



# Artificial Intelligence for Economic Policymaking

## The Frontier of Africa's Economic Transformation





**The African Center for Economic Transformation (ACET)** is a Pan-African economic policy institute supporting Africa's long-term growth through transformation. We produce research, offer policy advice, and convene key stakeholders so that African countries are better positioned for smart, inclusive, and sustainable development. Based in Accra, Ghana, we have worked in nearly two dozen African countries since our founding in 2008.

## **Ghana**

### ***Office location:***

7 Yiyiwa Drive  
Abelemkpe, Accra - Ghana  
Phone: +233 (0) 0242436858

### **Mailing address**

Cantonments PMB CT 4 Accra,  
Ghana

### ***Contact us:***

E-mail:  
[info@acetforafrica.org](mailto:info@acetforafrica.org)

Web:  
[acetforafrica.org](http://acetforafrica.org)

Copyright © 2023 African Center for Economic Transformation

Cover photo courtesy of istock (www.istockphoto.com)

The research presented in this publication was carried out with the financial assistance of Canada's International Development Research Centre (IDRC). The views expressed herein do not necessarily represent those of IDRC or its Board of Governors.

The primary author was Rob Floyd, Director, Innovation and Digital Policy, ACET.

This work is licensed under a Creative Commons Attribution 4.0 (CC-BY 4.0) International License (<https://creativecommons.org/licenses/by/4.0/legalcode>), which permits unrestricted use, distribution, and reproduction, provided the original work is properly credited.

## ACKNOWLEDGEMENTS

This report would not have been possible without inputs and feedback from Ed Brown, ACET Senior Director, Research, Policy & Programs; Freda Yawson, ACET Senior Manager; Chux Daniels and Klaus Tilmes, ACET Senior Fellows; and numerous other ACET staff.

Yvonne Nyake Ndelle, Postdoctoral Fellow - Open AIR, Queen Elizabeth Scholar, University of Ottawa contributed to the literature review.

The stakeholder consultations were undertaken in partnership with AUDA-NEPAD and the Tayarisha Center at Wits University. A special thanks to Mzukisi Qobo, Geci Karuri-Sebina, Bhekani Mbuli, Barbara Glover, and Pamla Gopal.

The authors would also to acknowledge and thank this report's funding partners for their generous support and collaboration: the International Development Research Centre, the Artificial Intelligence for Development in Africa program, and the Swedish International Development Cooperation Agency.



# CONTENTS

<b>Acknowledgements</b> .....	<b>3</b>
<b>Acronyms</b> .....	<b>5</b>
<b>About This Report</b> .....	<b>6</b>
<b>Key Findings</b> .....	<b>7</b>
<b>I. Overview</b> .....	<b>9</b>
<b>II. Context of AI Applications</b> .....	<b>11</b>
<b>III. AI in Economic Policymaking Around the World</b> .....	<b>13</b>
Macro forecasting with machine learning .....	14
Monetary modeling.....	14
Taxation .....	15
Banking and financial supervision .....	15
Central bank applications.....	15
Private sector applications .....	17
AI developed theory .....	17
<b>IV. AI in Economic Policymaking in Africa</b> .....	<b>18</b>
African economic policy institutes .....	18
African technology and ICT organizations .....	19
Academic institutions.....	20
International development institutions .....	21
Private sector .....	22
Governments .....	22
<b>V. Opportunities and Challenges</b> .....	<b>23</b>
<b>Annex 1: About ACET</b> .....	<b>28</b>
<b>Annex 2: Literature Review</b> .....	<b>29</b>
<b>Endnotes</b> .....	<b>31</b>

## ACRONYMS

<b>ACET</b> .....	African Center for Economic Transformation	<b>GDP</b> .....	Gross Domestic Product
<b>ACTS</b> .....	African Center for Technology Studies	<b>GRAAD</b> .....	Group for Research and Applied Analysis for Development
<b>AERC</b> .....	African Economic Research Consortium	<b>IDRC</b> .....	International Development Research Centre
<b>AfCFTA</b> .....	African Continental Free Trade Area	<b>IEA</b> .....	Institute of Economic Affairs
<b>AfDB</b> .....	African Development Bank	<b>ILO</b> .....	International Labour Organization
<b>AI</b> .....	artificial intelligence	<b>IMF</b> .....	International Monetary Fund
<b>AI4AFS</b> .....	Artificial Intelligence for Agriculture and Food Systems	<b>ISS</b> .....	Institute for Security Studies
<b>AI4D</b> .....	Artificial Intelligence for Development	<b>ITU</b> .....	International Telecommunications Union
<b>ATPS</b> .....	African Technology Policy Studies Network	<b>KIPPRA</b> .....	The Kenyan Institute for Public Policy Research and Analysis
<b>AU</b> .....	African Union	<b>MIT</b> .....	Massachusetts Institute of Technology
<b>AUDA-NEPAD</b> .....	African Union Development Agency	<b>NIIA</b> .....	Nigerian Institute of International Affairs
<b>CAIR</b> .....	Centre for AI Research	<b>OECD</b> .....	Organisation for Economic Co-operation and Development
<b>CARIA</b> .....	African Center for Research in Artificial Intelligence	<b>OCP</b> .....	Office Chérifien des Phosphates
<b>CERDI</b> .....	Center for Studies and Research on International Development	<b>PCNS</b> .....	The Policy Center for the New South
<b>CEPR</b> .....	The Center for Economic and Policy Research	<b>PSI</b> .....	Policy Studies Institute
<b>CIPIT</b> .....	Centre for Intellectual Property and Information Technology Law	<b>RAIL</b> .....	Robotics, Autonomous Intelligence and Learning
<b>CIPPEC</b> .....	Fundación Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento	<b>RECs</b> .....	regional economic communities
<b>CODESRIA</b> .....	Council for the Development of Social Science Research in Africa	<b>SAIIA</b> .....	South African Institute of International Affairs
<b>CIRES</b> .....	Centre Ivoirien de Recherches Economiques et Sociales	<b>SDGs</b> .....	Sustainable Development Goals
<b>CERSS</b> .....	Centre d'Etudes et de Recherches en Sciences Sociales (Morocco)	<b>UN</b> .....	United Nations
<b>CSTD</b> .....	Commission on Science and Technology for Development	<b>UNESCO</b> .....	United Nations Educational, Scientific and Cultural Organization
<b>D-NA</b> .....	Digital Nation Africa	<b>UNCTAD</b> .....	United Nations Conference on Trade and Development
<b>ECES</b> .....	Egyptian Center for Economic Studies	<b>UNECA</b> .....	United Nations Economic Commission for Africa
<b>EPFL</b> .....	École Polytechnique Fédérale de Lausanne	<b>UP</b> .....	University of Pretoria
<b>EPRC</b> .....	Economic Policy Research Center	<b>UPMVI</b> .....	Université Polytechnique Mohammed VI
<b>EU</b> .....	European Union	<b>US</b> .....	United States
<b>FERDI</b> .....	Foundation for Studies and Research on International Development	<b>USAID</b> .....	United States Agency for International Development
		<b>ZIPAR</b> .....	Zambia Institute for Policy Analysis and Research

## ABOUT THIS REPORT

This report was designed to assess the viability of using artificial intelligence (AI) to inform inclusive and sustainable economic, financial and industrial policies in Africa and to help identify where traditional and non-traditional data exists and where there are gaps. It was also written with the objective of establishing the basis for future work on how to fill gaps and develop an approach for designing and implementing a research initiative based on well-designed models for economic transformation. Secondly, it was designed to better understand the interests of national stakeholders and international development partners on this important topic. The research was conducted through a combination of desk analysis, key informant interviews and stakeholder workshops.

The research addressed how AI may contribute to, or inform, policy that supports inclusive and sustainable economic transformation on issues such as productivity, employment, taxation, resource utilization, fiscal and monetary policy or economic output. There are lessons learned from regional and global experience, although this remains a frontier area of inquiry. The research also sought to understand what data exists across sectors suitable for AI solutions and what new data may be created using new tools and approaches.

In developing a framework for future study, the authors have addressed opportunities that exist to experiment and scale AI applications directly in economic policy planning processes using economic transformation models. This includes a high-level assessment of how well countries are positioned to test applications and how to ensure research leads to policy impact. It also identifies prospective countries for future engagement whereby it may be possible to test and scale AI for economic policymaking approaches. Through the analysis and stakeholder consultations, the research identifies African organizations, researchers and policymakers that have an interest in using AI to inform economic policy and planning. The analysis also identifies a series of research questions to inform future analysis and prospective sandbox policy exercises. Finally, throughout the work, the authors identified risks and challenges to using AI solutions to inform economic policymaking.

This work began in April 2022 and was concluded in January 2023. It was carried out by the African Center for Economic Transformation (ACET), with financial support from the Artificial Intelligence for Development (AI4D) Africa program, a partnership between International Development Research Centre (IDRC) and the Swedish International Development Cooperation Agency (Sida).

