the development of new products.

d. Tax incentives for R&D

Governments can also offer tax credits on expenditure incurred from research and development activities, in order to boost innovation.

e. Tax benefits for startups

Tax exemptions are another effective means of supporting startups, as they can significantly bolster the initial development phase by allowing profits to be reinvested directly into the business.

f. Regulatory sandboxes

The idea of regulatory sandboxes originated from the UK's Financial Conduct Authority (FCA)'s assessment of its fintech sector. A regulatory sandbox is defined as "a 'safe space' in which businesses can test innovative products, services, business models and delivery mechanisms without immediately incurring all the normal regulatory consequences of

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[142]Maher, Hamid, Anas Laabi, Lisa Ivers, and Guy Ngambeket. 2023. "Overcoming Africa's Tech Startup Obstacles." BCG Global. September 15, 2023.
https://www.bcg.com/publications/2021/new-strategies-needed-to-help-tech-startups-in-africa.
[143] World Bank, *Open Government Data Toolkit*,
https://opendatatoolkit.worldbank.org/en/data/opendatatoolkit/open-data-in-60-seconds

engaging in the activity in question."[144] It also helps regulators to learn about how a new product, technology, or business model works and the outcomes it produces.[145] It does this by allowing the innovation to be tested in the real world on a time-and-scope limited basis in order to determine the appropriate regulatory treatment before the innovation can fully operate in the market.[146]

> 💡Use of regulatory sandboxes, where appropriate, could help promote innovation while ensuring that such innovation is properly regulated in order to mitigate any potential risks associated with the new product, process or business model. Regulatory sandboxes have been used frequently in the fintech sectors in various countries, including Kenya, Sierra Leone, Thailand, Singapore, HongKong, and more, at a time when new financial products and services posed challenges to existing regulatory frameworks at the time.

The uncertainties inherent in AI innovation make regulatory sandboxes an appropriate tool for ensuring a balance between innovation and safety. The design of a regulatory sandbox must generally follow clear guidelines regarding: 1) which government agency is eligible to set up a regulatory sandbox? 2) which entities are eligible to participate and their responsibilities vis a vis the regulatory agency 3) the length and scope of the testing phase in terms of geography, number of clients, volume or number of transactions etc 4) any safeguards that eligible entities must implement, and 5) the exit options for firms participating in the sandbox.[147]

g. Institutional longevity

All the above mechanisms are best created and sustained through dedicated institutional support for startups, rather than one-off pronouncements. One way of ensuring longevity is through the enacting of Startup Acts and/or the establishment of government bodies to provide information about startup support and administer startup benefits. Tunisia and Senegal were the first African countries to enact Startup Acts. Both countries' legislations establish a dedicated resource for companies to apply for "Startup" status, and a

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[144] Financial Conduct Authority, *Regulatory Sandbox*, (2015), 2, https://www.fca.org.uk/publication/research/regulatory-sandbox.pdf

[145]Ivo Jeník & Duff Schan,"How to Build a Regulatory Sandbox: A Practical Guide for Policy Makers." (Technical Guide. Washington, D.C.: CGAP, 2020)

[146] Ibid.

[147] Ibid.

coordinating body for startup support – a Technical Committee in Tunisia, and a Commission in the case of Senegal.[148]

💡India's Startup Initiative is worth mentioning.[149] This comprehensive program, managed by the Ministry of Commerce and Industry, is hosted on an online platform that offers a simplified process for business registration and regulatory compliance. Additionally, it provides support for intellectual property registration, funding, and market access. The platform also offers guidance on obtaining the "Startup" label, along with details on the numerous tax and funding benefits associated with it. Notably, the platform is accessible in a variety of languages, reflecting the rich diversity of the Indian nation.

6.5. Government as a Fixer

As a fixer, the government's role is to design effective solutions to barriers that clog innovation in a particular country, or region, industry or sector.

Such barriers are wide-ranging, and could include macro issues such as inadequate infrastructure like electricity and internet access; limited skilled workforce, the problem of brain drain etc. It could also include micro-issues such as regulatory/bureaucratic hurdles or lack of information about regulatory processes; lack of information about funding opportunities; limited linkages between potential funders and startup communities; challenges getting to commercialization, challenges accessing regional and global markets etc.

Due to the broad nature of potential barriers, the government's fixer role requires continuous learning about the innovation ecosystem and consistent contact with relevant stakeholders. It also requires the creation of institutional mechanisms to maintain this consistent contact with relevant stakeholders, both in the public and private sector. Kenya's Kenya National Innovation Agency[150] is one example of a government agency that connects different actors in the innovation ecosystem. More on this is covered in chapter 8 on review and evaluation.

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[148] Tech Hive Advisory, *Startup Laws in Africa: Highlights and Comparisons* (2020). https://techhiveadvisory.org.ng/wp-content/uploads/2021/08/Startup-min.pdf
[149] "Startup India," Startup India, n.d., https://www.startupindia.gov.in/.
[150] "Kenya National Innovation Agency," n.d., https://www.innovationagency.go.ke/.

7. Education and Capacity Building

While AI presents unprecedented opportunities for innovation, and socio-economic development, these opportunities can only be fully realised if there is a concerted effort to equip people with relevant skills. A coordinated AI strategy must incorporate a comprehensive approach to education and capacity building that aims at:

- Building a supply of AI talent needed for AI research and development

- Fostering general AI literacy, computational thinking, and a culture of continuous learning across all sectors of the population.

- Cultivating skills and knowledge needed for the evolving workplace, and policies for ensuring reskilling or upskilling of existing labour force.

- Building capacity on AI skills, development and governance within the public sector

In this chapter, we examine various ways African governments can lay the groundwork for a sustainable AI-driven economy, by investing in education and capacity building initiatives.

7.1. Developing AI Talent

In order to develop a pool of highly skilled AI talent, governments should aim to increase the share of its population that's trained in computer science, and other related Science, Technology, Engineering, and Mathematics (STEM) fields. This involves:

➔ **Increasing the number of AI-related departments/programs in universities, colleges, and TVETs (Technical and Vocational Education and Training) at undergraduate, graduate, and postgraduate levels.**

This involves expanding already existing programs/departments, or creating new ones, and recruiting more teachers to facilitate STEM education. Alongside increased departments, it is advisable to introduce interdisciplinary programs that encourage the study of AI- related courses with other fields such as the social sciences, medicine, arts and humanities etc.

Some countries have taken on a more concentrated approach by introducing specific AI programs. Mauritius aims to establish an AI campus with a tailor-made course developed

with the assistance of local universities and international experts.[151] Canada has 3 centres for AI research and academic training, located at the country's 3 regional AI ecosystem hubs. The centres are affiliated with local universities, and are faculty-led; they also fund and support fellows from these universities to further AI research and machine learning, as well as develop cutting edge applications.[152]

➔ **Promoting other avenues for AI skills training, such as programs offered by private institutions.**

An example of this is the Kenya based high-tech skills training institution, Moringa School, which offers courses/certifications in software engineering, data science, data analytics, software development, cybersecurity etc.[153] As such institutions support the government's goal to increase AI talent, governments can support by publicly endorsing their programs, and officially recognizing their certifications.

Governments can also collaborate directly where possible. For instance, Singapore runs an AI apprenticeship program with the goal of training Singaporean AI talents to work in Singapore. The program targets individuals who already possess some knowledge and skill in AI to undergo a 2 month deep-skill learning program followed by a seven-month period of working in the AI industry, thus offering an opportunity to develop talent and deploy it in the real world.[154]

The Singaporean model is world-renowned, with several countries trying to replicate the model. Within the African continent, the Egyptian Ministry of Communications and Information Technology (MCIT) is collaborating with Singapore to replicate this model in Egypt through a train-the-trainer model.[155]

➔ **Increasing enrollment of both boys and girls in STEM fields.**

It's important to set specific targets for the number of students or researchers to be trained in the short, and medium term, and to introduce policy measures to support the

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[151] Mauritius Working Group on AI, *Mauritius Artificial Intelligence Strategy,* (2018), 65, https://ncb.govmu.org/ncb/strategicplans/MauritiusAIStrategy2018.pdf

[152] These are: The Amii (Alberta Machine Intelligence Institute) https://www.amii.ca/research/academic/, The Mila AI Institute in Quebec https://mila.quebec/en , and the Vector Institute in Toronto https://vectorinstitute.ai/research/

[153] Moringa School, https://moringaschool.com/about-us/

[154] "AI Apprenticeship Programme (AIAP)® - AI Singapore," AI Singapore, https://aisingapore.org/innovation/aiap/

[155] "International - AI Singapore," AI Singapore, https://aisingapore.org/home/international/

attainment of these targets. This could be done through subsidisation of education in public institutions, and offering student loans at low interest rates. Scholarships and fellowships can also be offered in partnership with collaborators such as the private sector, especially for graduate and postgraduate level AI researchers.

➔ **Expanding opportunities for international partnerships and/or exchange programs**

African governments can pursue partnerships that promote exchange programs and internships with countries that have more developed AI ecosystems. These collaborations offer invaluable opportunities for knowledge transfer, collaborative research, and exposure to cutting-edge technologies. Such partnerships can be facilitated through development-oriented organisations like USAID, GIZ, DFID et al. For example, Kenya and Nigeria are part of a joint talent partnership with Estonia, Lithuania, and Latvia, where students receive programming training and subsequently intern with technology companies in these countries.[156]Ideally, participants in such programs should be incentivized to return or required to return for a certain amount of time.