## KEY FINDINGS

1. **Significant opportunities exist.** Based on global and regional examples, inputs from experts and the increasing interest in artificial intelligence more broadly, nearly all stakeholders consulted agreed that significant opportunities exist to leverage AI solutions for economic policymaking in Africa in the future. That said, nearly all also emphasized that it will require efforts to build knowledge, capacity, understanding and trust. And many recommended the need to capture positive case studies, develop champions and support ecosystems.
2. **AI for economic policymaking remains a frontier agenda.** While there are significant opportunities, the research confirmed that AI in economic policymaking is a frontier theme. Even among stakeholders with deep AI knowledge, most had not given significant thought to the use of AI in economic policymaking. When it was explained, nearly all showed excitement about the prospect and emphasized its utility in the African context. Among policymakers, the issue is even further off their radar. Numerous stakeholders emphasized that it will be important for the topic of AI in economic policymaking to become an area of academic research within macroeconomic fields.
3. **Technical experts are the most interested.** The primary interest for exploring AI in economic policymaking is among technical experts who can understand the benefits from a theoretical or methodological perspective. This relates, to some extent, to the lack of real-life examples for policymakers or politicians to see its application in other countries. In one of the stakeholder events, some participants noted the importance for politicians to see the positive benefits versus possible negative impacts of AI in this regard.
4. **Digital leadership is missing.** While primary interest is among technical experts, many stakeholders lamented the lack of digital leadership in Africa generally. It was most often attributed to a cadre of political leadership where often the president and cabinet members are older, focused on traditional sectors and may not be comfortable with discussions of frontier technologies. But it was also noted in numerous instances that the African Union (AU) needs to have a stronger focus on policy issues related to artificial intelligence and other technologies, as does the African Development Bank (AfDB), regional economic communities (RECs) and other regional bodies. Stakeholders emphasized the need for strong advocacy and bottom-up approaches. Some argued that civil society and youth have an important role to play in this regard.
5. **Data usability is a primary challenge.** Not surprising, the research found the usability of existing data prohibits its full utilization as big data sources. Official data is often outdated, poorly collated and kept in formats that prohibit its rapid and low-cost use. Stakeholders believe that in some cases these challenges can be addressed easily -- though it requires political will -- while in other cases massive institutional change across many parts of government will be needed. It was emphasized that treatment of government data needs to be addressed through common policy approaches.

6. **Data access is another primary challenge.** Most stakeholders indicated that government data will only be a small part of AI solutions for economic policymaking. Where new data may be created (telephony, geo-located data, wearables, customer data, financial data, social media data, synthetic data and more), it will most likely be done by the private sector. There is significant potential in synthetic data, which can be generated from mathematical or machine learning models, thus relying less on data directly linked to individual citizens. And existing, large datasets owned by the private sector will be necessary if AI is to be used effectively for financial and monetary policy. To access this data will require both trust-building between government and the private sector, as well as policies that provides government with legal access to data -- but also with appropriate legal guardrails.
7. **More policy action is needed on data security, privacy and ownership.** Further to data access challenges, stakeholders said all African countries should show more urgency around establishing well-informed policy on data security, data privacy and data ownership. This is not only necessary for AI solutions in economic policymaking but also to ensure a business and investment environment that will lead to an expanded digital economy, an innovation ecosystem, successful start-ups and application of new technologies to development challenges. On data ownership, there were numerous discussions about the need for Africans to own Africa's data, which will require legislation, particularly relating to the global technology firms.
8. **An ecosystem to support AI solutions should be established.** The lack of an ecosystem to support AI solutions for economic policymaking was a commonly expressed concern. Many stakeholders emphasized that on issues related to data generally there is little or no dialogue between government, the private sector, academia and think tanks — and there is even less dialogue on issues related to data and economic policy. A common recommendation was to foster such dialogue and support such an ecosystem.
9. **A future research agenda resonates with stakeholders.** When a possible future research initiative was posited, nearly all stakeholders supported the idea — and many noted their interest in participating. In many instances the aforementioned findings were suggested as key pillars of a future research agenda, particularly building awareness, developing an ecosystem and addressing policy gaps.
10. **Digital infrastructure and digital skills development needs are not yet seen as urgent.** Two things in particular surprised the research team. First, there was little emphasis on digital infrastructure needs. While the need for data storage and supercomputing were sometimes mentioned, there was less concern about the need for these investments than was originally expected. The second surprise concerned digital skills. While there was significant focus on the need to build skills and awareness of political leaders, there was less emphasis on the lack of digital skills (or more specifically, AI skills) within government. Some experts suggested that these skills should be “hired in” rather than developed internally.



# I. Overview

Artificial intelligence has rapidly become a constant in the lives of most people through its application in commerce, education, health, public service delivery, communications, governance, agriculture and manufacturing. For the developing world, AI is already contributing to meeting the Sustainable Development Goals (SDGs) and it is increasingly being deployed for targeting humanitarian relief and addressing the impacts of climate change. That said, in most African countries there are few comprehensive policy frameworks in place to incentivize responsible AI, regulate AI driven business models or effectively promote the creation and capture of high-quality African data. Few countries have outlined holistic strategies for innovation and digital transformation, including AI. According to the Government AI Readiness Index 2022, Africa is ranked the lowest compared to all other regions, and numerous African countries are in the lowest range of the rankings.<sup>1</sup>

The Organisation for Economic Co-operation and Development (OECD) Artificial Intelligence Policy Observatory data show that the European Union (EU) and 60 other countries have some form of AI strategies that cover more than 600 policy initiatives. There are more than 50 such initiatives in the EU and nearly 50 in the United States, but few such efforts in Africa.

But even with a slowly evolving environment for AI in Africa, there many examples of AI applications, businesses using AI and government adoption of big data and AI applications. The Centre for Intellectual Property and Information Technology Law (CIPIT) at the Strathmore Law School in Kenya found 213 applications of AI developed in, or for use in, Africa across 33 sectors in 2021.<sup>2</sup> These were largely concentrated in corporate services, health, agriculture, business intelligence and education, with the applications mostly being data analytics, chatbots and decision support.

To date there is not an African-owned definition of AI, or its unique attributes when applied in Africa. Therefore, this report relies on a widely used definition from the European Commission, which states that “artificial intelligence refers to systems that display intelligent behavior by analyzing their environment and taking actions — with some degree of autonomy — to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g., voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g., advanced robots, autonomous cars, drones or Internet of Things applications).”<sup>3</sup>

Another definition from the OECD outlines an “AI system as a machine-based system that is capable of influencing the environment by producing an output (predictions, recommendations or decisions) for a given set of objectives. It uses machine and/or human-based data and inputs to: (i) perceive real and/or virtual environments; (ii) abstract these perceptions into models through analysis in an automated manner (e.g., with machine learning), or manually; and (iii) use model inference to formulate options for outcomes. AI systems are designed to operate with varying levels of autonomy.”

Qualitative data, by definition, is non-numerical data, and can be an important part of AI and machine learning solutions. This may include text, images, and audio. This type of data can improve accuracy and predictability by providing additional perspectives for policymakers. In some instances, it can also prevent AI systems from becoming over-trained on traditional datasets.

## I. Overview

This report defines economic policy as instruments used to influence fiscal space, monetary easing or tightening or increase productive capacity. Examples include taxation and revenue utilization, interest rates, exchange rates, money supply and debt management, among others. In some instances, economic policy may also include aspects of trade, industrial output and public or private investment.



## II. Context of AI Applications

AI solutions and applications have become ubiquitous in popular press and social media, particularly with the new generation of natural language processing tools that are driven by AI technologies. These can engage in human-like conversation, answer queries and compose text and code with increasingly good outputs. ChatGPT, developed by OpenAI, has received the most press coverage and has been the subject of academic studies, but many large tech companies such as Meta and Google have already developed sophisticated language model tools, which will likely transform numerous sectors over the coming years.

In the private sector, AI applications are sophisticated and used for risk management and compliance, business automation, financial operations, customer service, information technology operations and more. Generally, two particular types of AI technology are being deployed by businesses. Machine learning allows computers to “learn” without bespoke programming. This happens through assessing huge volumes of data and then using patterns in the data sets to improve a program’s ability to predict. Machine learning is now embedded in most online applications such as e-commerce, video streaming or gaming. Natural language processing is another form of AI that can read and “understand” language, allowing the computer to respond as if it were a human. In this way, AI is widely used in chatbots, speech recognition and translation software.

As an example of just how integrated AI has become, 70 percent of all banking institutions and more than 100 million people globally use IBM’s Watson for things such as predictive analytics, automation and optimizing employee time.<sup>4</sup> AI is being utilized across all sectors. The motorcycle manufacturer, Harley-Davidson, has reduced assembly time from 21 days to 6 hours using intelligent systems, while South Korean tech giant Samsung is planning to convert one of its factories to AI-powered production in 2023.<sup>5</sup> According to the business intelligence group Grand View, the worldwide AI market size was valued at \$93.5 billion in 2021. This is expected to grow at a compound annual growth rate of 38 percent from 2022 to 2030.<sup>6</sup>

The application of AI extends well beyond commerce and productive sectors. The US Department of Defense established the Joint Artificial Intelligence Center in 2018. Firms such as Falconry are using digital twins to discover patterns in their equipment. This can, for example, identify equipment failure before it actually happens. They do this with machine learning models with high speed signal pattern recognition and automatic confidence scores.