➔ **Reaching global talent, including diaspora communities**

Attracting global talent, including diaspora communities, is a strategic approach to building a strong AI ecosystem in African countries. Governments and institutions can introduce policy measures that incentivize global talent to relocate and contribute to AI research and development in Africa. This can be achieved by easing immigration and work authorization regulations, making it easier to hire international AI experts. For the diaspora, governments can introduce programs that encourage professionals to contribute to AI development through mentorship, remote work, and collaborative research projects. It is crucial to gather data on diaspora communities and co-create these programs with them, building on existing initiatives, where they exist. For instance, Nigeria runs a Global Database of Nigerians in Diaspora in collaboration with the Nigerians in the Diaspora Organisation (NIDO). Through this database, the Nigerian diaspora can register their details, providing a valuable resource for the government to access specific skills from abroad.[157]

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[156] "Kenyan IT Students Complete Internships in Estonia as Part of Joint Baltic Talent Partnership Project | ESTDEV," ESTDEV, June 21, 2024, https://estdev.ee/en/articles/kenyan-it-students-complete-internships-estonia-part-joint-baltic-talent-partnership.
[157] Global Database of Nigerians in Diaspora, http://www.nigeriandiaspora.org/history.aspx

7.2. Fostering AI literacy and a Culture of Continuous Learning in the General Population.

Promoting AI literacy for the entire population is also crucial, and should be made a component of basic education and continuous life-long learning. AI literacy will enhance the ability of individuals to interact with AI-powered technologies, make informed decisions, and foster greater understanding of the ethical and societal implications of AI. It will also help to ensure the general population is well prepared for the changing workplace. Some strategies for fostering general AI literacy and continuous life- long education include:

➔ **AI education can be introduced at the primary level and progressively enhanced throughout secondary and high school education.**

Developing or revising curricula in partnership with education policy specialists, AI professionals, and incorporating the insights of teachers who are intimately familiar with the education system is advisable. Governments can also draw lessons from the challenges and successes of countries that have begun integrating AI education into their curricula, such as South Korea and Singapore.

> It is also important to train teachers or support their training on how to integrate AI into the classroom. Some countries, like South Korea, have begun incorporating AI content into their teacher certification programs.[158] Others, like Canada, have developed short-term courses that provide teachers with resources and support to integrate AI into their curricula.[159]

➔ **AI Literacy for all**

Besides promoting AI literacy through the formal education system, Governments can provide or support learning opportunities for the general population. This could be through short courses at universities, colleges, and vocational institutions, or through community centred initiatives. Such courses could also be offered through both open/free online[160] or

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[158] The Government of the Republic of Korea, National Strategy for Artificial Intelligence (2018), 33, https://wp.oecd.ai/app/uploads/2021/12/Korea_National_Strategy_for_Artificial_Intelligence_2019.pdf

[159] Alberta Machine Intelligence Institute, "Teacher Resources | AI Literacy for the K-12 Classroom" https://www.amii.ca/ai-literacy/k-12-teacher-program/

[160] E.g., "LearnAI | AI for Everyone (AI4E)®," LearnAI, https://learn.aisingapore.org/courses/ai-for-everyone-ai4e-v3/

offline learning platforms, and publicised through public-awareness campaigns on radio, television, social media platforms, and other relevant channels. Additionally, governments can encourage enterprises or organisations to provide AI skills training for their employees. The goal of such programs would be to always promote AI literacy for all sectors of the population, to enhance the ability of individuals to interact with AI technologies in their daily lives.

Notably, Canada offers a program specifically designed for individuals, companies, and other organisations seeking to deepen their understanding of AI for integration into their businesses and products.[161]

➜ Capacity development for public officials

Building AI capacity among public officials such as leaders of government ministries, government agencies, policy makers and advisors et al, is crucial for effective governance. AI training programs such as workshops and seminars can be incorporated into continuous education programs for public officials, where they exist, or created anew where they do not.[162] Such training could focus on fundamentals of AI and machine learning, its application in various sectors, ethical considerations, implications for society, and the role of the policy maker in ensuring effective AI governance.

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[161] Alberta Machine Intelligence Institute, "Your Business," https://www.amii.ca/your-business/
[162] See for example, AI Policy Compass for public officials in Canada."Mila | AI Policy Compass," https://mila.quebec/en/ai4humanity/learning/ai-policy-compass

8. Review & Evaluation Mechanisms

An effective AI governance system should incorporate a comprehensive evaluation mechanism that assesses what is functioning well, what is not, why certain elements are succeeding or failing, and what actions can be taken to address these outcomes. This essentially means that the system should be responsive and adaptive to the outcomes it generates, adjusting as needed to ensure continual improvement.

8.1. The Role of Institutions

In order to build a responsive and adaptive AI Governance system, governments should establish an institutional framework to oversee all aspects of the system. Institutions are the backbone of any governance system. They ensure that any strategies, guidelines, rules or principles adopted in furtherance of identified goals are pursued within a dedicated framework that provides structure and stability that transcends individual leadership and the policies adopted at a given time.

> **A comprehensive framework would:**
>
> 1) Identify the institutional functions within a given AI National Innovation and Governance System.
>
> 2) Define roles and responsibilities of institutions that would manage different aspects of the AI Governance system, including the overall body that coordinates all functions.
>
> 3) Provide for mechanisms to ensure policy synchronisation and coordination among the different institutions.

Inevitably, countries will structure their AI governance institutions in ways that reflect their unique goals, existing capabilities, and pre-established national innovation systems. These structures are often built upon governance bodies that are already overseeing key areas such as research and development, industrial promotion (including start up promotion) competition, intellectual property regulation and enforcement, consumer protection, and data protection.

Additionally, sector-specific ministries—such as those responsible for education, industrial policy, and labour protection—will play critical roles in shaping the AI governance landscape, ensuring that AI strategies are integrated across various policy domains.

An example of an institutional structure might be:

Institution	Role	General approaches to institutional set-up
National AI Development Strategy Office	Develop AI Strategy. Provide institutional leadership by overseeing the implementation of the country's AI Strategy. Coordinate, review and monitor the implementation of the Strategy and its various components by working with different institutions. Often, this office may work with an advisory committee of experts in the field.	Such an office/department can be established under a pre-existing Ministry of ICT or Ministry of Science & Technology or others with similar mandates.
National Research & Development Agency	Advancing AI research and development, and its commercialization.	Governments can create new R&D institutions focused on AI specifically. For instance, Nigeria recently established an Artificial Intelligence Research Scheme.[163] They can also create new departments within existing public research and development agencies.
National AI Office	Leading in AI policy development, issuing guidelines, enforcing AI legislation,	Advanced economies have begun to establish National AI offices to implement AI legislation.

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[163] "Nigeria Artificial Intelligence Research Scheme," n.d., https://airg.nitda.gov.ng/.

	cooperating with administrative bodies that work on tangential issues (e.g., data protection, competition etc)	The European AI Office is an example.[164]
Innovation Promotion Agency	Developing the national innovation system (including AI innovation) by identifying barriers to innovation and coordinating the development of appropriate innovation policies. This department can also administer startup promotion activities.	Many countries have a department or office in charge of innovation promotion. However, the offices themselves are established under varying Ministries. For example, Kenya's Innovation Agency exists under the Ministry of Education;[165] India's StartupIndia exists under the Ministry of Commerce & Industry.[166] Others establish start up promotion departments under Ministries of ICT.
Competition Authority	Oversee issues relating to competition in the AI market structure and consumer protection.	Existing Competition bodies (if any) can extend their purview of work to include the AI economy.
Intellectual Property Office	Administer IP protection and enforcement.	Existing body (if any) can extend its work to the AI economy.
Data Protection Office	Ensure compliance with data protection principles. Could also oversee adherence to ethical AI principles.	Governments are now creating data protection offices to enforce data protection legislation.
Legislature/ICT committees in legislature	Oversee regulatory changes in light of AI developments by coordinating with various regulatory agencies.	Create a new committee in the legislature or expand the mandate of any such pre-existing committee.

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[164] "European AI Office," Shaping Europe's Digital Future, n.d., https://digital-strategy.ec.europa.eu/en/policies/ai-office.

[165] "Kenya National Innovation Agency," n.d., https://www.innovationagency.go.ke/.

[166] "Startup India," Startup India, n.d., https://www.startupindia.gov.in/.

Sector–specific bodies e.g., in education, health, finance, agriculture, education etc	Oversee AI adoption, and regulation in specific sectors, and recommend guidelines for ethical and socially beneficial use. Recommend legislative changes.	Existing bodies should expand their mandates. Examples of such sector-specific bodies include Central Banks, and departments within the Ministries of Health, Education, Agriculture et al.

Case Study: Rwanda

The Rwanda AI Policy[167] outlines the responsibility of the various institutions involved in the implementation of AI Strategy.

Stakeholder	Responsibility	Indicators
Ministry of Information, Communication Technology and Innovation (MINICT)	Lead and coordinate the overall implementation of the National AI Policy.	Establishment of the Responsible Artificial Intelligence Office (RAIO). Adoption of AI solutions in the public sector
Rwanda Utilities Regulatory Authority (RURA)	Lead the development and implementation of AI regulations, as well as create and implement AI-related ethical standards.	Development and enforcement of ethical AI guidelines.
Centre for the 4th Industrial Revolution Rwanda (C4IR):	Act as a centre for cooperation, innovation, and research in AI.	Partnerships between academia, public and private sector. Provide status of the suggested AI policy recommendations.

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[167]https://www.minict.gov.rw/index.php?eID=dumpFile&t=f&f=67550&token=6195a53203e197efa47592f40ff4aaf24579640e

International partners, e.g., GIZ FAIR Forward (German Corporation for International Cooperation)	Facilitate Rwanda with international cooperation and assistance for the development of AI.	Improvement of Rwanda's AI capacity through training and international collaboration on projects.

8.2. An Adaptive AI Governance System

Institutions should aid in the creation of an adaptive AI Governance System that is generally dynamic, flexible, and responsive to evidence about its outcomes. It is designed to continually monitor technological developments as well as their effects on society, and to intervene where there are harmful effects. This could be through tracking real world effects of AI systems, as well as integrating mechanisms for feedback from diverse stakeholders.

Case study: Egypt

Egypt's National AI Strategy[168] adopts the Explore, Plan and Execute (EPE) model to track the effectiveness of the strategy in driving change and enabling AI adoption. This helps ensure that the AI Strategy is aligned with both local and global AI trends. Below are some of the Key Performance Indicators under each stage of the EPE model.