At the same time AI is used for more noble purposes, such as targeting of humanitarian aid. According to the Borgen Project, as climate change increases the number of hurricanes and other weather-related events, big data allows non-government and aid organizations to better target support to 160 million people.<sup>7</sup> AI is being used to plan delivery routes and humanitarian corridors, geotag affected areas using satellite imagery and computer vision, classify damage to allow for prioritization and quickly estimate the extent of damage and costs.

The COVID-19 pandemic was another instance where AI was rapidly deployed to save lives and target social and financial support. AI is being used to monitor recovery initiatives, and it was an important part of establishing surveillance and tracing. It can also be used in predicting the spread of the virus

and speeding up research on vaccines and treatments. There are regular reports of additional AI technology breakthroughs such as a novel deep convolutional neural network AI algorithm that can detect COVID-19 within minutes with almost 100 percent accuracy; or a smart watch that detects COVID-19 using AI sensors to monitor temperature, heart rate, galvanic skin response, oxygen saturation rates and blood pressure. Of course, in some cases such efforts have failed, and all technology solutions should be verified, and where medical care is involved, should be approved or certified by appropriate governmental bodies.<sup>8</sup>

A well-known application of AI during the pandemic was in Togo, which launched its Novissi program (solidarity in the Ewe language). The program provided financial support to citizens pushed back into poverty due to the financial implications of COVID-19. To ensure better targeted relief, Togo worked with the University of California, Berkeley on AI applications and big data to highly target the poorest communities using satellite imagery and cellular data sets.

Despite AI being widely used by the private sector across all segments of society from defense to humanitarian relief, and in response to the COVID-19 pandemic, AI remains nascent in economic policymaking. This may be due, in part, to the risks and challenges associated with the use of AI.

The technology can increase the effectiveness of hacking, digital surveillance, spy craft, tracking and targeting and malware. Digital surveillance for public safety and transportation is now hotly debated in Africa, with the sector growing quickly. For example, the government of Uganda purchased more than \$125 million worth of digital surveillance equipment from Huawei in 2019. Two years later, the South African Constitutional Court ordered updates to the Regulation of Interception of Communications and Provision of Communication-related Information Act of 2002 (RICA), in part due to the growing private digital surveillance sector.<sup>9</sup> In addition to the well-known Pegasus spyware from the Israeli firm NSO Group, other actors include Amesys (France), Hacking Team (Italy), Huawei (China) and Gamma Group (UK). According to research from the Brookings Institution, these companies all provide digital surveillance solutions to African governments.<sup>10</sup>

The role of China in Africa in general is well documented.<sup>11</sup> Between 2000 and 2020, direct investment of Chinese companies in Africa surpassed \$43 billion, and China has established more than 3,500 companies on the continent. This is in addition to direct and indirect government investment.<sup>12</sup> But it is also worth looking at China's role in Africa in the context of technology in particular. For example, China has commercial and scientific agreements with 14 African countries related to space exploration and satellite launches.<sup>13</sup> Additionally, according to CSIS, in some African countries, companies such as Huawei and ZTE have market dominance from digital infrastructure development to technology exports. This has led to the adoption of Chinese tech standards in many cases as technology exports from China sometimes come with bilateral harmonization of technical standards. As of 2019, China had officially signed 85 standardization cooperation agreements with 49 countries and regions as part of the Digital Silk Road.<sup>14</sup>

China's 2021 white paper "China and Africa in the New Era: A Partnership of Equals" clearly lays out the country's ambitions for investment in technology and digital sectors. According to the paper, Chinese firms have built more than 50 percent of Africa's wireless and high-speed mobile broadband networks. They have installed more than 200,000 kilometers of optical fiber, which reaches approximately 900 million African citizens. They indicate that more than 1,500 Chinese companies in 17 African cities have Chinese collaborators on digital investment. And 29 African countries have purchased e-government applications provided by Chinese firms. China has established a public cloud service in South Africa that covers the entire African region, while it also established the first 5G independent network in Africa.



## III. AI in Economic Policymaking Around the World

The lack of wide-spread AI application in economic policymaking is an opportunity for countries in Africa and the global south. With appropriate regulations and protections, AI can, in principle, improve economic forecasting, targeting of taxes and spending and informed decision-making regarding inflation, interest rates and exchange rates. It can also be used to more carefully craft tariffs and fees, incentivize investment and diversify manufacturing and exports. Overall, AI can be used to accelerate economic transformation, which is sorely missing.

According to ACET's 2023 African Transformation Index, economic transformation has lagged or even reversed in much of Africa. ACET defines economic transformation for Africa as growth with DEPTH, whereby DEPTH is an acronym for five key dimensions of successful transformation: Diversification, Export competitiveness, Productivity increases, Technological upgrading and Human well-being. (See Annex 1 for more.) During the first decade of the 2000s, Africa experienced a GDP growth acceleration that brought hopes of prosperity never seen before. However, those hopes were soon dashed, as the 2006-2007 global financial crisis led to subdued global consumer and investment demand; the end of the commodity supercycle in 2014-2015 soon followed. By 2016-2018, Africa's aggregate GDP growth was almost half of what it was ten years before, coming to a virtual standstill in per capita terms.

Overall, while growing in aggregate, African economies were failing to establish new activities to produce and export more varied goods and services. They were also failing to capture increasing shares in external markets, especially in the non-extractive commodity markets. They commanded low labor productivity and failed to sufficiently upgrade technologies to effectively embody them in products and exports with higher value added and quality. AI solutions could be used to inform policy directions and decisions in each of these areas.

However, governments around the world have significantly lagged the private sector in adopting AI solutions, and this is even more highly pronounced with regard to economic and policymaking. Ministries of finance and central banks have been particularly cautious in this regard. This is in part due to intense public scrutiny on big tech companies, which must be partners in government AI applications. Moving toward, AI solutions will also require large, costly and long-term investments, some of which may lead to a reduction in some jobs for a limited set of functions. Due to the pandemic, some governments have become more open to changing processes, platforms and interfaces with data.

Numerous institutions are assessing the potential for AI, undertaking pilot projects and exploring options and good examples of government using AI to inform decisions that have an impact on fiscal and monetary policy, even if not the policy itself. For example, in the United States the Department of Health and Human Services uses AI applications to analyze procurement trends to reduce costs and improve contract structure; Singapore uses AI to assess financial data in procurement and tender approvals to identify patterns that may indicate corrupt practices.<sup>15</sup> Additional examples of experimentation and usage follow.

## Macro forecasting with machine learning

In response to the COVID-19 crisis an IMF team experimented with dynamic factor models, machine learning and novel data to nowcast GDP in Europe. They were able to use new data from unofficial sources such as sentiment analysis, market surveys, online search engines, and sensor data to quickly register big changes in economic activity. This was supplemented with traditional data and validated by national statistical offices. The team compiled datasets for six European countries and compared traditional and new nowcasting methods. The datasets comprised traditional and non-traditional data. The machine learning methods reduced average forecast errors by up to 75 percent. Importantly the models worked better in times of low volatility and the models were not able to predict significant contractions, but they did predict economic downturns.

Similarly, an IMF team developed a machine learning framework to nowcast and forecast economic growth in Turkey, reducing forecast errors by 30 percent relative to traditional models. This approach can be particularly useful in volatile economies where there may be big changes in economic activity. The team was also able to improve transparency and interpretability of the machine learning forecasts by uncovering the contribution factors of each predictor to individual forecasts.<sup>16</sup> The research found that state of the art traditional forecasting models often have large errors, while machine learning models perform better because they more appropriately handle non-linear interactions among a large number of predictors. Importantly, machine learning models can be trained to avoid over-extrapolation of historical relationships. As would be expected, the research also showed that nowcast errors decrease considerably over time periods as more data is added to train the models.

## Monetary modeling

The team at Rebuilding Macroeconomics, with experts from the Bank of England, University of California Berkeley and others is focused on financial stability. Given that finance had not generally been seen in academic circles as part of mainstream macroeconomic models prior to the global financial crisis, they use learning models that allow actors time to adjust by making mistakes and then adjusting actions based on new information that is generated. They have adapted those models by incorporating AI into decision-making processes. For example, with AI one can introduce options to fine tune the rationality of economic actions. Also with AI, big data can be introduced for a significantly larger number of variables than usual learning models. This is one of the early applications of AI to a traditional model of adaptive learning in macroeconomics to address the interaction of fiscal policy variables and monetary policy.

With AI, one can solve models across policy frameworks, which has not been efficient with traditional learning models in the past. They are next planning to explore how AI agents respond to fiscal and monetary shocks and how this would differ from current parameters for policy analysis and recommendations. This would allow, for example the AI model to forecast credit provision, money creation and financial stability in the face of huge financial shocks.<sup>17</sup>

## Taxation

Tax policy is a primary way that governments raise financing for infrastructure, poverty reduction programs and many other necessary public needs. In even the most sophisticated economies, designing and implementing optimal tax policy is fraught, often creating disincentives such as tax avoidance. It is particularly difficult to design tax policy that responds to tax sensitivity of different segments of the economy and population. To help address this challenge, Harvard University and Sales Force have created an AI Economist, which is a two-level deep reinforcement learning framework. The AI Economist “learns” tax policy based on observable data, but with reduced bias, as it does not have data on the functions of citizens or assumptions about their actions.