Explore Phase: Here, themes for prospective AI initiatives are identified during this phase and put through a series of assessments to see if they fit in with the nation's strategy. The KPIs for this phase include:
- Total number of themes that are scored, advanced to the 'plan phase and adopted yearly
- Total number of committees established yearly.
- Alignment of projects with the AI strategy.

Plan Phase: Here, themes advanced from the explore phase are developed and aligned with Egypt's specific needs. The KPIs for this phase include:
- Total number of Proof of Value (POV) that are adopted and advanced to the execute phase.
- Impact on Egypt- specified cases.
- Contribution to the global AI community and AI readiness index

Execute Phase: Here, AI projects are operationalised across sectors and government entities and their impact and contribution to the GDP are taken into account. The KPIs for this phase include:
- Total number of projects operationalised
- Total impact e.g increased income etc
- Number of government entities that are AI enabled.

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[168] Ministry of Communications and Information Technology (MCIT). *Artificial Intelligence for Development in Egypt: National AI Strategy*. 2024. https://mcit.gov.eg/en/Publication/Publication_Summary/9283.

> - Public mention of successful AI projects

Below we examine some of the ways in which institutions can promote an adaptive system of AI Governance.

8.2.1. Substantive Elements of an Adaptive AI Governance System

An Adaptive AI Governance would address the progress and effectiveness of various interconnected components. These include:

→ **AI Strategy and Action Points:** This involves evaluating whether specific targets within the AI strategy are being met and determining if a shift in strategic direction is needed based on outcomes.

→ **Complementary Strategies/Plans**: Governments often have additional blueprints related to the AI ecosystem, such as those aimed at enhancing internet connectivity, promoting digital and AI literacy, or fostering innovation. The evaluation framework should assess the success or setbacks in implementing initiatives across these related strategies.

→ **Institutional Effectiveness:** This component evaluates the coordination and efficacy of institutions responsible for different aspects of AI governance. Are these institutions meeting their mandates effectively, or are there gaps that hinder their performance?

→ **Impact on Society: How is AI transforming society?** This assessment should explore how different groups are affected, identify potential legal loopholes exploited by companies, and determine whether certain AI innovations require stricter regulation or perhaps outright prohibition. Additionally, this component should highlight socially beneficial AI use cases and explore ways to further encourage these positive outcomes.

→ **Adapting Laws and Policies:** Based on societal impacts, it is crucial to assess the effectiveness of current laws and policies in the face of evolving AI technology. This includes examining how these regulations mitigate or perpetuate emerging risks like bias, inequality, and privacy concerns, as well as how they may impede socially beneficial innovations.

→ **Impact on Society and Economy:** This assessment should examine both societal and economic transformations brought about by AI adoption:

Societal Impact Assessment: This should explore how different groups are affected, identify potential legal loopholes exploited by companies, and determine whether certain AI innovations require stricter regulation or perhaps outright prohibition. Additionally, this component should highlight socially beneficial AI use cases and explore ways to further encourage these positive outcomes.

Economic Impact Assessment: Policymakers should establish frameworks to measure and evaluate the economic effects of AI policies and interventions across various dimensions.

Indicators for A.I. Economic Impact

1. **Macroeconomic Indicators** These high-level economic indicators measure AI's overall economic impact:

    - GDP contribution: Measures AI's contribution to economic growth. PwC estimates AI could add about $1.5 trillion to Africa's GDP by 2030[169]
    - Productivity metrics: Assesses economy-wide improvements in output per hour worked
    - Investment flows: Tracks domestic and foreign investment in AI-related sectors
    - Trade balance: Monitors AI-related imports and exports, including digital services
    - Public sector spending: Measures government investment in AI infrastructure and programs

2. **Industry & Market Metrics** Measures of business activity and market development:

    - Business creation: Number and growth of AI companies and startups
    - Market valuation: Total value of AI sector companies
    - Revenue growth: Sector-specific revenue attributed to AI implementation
    - Cost efficiency: Operational cost reductions from AI adoption
    - Innovation metrics: Patents filed, research publications, and commercial applications
    - Industry adoption rates: Penetration of AI technologies across different sectors

3. **Sector-Specific Performance Indicators** Key metrics tailored to major economic

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[169] PricewaterhouseCoopers. n.d. "PwC's Global Artificial Intelligence Study: Sizing The Prize." PwC. https://www.pwc.com/gx/en/issues/artificial-intelligence/publications/artificial-intelligence-study.html.

sectors:

- Agriculture & Mining: Yield improvements, resource efficiency, sustainability metrics
- Manufacturing: Production efficiency, quality metrics, supply chain optimization
- Healthcare: Treatment outcomes, cost per patient, service accessibility. Research shows $2-$4 return per $1 invested[170]
- Financial Services: Financial inclusion rates, transaction volumes, credit access. Mobile money platforms show up to 1% higher GDP per capita growth[171]
- Education: Learning outcomes, educational access, skill development rates

4. **Labor Market Dynamics** Comprehensive assessment of AI's impact on employment:

- Job creation: New roles and positions created by AI adoption
- Job displacement: Positions automated or modified by AI
- Net employment effect: Overall change in employment levels
- Wage impacts: Changes in compensation across affected sectors
- Skills transition: Success rates of reskilling and upskilling programs