The Harvard and Sales Force teams use simulations that test economic policies on a large scale and with a broad range of metrics. This allows for the comparison of millions of economic designs, while the machine behavior is “learned” in parallel. The simulation approach can help inform real-world tax system design. With this approach the AI agents can introduce expected bad behaviors such as tax-avoidance and even adjust taxable incomes over time.<sup>18</sup>

## Banking and financial supervision

While supervision authorities do not make economic and financial policy, they are central to ensuring policy is implemented correctly and legally. AI is used by regulators and supervisors to identify patterns that humans may not see — and in turn enhance the effectiveness of financial and economic supervision. AI is also more nimble than humans and can highlight anomalies to regulatory officials more quickly. There are numerous examples from around the world where AI is being used in this manner, generally by central banks.<sup>19</sup>

The Banca d’Italia is using machine learning for loan default forecasting. It does this by using big data from different sources. Likewise, the Banco de España is leveraging natural language processing to process environmental, social and governance disclosures and better respond to economic changes in the green economy. In southeast Asia, the Bank of Thailand is depending upon artificial intelligence and machine learning platforms to assess the minutes from board meetings of financial institutions to better understand compliance or non-compliance, while the Monetary Authority of Singapore is using AI algorithms for credit risk assessments.

## Central bank applications

Since early 2020, the Center for Economic and Policy Research (CEPR) has been advocating for more AI solutions applications by central banks. CEPR argues that monetary systems are infinitely complex, whereby any policy implemented by a government and any action taken a citizen will change the dynamic system. CEPR also argues there could be tremendous upside to using AI during financial crises or chaos when there is significant volatility and decisions need to be made quickly. In some cases, central bank management only has a very limited window to make decisions that can impact millions of — or billions — of citizens. AI offers the speed of information gathering and assessment that is necessary in those situations. They term this form of artificial intelligence as “microprudential AI.” At the same time, AI can influence macroprudential regulations through big-data collection and forecasting, which will in turn improve communication between policymakers and financial institutions.

CEPR has also outlined four key challenges worth noting. First is the homogenous perception of risks. There is a concern that as AI models increasingly see similar risks, they may naturally adapt in similar ways. Second, since AI models only operate on the data they can “see,” they will miss the “unknown-unknowns.” The AI platforms can only be trained on events that either have already happened or are generated from simulations. Third, while some AI applications could be useful now for monetary policy, it is unlikely that users will trust AI in this space for some time. (CEPR indicates that such trust gaps are often overcome over time.) Fourth is how AI will handle bad actors. The standard defense is for AI models to react randomly, limiting the ability of such actors, but this will become increasingly difficult as AI is used to “hack” AI.<sup>20</sup>

At the Frankfurt School of Finance and Economics, experts are researching how AI and machine learning can support monetary policy decisions.<sup>21</sup> In particular, they focus on issues such as forecasting, assessing financial risk and macroeconomic analysis. Similar to some other examples, this work was a response to the impacts of the global financial crisis. The researchers feel that new approaches are needed to address systemic risk and banking supervision to avoid future shocks. They note that application of AI in banking has also been accelerating as central banks have access to very large data sets such as financial market data and transactions. In 2020, approximately 80 percent of central banks used big data, with about 40 percent using big data to inform monetary policy. While AI is not always used to interpret big data, the researchers note it can be used to create better information that reinforces macroeconomic indicators, and thus can introduce new types of data.

AI and machine learning can also be used by central banks to measure levels of uncertainty in policy recommendation. This is often done by applying text analysis and indices to measure uncertainty in the overall state of the economy. For example, the European Central Bank is using AI-enabled supervisory technology. Big data analytics are deployed to increase the understanding of financial system early warning frameworks.

Other central banks use AI to better understand market uncertainty.<sup>22</sup> For example, De Nederlandsche Bank is assessing the use of AI to detect liquidity issues at banking institutions. Banco Central de Chile uses artificial intelligence to track perceived unhappiness by citizens with financial and monetary policies, while Banco de Mexico uses sentiment analysis to analyze Twitter messages in response to shocks to the economy.

There are several central banks that are using artificial intelligence to support other key functions. Sveriges Riksbank in Sweden is leveraging new technologies to strengthen nowcasting by using machine learning by scraping the internet for key data on commodities to improve short-term inflation forecasts. The Reserve Bank of New Zealand is experimenting with AI to access large data sets to improve nowcasting of economic growth. And the Bank of Indonesia is experimenting with AI for sentiment analysis to inform its policy rate.

## Private sector applications

There has been a rapid expansion of private sector applications using AI, particularly in reg-tech. According to Deloitte, the reg-tech market matured from just 150 products/services to more than 400 between 2017 and 2021.<sup>23</sup> While these solutions are currently being used for private sector efforts, their applications may be appropriate for public sector entities in the future. For example, the firm Arachnyns uses big data analytics, voice and text recognition and cloud computing to provide know your customer and anti-money laundering solutions that capture data and facilitates real time risk analysis. It currently operates in 98 languages across 2020 jurisdictions.

Another example is the company TriLine GRC, which uses big data analytics, smart contracts and cloud computing to scan regulatory horizons to rapidly adapt to new regulatory risks. It provides almost instant input with regulatory actions pre-identified. TriLine works across sectors such as financial services, healthcare, manufacturing and insurance. Slimmer AI is also an example where the private sector is utilizing AI in ways that could be applicable to economic policymaking. The firm uses AI and machine learning to simplify fraud compliance processes. It reduces time spent by employees by 50 percent and results in a 50 percent cost savings.

## AI developed theory

A researcher at the IMF is exploring the new types of AI models that are either unsupervised, or those using reinforcement learning algorithms, which have the ability to boundlessly search while also iterating and artificially testing relations between an infinite set of variables. With variables that are both economic and non-economic, these new AI models can detect new best practice policies that may be applied to fiscal and monetary policy. The IMF emphasizes that a challenge to AI developed theory is that AI systems are influenced by bias for or against certain theories, either through the data inputs or in the algorithm with look at that data. The other key challenge is “theoretical blindness,” in that AI systems cannot apply theories to data. The ability of unsupervised and reinforcement learning systems to operate independently and identify and test patterns and information that was previously undetected can greatly increase efficiencies and move closer to economics that is not centered on historical schools of thought.



## IV. AI in Economic Policymaking in Africa

AI in economic policymaking is a frontier agenda globally, and particularly in Africa. This provides a unique opportunity for African policymakers, particularly ministries of finance and central banks. These opportunities include options for improving taxation and resource utilization, economic productivity, equitable employment, interest rates, exchange ranges and broader fiscal and monetary policy such as tariffs, industrialization and investment.

While AI is a frontier issue, there is a wide range of stakeholders who can help inform AI for economic policymaking over the coming years in ways that are specific to Africa's needs, including economic policy institutes, technology and ICT organizations, academic institutions, international development institutions, the private sector and governments. ACET engaged with many of these stakeholders to understand their perspectives and interests in this topic.

### African economic policy institutes

Numerous think tanks and economic policy institutes have research programs and discreet projects on AI applications in sectors, for public service delivery and to meet individual SDGs. In some cases, this interest is related directly to economic policymaking, while in other cases it is more related to interest in African futures, particular projects or national development objectives.

For example, in 2021, Fundación Centro de Implementación de Políticas Públicas para la Equidad y el Crecimiento (CIPPEC) and the African Economic Research Consortium (AERC) organized a series of roundtable dialogues with researchers, academics and policymakers. This included sessions on artificial intelligence and platform economies, with a focus on policy formulation that is specific to African economies. The Institute for Security Studies (ISS) has published extensively on AI, including on the emergence of artificial intelligence technology tools, and the role of AI in political divisions and tension. In another example, the South African Institute of International Affairs (SAIIA) has undertaken analysis on the role of AI in surveillance, and has provided recommendations on issues such as ensuring data transparency and access.

The Egyptian Center for Economic Studies (ECES) has run workshops on scaling AI adoption and development in Egypt, with a focus on harnessing trustworthy AI for development and looking at the nascent AI ecosystem in the country. The Kenyan Institute for Public Policy Research and Analysis (KIPPRA) had artificial intelligence as a key theme in its 2021 annual regional conference, with a particular focus on how to mainstream digital innovations in public policy, including in areas such as tax incentives and industrial policy. The Policy Center for the New South (PCNS) has also published widely on AI, including its role in social transformation and cognitive sciences to inform political science.

The Nkafu Policy Institute has done research on the adoption of new technologies, such as artificial intelligence and cloud computing in the context of economic disruption in Cameroon, as well as building machine learning and artificial intelligence into educational reforms. At the same time, the

Council for the Development of Social Science Research in Africa (CODESRIA) in Senegal had artificial intelligence as a theme in the context of issues such as sensors, gesture recognition and haptics for education for its 12th international conference on ICT for development, education and training. The Centre d'Etudes et de Recherches en Sciences Sociales (CERSS) in Morocco has run a conference on society, culture and education in the digital era with a focus on artificial intelligence, big data and internet 4.0.

Interestingly, many of the leading or well-known African economic policy institutes have not focused on artificial intelligence as a primary theme. These include, for example, the Zambia Institute for Policy Analysis and Research (ZIPAR); REPOA, the leading policy institute in Tanzania; Policy Studies Institute (PSI) in Ethiopia; Centre Ivoirien de Recherches Economiques et Sociales (CIRES) in Cote d'Ivoire; Institute of Economic Affairs (IEA) in Ghana; the Nigerian Institute of International Affairs (NIIA); Economic Policy Research Center (EPRC) in Uganda; and the Group for Research and Applied Analysis for Development (GRAAD) in Burkina Faso.

### African technology and ICT organizations

As would be expected, there is more interest and activity related to AI among technology and ICT-oriented organizations in Africa. For example, the Busara Center, based in Nairobi uses analytics and data science tools for modeling behaviors, and then uses that data to design development solutions. The South Africa economic impact agency Cenfri has done research on helping data scientists contribute to data-driven policymaking in Africa, as well as considerable work on AI in financial services.

The African Center for Technology Studies (ACTS) has made artificial intelligence a key theme for its most recent annual conference, with a particular focus on using AI and machine learning to achieve the SDGs. ACTS also implements the Artificial Intelligence for Development (AI4D) Africa Scholarship Programme. The African Technology Policy Studies Network (ATPS) serves as the managing organization for the Responsible Artificial Intelligence for Agriculture and Food Systems (AI4AFS) Innovation Research Network, but otherwise does not have a primary focus on artificial intelligence.

AfricaLics is a network that connects academics working on themes of innovation and development, particularly related to innovation for sustainable industrialization and innovation in financial institutions and micro-finance, which may include opportunities for AI solutions. Research ICT Africa is a think tank that undertakes research on issues related to digital policy and governance, as well as the application of technology for Africa's economic development. It runs the African Observatory on Responsible Artificial Intelligence, with a research focus on African AI ethics, AI and difference, AI and democracy and public integrity in AI, as well as the Just AI Center.

SMART Africa is an alliance across 30 African countries that seeks to accelerate connectivity and a single African digital economy. The initiative has a wide range of projects from e-agriculture to smart cities to internet governance. Smart Africa has one country flagship project on AI in South Africa. The project focuses on strengthening technical skills on AI.

### Academic institutions

AI4D Africa supported an analysis in January 2021 that assessed higher education and training organizations, policymakers and the broader AI community.<sup>24</sup> The research found that 67 percent of higher education respondents indicated that they have AI researchers or experts; 54 percent noted that their institutions had AI-related academic courses. It is important to note that these courses were often in areas such as computer science, statistical modeling and information technology — so not directly related to using AI solutions for policymaking. That said, the report did indicate a demand for courses in areas such as AI solutions for data analysis and AI in social sciences.

The report also indicated instances of AI-related research and development. The University of Rwanda has an African Centre of Excellence in Data Science with a niche on the use of big data for AI and other applications. Other examples include the Addis Ababa Science and Technology University, which has established the Artificial Intelligence and Robotics Centre of Excellence, and plans partnerships with industry. Another example is the University of Pretoria (UP), which has established an Intelligent Systems Group (ISG) focused on theory and AI application such as digital image processing, remote sensing and computer vision. The University of Pretoria also established the Institute of Big Data and Data Science in September 2017.

Makerere University has an AI and Data Science Research Group, which undertakes research in areas such as urban management, remote sensing and disease diagnosis, while the University of Johannesburg has an Institute for Intelligent Information Systems for capacity building around AI, machine learning and data science. The Malawi University of Science and Technology and IBM have a Digital Nation Africa (D-NA) Project focused on using technologies such as blockchain, cloud computing and AI, while Strathmore University has an @iLabAfrica Research Centre, which seeks to accelerate innovative research in new tech, including AI as well as supporting local technology ecosystems.

The University of Lagos is hosting a Data Science Community Centre and Artificial Intelligence Hub, which has an interesting focus on linking academic and industrial research on deep learning and encouraging young talent discovery. Five universities in South Africa host nodes of the Centre for AI Research (CAIR), which supports applied research on AI in areas such as AI for development, ethics of AI and probabilistic modeling.

The Robotics, Autonomous Intelligence and Learning (RAIL) Lab at the University of the Witwatersrand has a particular research focus on reinforcement learning, and there are numerous others such as the Kwame Nkrumah University of Science and Technology, Carnegie Mellon University Africa, Kimathi University, Cheikh Anta Diop University, and Université Polytechnique Mohammed VI (UPMVI). On the latter, UPMVI has partnered with OCP Group, Ecole des Mines, Ecole Polytechnique, MIT, Columbia University and École Polytechnique Fédérale de Lausanne (EPFL) to establish AI graduate and executive programs and to set up coding schools in Benguerir and Khouribga in Morocco.<sup>25</sup>

Beyond academic institutions, some global think tanks and foundations have demonstrated an interest in the applications of AI in Africa. For example, the Botnar Foundation in Switzerland focuses on inclusion of youth and the equitable use of AI and digital technology, particularly related human rights in a digital age and responsible digital governance. Likewise, the Foundation for Studies and Research on International Development (FERDI) at the Center for Studies and Research on International Development (CERDI) in Clermont-Ferrand has established a Digital Trust Chair to focus on digital identity, blockchain, big data and artificial intelligence. Researchers there seek to identify technological solutions to address development challenges in Africa.

### International development institutions

The UN and other international development institutions are showing an increasing interest in AI solutions, including by building their own capacity. But few are applying their interests and initiatives directly to AI in economic policymaking. In February 2022, the UN Economic Commission for Africa (UNECA) launched the African Center for Research in Artificial Intelligence (CARIA) in Brazzaville, Congo. This center is hosted at the Denis Sassou-N'Guesso University. Early in the COVID-19 pandemic, UNECA also launched the Africa Communications Intelligence Platform, which relied on artificial intelligence technology, to share information and help governments respond.

The African Development Bank (AfDB) and Microsoft are collaborating on a Coding for Employment Programme with applications for AI, but it is mostly focused on supporting digital innovators. AfDB also runs an Entrepreneurship & Innovation Lab to support start-ups and young entrepreneurs as well as tech hubs. Many of the partner organizations are associated with AI solutions, but the lab does not have a specific focus on AI.

As noted previously, IMF staff members have published widely on issues related to AI in finance and monetary policy, and there are some AI-related pilots underway internally. Likewise, USAID has developed use cases and provides guidance to development practitioners in addressing issues of fairness and bias.<sup>26</sup>

The OECD has an Expert Group on AI and runs an AI policy observatory, which acts as a repository for data and also provides research and analysis. It covers 20 sectors and themes, including “economy,” but to date it has not focused on AI for economic policymaking. Additionally, the OECD has established a set of AI principles that promote use of AI that is innovative and trustworthy, with a particular emphasis on human rights and democratic values.

In 2021, UN Educational, Scientific and Cultural Organization (UNESCO) developed values and principles around ethics in AI.<sup>27</sup> Nearly 200 member states soon thereafter adopted the “Recommendation on the Ethics of Artificial Intelligence.” The values and principles are intended to protect human rights and human dignity and to provide a direction for the rule of law in digital matters around the globe.

Numerous other organs of the UN have a focus on AI globally. The International Labour Organization (ILO) supports research on AI-related issues such as the future of work, automation and labor mobility, while the International Telecommunications Union (ITU) convenes global events on beneficial AI. The UN Interregional Crime and Justice Research Institute has a Centre for AI and Robotics, with a focus on security issues. Under the umbrella of the UN Conference on Trade and Development (UNCTAD), the Commission on Science and Technology for Development (CSTD) supports a broad array of work on AI related matters in areas such as trade, health care, data flows and investment.

### Private sector

The large global tech firms that are leaders in AI are investing significantly in Africa. Google made a splash in opening Africa’s first AI laboratory center in Ghana. The company also supports machine learning initiatives at the African Institute for Mathematical Sciences center in Rwanda. In October 2021, Google committed to invest \$1 billion over five years in four countries: Ghana, Kenya, Nigeria and Uganda. The financing would be targeted to improving connectivity, including undersea cables,

and supporting start-ups. When Google opened its AI research center in Accra in 2019, they were supporting 100,000 developers and had more than 60 start-ups in the Google accelerator program.<sup>28</sup>

Facebook is also making huge investments, including an undersea cable expected to cost \$1 billion, and it has partnered with Liquid Intelligent Technologies to lay a fiber network in the Democratic Republic of the Congo.<sup>29</sup> Amazon is planning to build a \$300 million African headquarters in Cape Town, which is expected to create 19,000 jobs.<sup>30</sup> The company is also investing in large solar plants to power Amazon Web Services data centers in Africa.<sup>31</sup> Microsoft has Africa Development Centres in Kenya and Nigeria focused on applications for AI and machine learning. And the Microsoft Policy Innovation Centre at Strathmore University in Kenya serves as a platform to address policy issues surrounding digital transformation, including AI.

Activity in this space is not just limited to global tech firms; African firms using AI solutions are also raising capital. For example, Flutterwave, the Nigeria fintech company raised \$170 million in 2021, bringing its total fundraising to \$225 million in five years.<sup>32</sup> At the same time there has been significant growth in digital innovation hubs on the continent. Research by Briter Bridges has found more than 640 technology hubs, of which 41 percent are incubators, 24 percent are innovation hubs, and 14 percent are accelerators. In 2021, venture capital firms invested \$4.6 billion in the African technology sector, 40 percent of which went into fintech — a 150 percent year-on-year-increase.<sup>33</sup> In 2019, there were approximately 6,500 technology start-ups in Africa, about 10 percent of which were using AI. In 2019, Briter Bridges identified 75 companies in Africa using AI, machine learning and deep learning.