5. **Distributional Effects** Analysis of how AI's economic benefits are shared:

- Geographic distribution: Rural vs urban economic impacts
- Income distribution: Effects across different income groups
- Gender equality: Impact on economic opportunities by gender
- Digital divide: Access to AI technologies and benefits
- SME participation: Small business access to AI technologies

6. **Innovation Ecosystem Indicators** Measures of AI innovation capacity and capability:

- Research output: Quality and quantity of AI research
- Technology transfer: Rate of commercialization of AI research
- Talent pipeline: AI skills development and availability
- Infrastructure readiness: Computing, data, and connectivity metrics
- International competitiveness: Global rankings and comparisons

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[170] Ramdorai, Aditi, Jaana Remes, and Matt Wilson. 2020. "How Investing in Health Has a Significant Economic Payoff for Developing Economies." Brookings, July 21, 2020. https://www.brookings.edu/articles/how-investing-in-health-has-a-significant-economic-payoff-for-developing-economies/.

[171] "New Research Shows Mobile Finance Can Increase National GDP." n.d. UNDP. https://www.undp.org/news/new-research-shows-mobile-finance-can-increase-national-gdp.

8.2.2. Procedural Elements of an Adaptive AI Governance System

Common mechanisms used to gather evidence on the effectiveness of AI systems, laws, and policies include:

➔ **Periodic review** of strategies, plans or blueprints, alongside certain identified metrics.

➔ **Market inquiries** typically conducted by regulatory bodies to assess the functioning of particular markets as well as barriers to innovation. Lately, market inquiries have covered not only assessments of competition in markets but also, effects of technological platforms on privacy, consumer wellness, and effects on small businesses. Such inquiries can extend beyond these aspects to assess effects of technological systems across various groups, such as different classes of consumers, different genders, abilities etc.

➔ **Ethical and Societal Impact Assessments** could be periodically conducted to monitor impact of AI systems on different societal groups, and the role of law in enabling certain outcomes. Some countries also mandate regular AI/algorithmic audits to promote the development of ethical AI. For instance, Singapore operates an AI testing toolkit "AI Verify" that allows users and businesses to test AI models against specific recognized AI Governance principles.[172]

➔ **Regulatory sandboxes, and Pilot Programs.** These, already covered in chapter 6, can provide useful information on how new technologies affect society and the right regulatory response for those technologies.

➔ **Data Protection Impact Assessments** could be mandated for high risk projects. What constitutes a "high risk" project would need to be defined in order to ensure clarity.

➔ **Feedback channels** to allow the receipt of continuous feedback from different stakeholders is useful. Such feedback can provide useful lines of inquiry for broader impact assessments or market inquiries, whichever is appropriate.

➔ **Independent research.** Governments can also collaborate more effectively with interdisciplinary researchers who work on themes related to AI development and

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[172] AI Verify Foundation, "What Is AI Verify – AI Verify Foundation," July 9, 2024, https://aiverifyfoundation.sg/what-is-ai-verify/.

society. In addition to finding valuable research, they can also commission independent studies on various themes.

Case study: EU AI Office

The Artificial Intelligence Office was established under the European commission in May 2024 and it is incorporated into the Directorate-General for Communication Networks, Content, and Technology, where the office is governed by an annual management plan[173]. The AI Board, composed of EU member states, will oversee the AI Office.
The AI Office consists of 5 units as well as 2 advisors as listed below:

UNITS
1. The Excellence in AI and Robotics unit.
2. The Regulation and Compliance unit.
3. The AI Safety unit.
4. The AI Innovation and Policy Coordination unit.
5. The AI for Societal Good unit.

ADVISORS
1. The Lead Scientific Advisor.
2. The Advisor for International Affairs.

The office plans to hire over 140 employees, including administrative assistants, lawyers, economists, and policy and technology specialists.

The AI Office will:
- Support the **implementation and enforcement** of the AI Act by ensuring its consistent application across Member States, developing tools to evaluate AI models, collaborating on codes of practice, investigating rule violations, and preparing guidelines to ensure compliance with the regulation.
- Partner with the private and public sector to **promote trustworthy AI** by advancing beneficial policies, providing access to testing environments (AI sandboxes), fostering innovative ecosystems, and improving AI literacy.
- Fosters a **strategic and cohesive EU approach to trustworthy AI at the international level** by promoting collaboration with global institutions, encouraging international cooperation and governance, supporting the development of

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[173] European Commission. "AI Office." Shaping Europe's Digital Future. Accessed Sept, 2024.
https://digital-strategy.ec.europa.eu/en/policies/ai-office#ecl-inpage-tasks-of-the-ai

international agreements, and continuously monitoring the AI ecosystem for technological developments and systemic risks.

Conclusion

The development and deployment of artificial intelligence technologies presents both opportunities and challenges for African nations. This toolkit has outlined key considerations and practical approaches for developing locally-rooted AI governance frameworks that can help realise AI's potential while mitigating its risks.