## Governments

Only Mauritius and Egypt have developed a full AI strategy in Africa, while South Africa has a Presidential Commission on the Fourth Industrial Revolution.<sup>34</sup> Kenya has an AI taskforce that is creating guidance on how AI technologies can be used to further the country's development. In 2021, Rwanda established a technology center of excellence in the areas of digitalization and AI and is working on a strategy.<sup>35</sup> Also, Ethiopia has established an artificial intelligence research center, Tunisia has established a national industry association on AI (L'Association Tunisienne pour l'Intelligence Artificielle)<sup>36</sup> and Botswana is championing an effort for regional AI research labs. Many others are supportive of AI innovators and investors, as evidenced by the AI Center in Congo and the South African government's Blueprint on Artificial Intelligence for Africa.



## V. Opportunities and Challenges

Many times the binding constraints facing a frontier agenda are also opportunities. For example, in the case of AI for economic policymaking, one constraint is the lack of enabling policy to fully benefit from what AI has to offer. That said, the lack of existing policy is an opportunity for stakeholders to help ensure African governments design and implement solutions that are well informed, adapted to African contexts, and do not create disincentives for investment in innovation and technology. The potential benefits of AI solutions for economic policymaking are numerous. Some of the more notable opportunities include:

- **New, additional and non-traditional data:** Currently, most economic policy is informed by four traditional data sources. These are: (i) data generated by government statistical units, (ii) household surveys and similar data collection methods, (iii) market data, and (iv) data provided by international organizations. AI solutions provide the ability to use non-traditional data that add new perspectives and insights for policymakers. For example, data scraping, sentiment analysis and natural language processing can help predict how segments of an economy may respond to particular policies -- increases in tax rates, for example. This data can also be real-time, as opposed to government statistics, which are sometimes out of date or collected infrequently.
- **Faster and continuous inputs:** AI solutions can provide real-time inputs to policymakers for quicker decision-making. This can be particularly important during times of crisis when policymakers are under pressure, but where poorly informed decisions can have highly negative impacts on households and businesses. For example, AI is currently used to target humanitarian relief. It could, in principle, be used to target incentives to small and medium enterprises during times of economic hardship, resulting in higher impact. Many AI applications can also give efficacy probabilities to predictions. Additionally, machine learning can provide constant analysis and inputs to policymakers. For example, by using mobile banking data or transportation sensors, AI could help policymakers understand the impact of interest rate policies on economic activity, allowing for more precise policy adjustments.
- **Improved policy prioritization and sequencing:** AI solutions can help governments prioritize and sequence policy decisions. Frameworks can be designed for application in public sector settings with decision automation using prescriptive analytics or predictive analytics. Likewise, decision augmentation can be designed that recommends decision alternatives, thereby linking human knowledge and AI capacity. And there can be AI decision support mechanisms, where humans make decisions, supported by descriptive, diagnostic or predictive analytics.<sup>37</sup> These frameworks can be further defined by applying filters for simple actions such as payroll processing, or filters where complicated actions require expertise and multiple interdependencies. AI can be utilized at all levels of government to improve policy prioritization and sequencing for issues such as benefits management, identifying fraudulent claims, tracking disease spread, crime prevention and transportation. There is significant potential to use the same types of predictive tools to improve policy prioritization related to revenue utilization, targeting of taxes, and managing interest rates.

- **Increased transparency and data integrity:** The integrity of government statistics is often poor because of poor data collection practices, limited coordination across government, improper data storage and tagging, and manipulation for political or corrupt purposes, among other reasons. Using big data for AI solutions can address these challenges in some instances. Often big data is collected or owned by the private sector. Mobile banking data, for example, is often collected by financial institutions. Likewise, the data is often already tagged, disaggregated and cleaned. As the data is owned by non-government sources, manipulation of data is more difficult.

This increased transparency and data integrity may be seen as a threat to policymakers, politicians and political parties in some instances. In countries where government data is manipulated to meet political objectives or where a lack of data ultimately benefits governments that are under-delivering, new and more transparent data may expose corruption and poor implementation. During stakeholder consultations, it was often suggested that trust needs to be built between governments and the private sector, and that knowledge needs to be developed among policymakers and political leaders.

- **More policy options:** Around the world, the policy tools used by governments are limited in number and application. Most economies are managed in similar ways and with similar policies, simply adapted to meet particular goals. For example, interest rates are increased by central banks to slow borrowing and thus slow economic activity. This policy tool is used in all types of economies, from market-driven nations such as the United States to communist nations such as China or Cuba. They are also applied in all market sizes, from Togo to Brazil. Artificial intelligence will allow policymakers a much wider range of policy options — and possibly even different policy approaches. New big data can provide a deeper and broader understanding of economic drivers and therefore the range of policy options, particularly where policy can be highly targeted.

While there are many potential benefits, there are also significant challenges. These challenges will manifest in different ways depending on the AI readiness, capacity, laws and regulations, actors and support provided. AI systems in themselves raise concerns about embedded bias in AI and machine learning systems, the opaqueness of their outcomes in some instances, and their robustness to cyber threats and privacy. Some of the challenges identified include:

- **Poor AI ecosystem:** As previously indicated, the AI ecosystem in Africa is growing but remains nascent. There are increasingly more actors but very limited interaction between the tech community, government, research and development and the private sector. According to the January 2021 report “Artificial Intelligence Capacity in Sub Saharan Africa,” nearly 50 percent of respondents to the author’s survey indicated that their institutions do not engage with policymakers on AI-related policy issues, while more than another quarter were not sure. The lack of ecosystem extends to the innovation and digital sectors more broadly, whereby those with the most knowledge and expertise do not often inform policy. Given that the digital and innovation fields are rapidly evolving, there is an urgency to build up such ecosystems with structured engagements, appropriate funding and venues for knowledge sharing.
- **Understanding the technology and the opportunity:** AI is poorly understood by citizens globally, and while people interact with AI solutions regularly (chatbots for example) they do not necessarily associate those solutions with artificial intelligence. The same applies within government. Those who may have the best understanding of AI applications are likely within

ministries of science and technology or in higher education institutions — not within ministries of finance or central banks. Overall, the private sector has been much more nimble in adopting AI, although most governments in the global north now have dedicated teams on aspects of AI (such as defense, service delivery, technology development, and more).

Generally, African governments have not started to establish or implement AI maturity models that can provide strategies for assessing capacity, readiness and gaps. Many maturity frameworks focus on issues such as awareness, level of current usage, systemic integration and transformational utilization. It will be important that such models are adapted to the African context.

- **Bias:** A significant challenge for all AI applications is that they run on available data, and therefore AI solutions are not fit for purpose in many cases. AI is making decisions in Africa using non-African data or insufficient African data. Likewise, AI algorithms are often written for users or customers in the global north and may not be appropriate for other parts of the world. The most basic area of bias is training data that is needed for machine learning. The training data are data sets with outputs designed to make predictions. If the data and its labeling does account for local context, then it will be biased. More advanced AI systems can also exhibit bias. For example, facial recognition is a technology with known bias. A study by the US National Institute of Standards and Technology validated research that showed facial recognition algorithms, including those from IBM and Microsoft, performed the worst on darker-skinned females, with error rates up to 34 percent higher than for lighter-skinned males.<sup>38</sup>
- **Principles of responsible AI:** There are no accepted principles for responsible AI in Africa, with the most widely used principles being created by the OECD. This is a critical gap in ensuring common approaches across the continent. The UN Strategy on New Technologies calls for the responsible adoption of artificial intelligence, and a number of countries such as Ghana, Kenya, South Africa, Tunisia and Uganda are advancing work on data protection and in some cases ethics guideline. The African Union is implementing the AU Digital Transformation Strategy and the African Continental Free Trade Area (AfCFTA) is addressing digital protocols, but progress is slow. Digital trade was only included in the AfCFTA in February 2020. The negotiations will focus on market access; rules and regulations such as consumer protection, data protection, intellectual property rights, competition policy and tax-related issues; trade facilitation; and the enabling environment, including digital infrastructure, internet access and affordability.

The African Union Development Agency (AUDA-NEPAD) is leading the development of a continental strategy for AI, but the effort is more focused on identifying emerging technologies to support Africa's economic growth. The AU High-Level Panel on Emerging Technologies convened a group of experts in May 2022 to discuss a continental strategy for AI, and the panel plans to issue guidelines to African governments on AI.<sup>39</sup> The AU Education, Science & Technology Department has published the "Science, Technology and Innovation Strategy for Africa 2024," but it does not mention AI.

In 2019, Egypt led the creation of the African Working Group on AI, to develop a Pan-African strategy and to develop platforms to address digital skills gaps, but it has not led to substantive outputs. Likewise, the AU Specialized Technical Committee on Finance, Monetary Affairs, Economic Planning and Integration has debated areas related to AI in the context of skills and technology needed for the future of work.

- **Data and its ownership:** As AI is generally not yet used to inform economic policy, there is a lack of knowledge about what traditional and non-traditional data may be most applicable, where gaps exist, what data across sectors is suitable for AI and what AI applications may be most appropriate to address inclusive and sustainable economic. These issues will be a focus of future research, informed by numerous initiatives and partnerships such as WorldDataLabs, Deep Learning Indaba, and Zindi, a platform for African data scientists.

As outlined earlier, much of the data in Africa is not owned by African institutions nor retained on the continent. Africa has very limited cloud computing and data center capacity, both of which make it difficult to ensure a strong data ownership regime.

- **Data privacy and security:** Confidentiality and proprietary use make the usage of data for AI applications complex. If AI is used to inform fiscal and economic policy, then safeguards should be in place to ensure data privacy, particularly if new and non-traditional data sources are used. Currently these policies are often not in place or capacity for effective enforcement is weak. Likewise, if data from private sector operators is used for policy analysis, appropriate and clear guidelines are needed on ownership and usage of that data. In the future, synthetic data, which can be generated from mathematical or machine learning models, may alleviate some of the concerns about individualized citizen data. Data breaches are already common, often within the most sophisticated organizations; hence the risks in Africa are likely elevated. Related to data security, if AI solutions are used by ministries of finance or central banks, there is a higher risk of cyber-crime, including ransomware attacks.
- **Digital infrastructure:** Africa's digital infrastructure gap is huge. As AI and big data platforms becoming more important, this gap needs to be addressed, particularly for cloud computing, data centers and connectivity. The World Bank indicates that reaching the African Union's goal of universal and affordable internet coverage will increase GDP growth in Africa by two percentage points per year. Also, the probability of employment — regardless of education level — increases by 6.9 to 13.2 percent when fast internet becomes available, as it facilitates firm entry and boosts productivity and exports.<sup>40</sup>
- **Digital skills:** Ensuring adequate digital skills across economies is a challenge in most African countries. Developing professionals with high-level skills in modeling, coding, computation, data science and related fields is even harder. In 2021 there were no trained AI specialists in Ethiopia, while Rwanda has no more than 10 AI engineers.<sup>41</sup> In ministries of finance and central banks, basic digital skills may be relatively high, but the ability to understand and deploy AI solutions. While changing curriculum and teaching methods in primary, secondary and higher education will take a long time, urgent action is needed to improve digital skills to accelerate AI for economic policymaking.
- **Geopolitics:** There are geopolitical tensions around investment in the technology and digital space in Africa, particularly in relation to the role of China. The way such tensions play out may determine what type of AI solutions are deployed — and which ones are deployed for noble purposes and which ones are not. In turn, it may also inform the discussion around ethical AI and laws to protect citizens.

- **Sustainable and inclusive approaches:** An important challenge to address is ensuring the impacts of economic policy informed by AI leads to positive social change. Additionally, governments and citizens must be aware of direct impacts, such as the increasingly negative environmental impact of computing. Data centers, bitcoin mines and supercomputers require enormous amounts of electricity, most of which is created by burning fossil fuels. At the same time, and as previously noted, biases in AI modeling can lead to undesirable outcomes. This is particularly important in regards to gender, youth and underserved segments of the population.

Related to this is the fact that new technologies can lead to greater divides between those with and those without. International development practitioners have addressed this for decades in access to fertilizer, medicines or finance or markets. It is likely that the utilization of AI in economic policymaking will deepen divides between advanced and developing countries — and between groups of developing countries. AI is now largely concentrated in Europe, Asia and North America, but it can — and will — bring significant benefits to African economies. However, there is a risk that Africa will start to lag the global north due to a lack of infrastructure, research and development capacity and skills. International initiatives, such as AI4Good, AI4D Africa, and the OECD Principles for Responsible AI are useful, but more needs to be done through peer learning, capacity building, policy design support and ecosystem creation. A particular focus on gender and disadvantaged groups will be critical.

- **Trust:** In many countries, there is a trust deficit, whereby citizens do not trust government and government does not trust the technology industry. Related to the previous discussion of ecosystems, much more is needed to create forums for different stakeholder segments to learn from each other and from good practices.

## ANNEX 1: ABOUT ACET

The African Center for Economic Transformation (ACET) is a Pan-African economic policy institute supporting Africa’s long-term growth through transformation. We produce research, offer policy advice, and connect key stakeholders so that African countries are better positioned for smart, inclusive, and sustainable development. To make this happen, we work closely with governments, business leaders, and development partners to strengthen countries’ transformation agendas. Our vision is an economically transformed Africa within a generation.

In our view, economic growth alone is not enough to ensure Africa’s long-term sustainable development. While pursuing improvements in the macroeconomic and business environments, countries must also diversify their production and exports; become more competitive in global markets; increase productivity; especially among labor; and upgrade technology throughout the economy — all to improve human well-being by providing more productive jobs and higher incomes. We call this Growth with DEPTH, a framework to turn transformation from a concept into a practical policy agenda. We have used Growth with DEPTH to help Africa’s public and private sectors address the policy and institutional barriers that hamper sustained growth.

We provide thought leadership to help set the transformation agenda and inform policy through rigorous research and analysis. We study the drivers of economic transformation and identify and create roadmaps for the most promising pathways for countries to achieve growth with DEPTH. We also bring leading transformation ideas and strategies directly to policymakers to support policy design and implementation. We provide policymakers with practical advice for designing and implementing sound strategies for transformation by bringing countries together to draw lessons and share knowledge across borders on issues of similar focus and by providing direct technical advice.

We galvanize action through advocacy, outreach, and convening for impact. We engage at three levels of policymaking — country, regional, and global. Each engagement is positioned with a view towards helping African leaders and policymakers design strategies that will accelerate economic transformation. And we incorporate existing research, leverage regional and global expertise, and harness the growing interest in transformation strategies from other institutions and organizations.

ACET has five strategic programs: Economic Management and Governance; Gender Equality; Youth, Employment and Skills; Private Sector Development; and Regional Integration. This report has been prepared by the Innovation and Digital Policy practice within the Economic Management and Governance program.



## ANNEX 2: LITERATURE REVIEW

In addition to the Endnote references, the following sources were used as background research documentation.

- Abillama, Nadim; Steven Mills, and Miguel Carrasco. Now is the Time for AI-Powered Governments. 2020.
- Accenture report, "Why Artificial Intelligence is the Future of Growth". <https://www.accenture.com/us-en/insights/artificial-intelligence-summary-index>
- Adams, Rachel. AI in Africa -- Key Concerns and Policy Considerations for the Future of the Continent. AFRIPOLI. April 2022.
- Ahmed, Shamira. Artificial Intelligence (AI) and the Circular Economy in Africa: Key Considerations for a Just Transition. ResearchITCAfrica. March 15, 2022. Allen, Nathaniel and Marian "Ify" Okpali. Artificial Intelligence Creeps onto the African Battlefield. February 2022.
- Artificial Intelligence Capacity in Sub-Saharan Africa. Compendium Report.
- Artificial Intelligence for Development. Africa. January 2021.
- Artificial Intelligence for Africa: An Opportunity for Growth, Development, and Democratisation. Access Partnership. University of Pretoria. 2018.
- Artificial Intelligence Needs Assessment Survey in Africa. United Nations Educational, Scientific and Cultural Organization (UNESCO). 2021.
- Barhoumi, Karim; Mo Choi, Seung; Iyer, Tara; Li, Jiakun; Ouattara, Franck; Tiffin, Andrew, and Yao, Jiexiong. Overcoming Data Sparsity: A Machine Learning Approach to Track the Real-Time Impact of COVID-19 in Sub-Saharan Africa. IMF. May 2022.
- Dahir, A. L. Africa isn't ready to protect its citizens personal data even as EU champions digital privacy. Quartz. May 8, 2018. <https://qz.com/africa/1271756/africa-isnt-ready-to-protect-its-citizens-personal-data-even-as-eu-champions-digital-privacy>; a repository of data protection laws in Africa is available at: <https://dataprotection.africa>
- Engler, Alex. Can AI model economic choices? 2020.
- Executive Office of the President of the United States. Artificial Intelligence, Automation and the Economy. December 2016. <https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/Artificial-Intelligence-Automation-Economy.PDF>
- Felländer, Anna; Rebane, Jonathan; Larsson, Stefan; Wiggberg, Mattias; Heintz, Fredrik. Achieving a DataDriven Risk Assessment Methodology for Ethical AI. Lund University. 2022.
- Fox, Louis; Signé, Landry. From subsistence to disruptive innovation - Africa, the Fourth Industrial Revolution, and the future of jobs. Brookings Institution. March 2022.
- Furman, Jason. The New View of Fiscal Policy and Its Application. Chairman, Council of Economic Advisers Conference: Global Implications of Europe's Redesign New York, NY October 5, 2016.
- Gadzala, Aleksandra. Coming to life: Artificial intelligence in Africa. The Atlantic Council, November 2018. Africa Center. Issue Brief. 2018.
- Grother, Patrick; Ngan, Mei; Hanaoka, Kayee. Face Recognition Vendor Test (FRVT) Part 3: Demographic Effects. NIST. December 2019.