Several key themes emerge from our analysis:

First, the importance of building strong foundations cannot be overstated. As highlighted by the World Bank's Digital Economy Assessment framework[174] robust digital infrastructure - including connectivity, compute capacity, and reliable electricity - forms the bedrock of AI development. Our examination shows that while Africa faces significant infrastructure gaps, there are promising developments in areas like mobile connectivity and renewable energy that can be leveraged.

Second, data governance is crucial yet complex in the African context. While data is essential for AI development, African nations must carefully balance competing priorities around data sovereignty, cross-border data flows, and local capacity building. The African Union's Data Policy Framework provides important guidance, but individual nations will need to adapt these principles to their specific contexts while ensuring alignment with international standards.

Third, capacity building across multiple dimensions - from technical skills to policy expertise - requires sustained, coordinated effort. The experiences of countries like Rwanda and Mauritius demonstrate that targeted investments in AI education and training, coupled with international partnerships, can help build local AI capabilities. However, as scholars like Abeba Birhane have noted, it is essential that capacity building efforts be grounded in local contexts and needs rather than simply importing external models.

Fourth, institutional frameworks matter tremendously. Our analysis suggests that successful AI governance requires not just sound policies but also robust institutions to implement them. The cases of Kenya's Innovation Agency and Nigeria's AI Research Scheme offer instructive examples of different institutional approaches, though it is still too early to definitively assess their effectiveness.

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[174] Hanna, Nagy K. 2020. "Assessing the Digital Economy: Aims, Frameworks, Pilots, Results, and Lessons." *Journal of Innovation and Entrepreneurship* 9 (1). https://doi.org/10.1186/s13731-020-00129-1.

To advance these goals, several priorities emerge for African policymakers:

1. Taking a measured, step-by-step approach to AI governance that aligns with each country's development stage and priorities while remaining responsive to rapid technological change
2. Strengthening regional cooperation through forums like the African Continental Free Trade Area to build shared infrastructure and harmonise policies
3. Investing in research to better understand local AI applications and impacts
4. Developing flexible regulatory frameworks that promote innovation while protecting public interests

This toolkit represents an initial effort to support these goals, but much work remains to be done. Future iterations of this toolkit will examine implementation experiences, evaluate policy effectiveness, and develop more detailed guidance for specific sectors and use cases. Additionally, as emphasised by scholars like Sabelo Mhlambi, there is a need to more deeply explore African philosophical and ethical perspectives on AI governance.[175]

Progress in implementing these recommendations will not be linear or uniform across the continent. Different nations will need to chart their own courses based on their unique circumstances, capabilities, and objectives. However, by taking thoughtful, coordinated action now to establish strong governance foundations, African nations can work toward ensuring that AI development serves their citizens' needs and advances their development goals.

We close by acknowledging both the limitations of this work and the rapidly evolving nature of AI technology and governance approaches. This toolkit should be viewed as a living document to be refined and expanded through continued dialogue among policymakers, researchers, civil society, and other stakeholders across Africa. Success will require sustained commitment, careful attention to local contexts, and a willingness to learn and adapt as circumstances change.

The opportunity—and the challenge—is to develop AI governance frameworks that are both principled and practical, promoting responsible innovation while remaining firmly grounded in African realities and aspirations. We hope this toolkit provides useful guidance for that important journey.

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[175] Stanford HAI. 2022. "Sabelosethu Mhlambi: Decolonizing AI." https://www.youtube.com/watch?v=UqVwfuIuU2k.

Appendices

1. AI Readiness Checklist 🔴🟠🟢

Each completed item in the checklist = **1 point** and offers a general assessment of a nation's AI readiness, ranging from limited to high. The accompanying **Roadmap for Policymakers** then serves as an additional resource to guide you on where attention is needed.

Governance & Policy

- Have you developed a national AI strategy or policy framework?
- Do you have a dedicated AI governance body (e.g., AI Council, task force)?
- Does your legal framework address AI risks (bias, privacy, cybersecurity, accountability)?
- Do you have clear guidelines for AI deployment in key sectors (health, finance, education)?
- Are ethical principles and responsible AI commitments embedded in your AI policy?

Data & Digital Infrastructure

- Do you have strong data protection laws in place?
- Have you implemented a national data governance framework?
- Do you have policies ensuring local data control and sovereignty?
- Are open data policies in place to encourage responsible data sharing?
- Have you assessed your country's compute, cloud, and energy infrastructure for AI?

AI Talent & Workforce Development

- Do universities and technical institutions offer AI-related programs?
- Are there government-supported AI upskilling programs for policymakers and civil servants?
- Have you developed policies to retain and attract AI talent?
- Are public-private partnerships in place to support AI education and training?
- Have you integrated AI literacy into national education curriculums at secondary or higher education levels

Public Trust & Ethical AI

- Have you consulted the public and stakeholders in shaping AI policies?
- Do you have mechanisms for addressing AI-related complaints and harms?
- Are there transparency requirements for AI decision-making in high-risk applications?
- Do you have safeguards against AI bias and discrimination?
- Are AI policies inclusive of marginalized and underrepresented groups?