- Hlomani, Hanani; More clouds over Africa: What will they bring? African Observatory of Responsible Artificial Intelligence. November 2, 2022
- IFC. Artificial Intelligence in Emerging Markets - Opportunities, Trends, and Emerging Business Models. 2020.
- Ilori, Tomiwa. Data protection in Africa and the COVID-19 pandemic: Old problems, new challenges and multistakeholder solutions.
- Kinywamaghana, Alexandra and Sascha Steffen. A Note on the Use of Machine Learning in Central Banking. 2021.
- Mauritius Artificial Intelligence Strategy. A Report. Mauritius Working Group on Artificial Intelligence. November 2018.
- Mou, Xiaomin. Artificial Intelligence: Investment Trends and Selected Industry Uses. IFC. September 2019.
- OECD. Measuring the Environmental Impacts of Artificial Intelligence Compute and Applications. November 15, 2022.
- OECD. Artificial Intelligence and International Trade -- Some Preliminary Implications. April 2022.
- Oxford Insights. Government AI Readiness Index. 2022.
- Stanford University. Artificial Intelligence Index Report. 2022.
- Tony Blair Institute for Global Change. Reaping the Rewards of the Next Technological Revolution: How Africa Can Accelerate AI Adoption Today. October 13, 2022.
- Wairegi, Angeline; Omino, Melissa; and Rutenberg, Isaac. "AI in Africa : Framing AI through an African Lens", Communication, technologies et développement [Online], 10 | 2021, Online since 20 May 2020, connection on 27 May 2021. URL: <http://journals.openedition.org/ctd/4775> ; DOI: <https://doi.org/10.4000/ctd.4775>
- Zheng, Stephan and Trott, Alexander and Srinivasa, Sunil and Naik, Nikhil and Gruesbeck, Melvin and Parkes, David C. and Socher, Richard. The AI Economist: Improving Equality and Productivity with AI-Driven Tax Policies. 2020.

## ENDNOTES

- 1 Oxford Insights. Government AI Readiness Index. December 2022. 2021 [https://static1.squarespace.com/static/58b2e92c1e5b6c828058484e/t/61ead0752e7529590e98d35f/1642778757117/Government\\_AI\\_Readiness\\_21.pdf](https://static1.squarespace.com/static/58b2e92c1e5b6c828058484e/t/61ead0752e7529590e98d35f/1642778757117/Government_AI_Readiness_21.pdf)
- 2 Centre for Intellectual Property and Information Technology Law. October 2021. <https://cipit.strathmore.edu/artificial-intelligence/#1620755861855-0dff062-e197>
- 3 European Commission's High Level Expert Group on Artificial Intelligence. A Definition of AI: Main Capabilities and Scientific Disciplines. December 2018. [https://ec.europa.eu/futurium/en/system/files/ged/ai\\_hleg\\_definition\\_of\\_ai\\_18\\_december\\_1.pdf](https://ec.europa.eu/futurium/en/system/files/ged/ai_hleg_definition_of_ai_18_december_1.pdf)
- 4 IBM. June 2022. [https://www.ibm.com/watson?utm\\_content=SRCWW&p1=Search&p4=43700069747427191&p5=e&gclid=959122d7616b1953247e40494d937ed1&gclidsrc=3p.ds](https://www.ibm.com/watson?utm_content=SRCWW&p1=Search&p4=43700069747427191&p5=e&gclid=959122d7616b1953247e40494d937ed1&gclidsrc=3p.ds)
- 5 IT Chronicles. March 18. 2022. <https://itchronicles.com/artificial-intelligence/the-impact-of-artificial-intelligence-ai-on-business/>
- 6 Grand View. Artificial Intelligence Market Size, Share & Trends Analysis Report by Solution, By Technology (Deep Learning, Machine Learning, Natural Language Processing, Machine Vision), By End Use, By Region, And Segment Forecasts, 2022 -- 2030. <https://www.grandviewresearch.com/industry-analysis/artificial-intelligence-ai-market>
- 7 The Borgen Project. November 2020. <https://www.borgenmagazine.com/advantages-and-risks-of-ai-in-humanitarian-aid>
- 8 <https://hbr.org/2022/03/why-ai-failed-to-live-up-to-its-potential-during-the-pandemic>
- 9 <https://www.msn.com/en-za/news/others/the-awful-state-of-lawful-interception-in-sa-part-two-surveillance-technology-that-s-above-the-law/ar-AA104Z2P>
- 10 <https://www.brookings.edu/techstream/how-digital-espionage-tools-exacerbate-authoritarianism-across-africa/>
- 11 <https://foreignpolicy.com/2018/07/24/beijings-big-brother-tech-needs-african-faces/>
- 12 [https://www.chinadaily.com.cn/a/202111/27/WS61a190f8a310cdd39bc77e3e\\_2.html](https://www.chinadaily.com.cn/a/202111/27/WS61a190f8a310cdd39bc77e3e_2.html)
- 13 China, Africa, and the Rest: Recent Trends in Space Science, Technology, and Satellite Development. China-Africa Research Initiative. May 2020.
- 14 <https://www.csis.org/blogs/development-dispatches/global-gateway-and-eus-digital-ambitions>
- 15 BCG. "Now is the Time for AI Powered Governments". August 2020. Nadim Abillama, Steven Mills, and Miguel Carrasco.
- 16 Deus ex Machina? A Framework for Macro Forecasting with Machine Learning. February 2020. Marijn Bolhuis and Brett Rayner. IMF
- 17 Rebuilding Macroeconomics. Artificial Intelligence in a Monetary Model. April 2021. Mingli Chen, Andreas Joseph, Michael Kumhof, Xinlei Pan, Aruhan Shi, Xuan Zhou. <https://www.rebuildingmacroeconomics.ac.uk/post/artificial-intelligence-in-a-monetary-model>
- 18 Sales Force Research and Harvard University. "The AI Economist: Improving Equality and Productivity with AI-Driven Tax Policies." April 2020. Stephan Zheng, Alexander Trott, Sunil Srinivasa, Nikhil Naik, Melvin Gruesbeck, David C. Parked, and Richard Socher.
- 19 Powering the Digital Economy – Opportunities and Risks of Artificial Intelligence in Finance. IMF. October 2021.

- 20 CEPR. Artificial Intelligence as a Central Banker. March 2020.
- 21 Frankfurt School of Finance and Economics. A Note on the Use of Machine Learning in Central Banking. July 2021. Alexandra Kinywamaghana; Sascha Steffen.
- 22 Powering the Digital Economy – Opportunities and Risks of Artificial Intelligence in Finance. IMF. October 2021.
- 23 Deloitte. RegTech Business Cases 2021. May 2021
- 24 Artificial Intelligence Capacity in Sub-Saharan Africa Compendium Report. January 2021. Neil Butcher, Merridy Wilson-Strydom, Mohini Baijnath.
- 25 <https://oecd-development-matters.org/2021/02/09/developing-an-artificial-intelligence-for-africa-strategy/>
- 26 Reflecting The Past, Shaping the Future: Making AI Work for International Development. September 5, 2018. USAID.
- 27 <https://unesdoc.unesco.org/ark:/48223/pf0000381137>
- 28 <https://www.blog.google/around-the-globe/google-africa/google-ai-ghana/>
- 29 Business Day. October 2021. <https://www.businesslive.co.za/bd/companies/telecoms-and-technology/2021-10-06-facebook-moves-forward-with-connecting-1-billion-people-in-africa.>
- 30 New York Times. March 21, 2022. <https://www.nytimes.com/2022/03/21/world/africa/amazon-south-africa.html>
- 31 AboutAmazon.com. February 22, 2022. <https://www.aboutamazon.com/news/aws/amazons-first-south-african-solar-plant-delivers-energy-and-opportunity>
- 32 PYMNTS.com. March 11, 2021. <https://www.pymnts.com/news/fintech-investments/2022/global-startup-uncertainty-drives-mega-investments-in-africas-burgeoning-tech-scene>
- 33 PYMNTS.com. May 31, 2022. <https://www.pymnts.com/news/fintech-investments/2022/global-startup-uncertainty-drives-mega-investments-in-africas-burgeoning-tech-scene>
- 34 Government AI Readiness Index 2021. Oxford Insights. January 2022.
- 35 The Government of Rwanda Announces the Establishment of a Center of Excellence in the Areas of Digitalization and AI – Official Rwanda Development Board (RDB) web site
- 36 <https://qz.com/africa/2180864/africa-does-not-want-to-be-left-behind-in-the-ai-revolution>
- 37 <https://www.gartner.com/smarterwithgartner/would-you-let-artificial-intelligence-make-your-pay-decisions>
- 38 Face Recognition Vendor Test (FRVT), Part 3: Demographic Effects (nist.gov). NIST. 2019.
- 39 <https://www.nepad.org/news/african-union-artificial-intelligence-continental-strategy-africa>
- 40 Shooting for the moon: An agenda to bridge Africa's digital divide. Hafez Ghanem. February 7, 2020
- 41 Government AI Readiness Index 2021. Oxford Insights. January 2022.

Innovation and Digital Policy

# Artificial Intelligence for Economic Policymaking: The Frontier of Africa's Economic Transformation

April 2023



**ACET** African Center  
for Economic  
Transformation



[www.acetforafrica.org](http://www.acetforafrica.org)



@acetforafrica