AI Market & Innovation Ecosystem

- Are there government incentives (e.g., grants, tax breaks) to support AI startups and SMEs?
- Do local businesses have access to AI venture capital and funding opportunities?
- Have you established AI innovation hubs, accelerators, or incubators?
- Are AI-powered solutions being developed and deployed domestically?
- Do trade policies support AI adoption and cross-border collaboration?

Final readiness score: __ / 25

Traffic light rating:

- 🔴 (0-9) → Limited Readiness – Critical gaps in AI governance. Immediate foundational work required.
- 🟠 (10-19) → Emerging Readiness – Progress in key areas, but governance structures need strengthening.
- 🟢 (20-25) → High Readiness – Well-developed AI governance; refinements likely needed for long-term sustainability.

2. Roadmap for Policymakers: AI Governance Milestones

Phase 1: Foundational Assessments & Vision Setting (0-6 months)

National AI Readiness Assessment

- Conduct a baseline AI readiness evaluation (infrastructure, policies, talent, governance gaps).
- Engage key stakeholders (government, private sector, academia, civil society).
- Identify country-specific AI opportunities and challenges.
- Map existing policies, data laws, and AI strategies.

Develop a National AI Vision & Strategy

- Set clear, actionable AI goals based on readiness assessment.
- Align AI strategy with national development priorities (e.g., health, education, security).
- Leverage regional/international collaborations (e.g., AU AI Strategy, Pan-African AI Council).
- Define AI governance priorities, including ethics and inclusion.
- Ensure the right talent is available to support in building legal frameworks

Establish Coordination Structures

- Form a **National AI Taskforce** to oversee implementation and ensure accountability.
- Assign responsibilities to ministries and regulatory bodies.
- Develop **public-private partnerships** for AI research, funding, and innovation.

Phase 2: Laying the Legal & Institutional Foundations (6-12 months)

Draft AI Governance & Regulatory Framework

- Develop a policy framework m, and accountability.
- Align AI policies with existing laws (data protection, cybersecurity, intellectual property).

- ○ Or consider implementing these foundational laws first.
- Establish AI guidelines for key sectors (health, finance, agriculture, education).
- Ensure gender & diversity inclusion in policymaking.

Strengthen Data Governance & Infrastructure

- Implement a **national data governance framework** to ensure data privacy and security.
- Develop open data policies and responsible data-sharing initiatives.
- Assess **compute and energy infrastructure** for AI systems.

Capacity Building & Awareness Campaigns

- Roll out broader training of policymakers and regulators on AI risks, opportunities, and governance.
- Design AI literacy programs for public officials and citizens.
- Create AI learning hubs, boot camps, and university collaborations.

Phase 3: Pilot AI Implementation & Risk Management (12-24 months)

Launch AI Governance Sandbox

- Pilot **regulatory sandboxes** to test AI models under supervision.
- Develop **algorithmic impact assessment (AIA)** and auditing protocols.

Strengthen AI Ethics & Inclusion

- Develop national AI ethics guidelines and responsible AI principles.
- Require **explainability and transparency** in public sector AI deployments.

Invest in AI Infrastructure & R&D

- Incentivise AI startups through **public funding** and accelerators.
- Support regional **compute & cloud** access for developers.
- Establish **AI innovation clusters** for local AI applications.

Phase 4: Scaling & Monitoring Impact (24+ months)

Embed AI in Governance & Public Services

- Establish AI **procurement guidelines** for responsible adoption.
- Utilise AI for **government efficiency** (e.g., chatbots, predictive policy modelling).
- Assess AI's impact on **employment & labour markets**.

Develop AI Risk Monitoring Systems

- Implement **continuous algorithmic audits** for high-risk AI applications.
- Enforce **AI cybersecurity safeguards**.
- Launch an **independent AI oversight body** for compliance and dispute resolution.

Foster Regional & International Cooperation

- Harmonise cross-border AI policies and strengthen **continental partnerships**

About the Partners

About Qhala

Qhala is a team of problem solvers passionately driven to lead Africa's digital transformation and innovation. The team combines strategy, research, design, and technology to create products, services, and new business models that meet today's needs and future goals. Qhala's team of strategists, researchers, designers, and engineers solves problems and creates solutions that help organisations improve operational efficiency and deliver value to customers. They achieve this through a co-creative approach with businesses, customers, and other stakeholders.

About Smart Africa

Smart Africa is an innovative commitment by African Heads of State and Government to accelerate sustainable socio-economic development, leading Africa into a knowledge economy through affordable broadband access and Information and Communications Technologies (ICTs). This bold venture was initiated at the Transform Africa Summit, where the Smart Africa Manifesto was adopted. Since then, the manifesto has garnered the endorsement of all African Union member states, demonstrating the continent's unified vision for digital transformation.

About Qubit Hub

Incubated by Qhala, Qubit Hub is an African-based AI research, innovation and development lab, a commune of African Researchers in Data Analysis, ML, Physics and Policy, whose goal is to ideate and incubate, conceptualise, design, develop and deploy AI Initiatives, while actively engaging with policymakers in creating relevant and practical regulatory directions.