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Article

Leveraging Artificial Intelligence in Africa's Energy Transition: A Collaborative Governance Perspective

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Artificial Intelligence (AI) presents transformative opportunities for addressing longstanding energy sector challenges across Africa. Predictive analytics, smart grids, and demand forecasting technologies can enhance energy access, efficiency, and sustainability. Yet, systemic barriers – infrastructure gaps, regulatory uncertainty, financial limitations, and AI literacy needs – constrain widespread AI adoption. This paper explores how collaborative governance that expands from hard to soft approaches can help overcome these barriers. Drawing on examples from Africa and beyond, we highlight how strategic partnerships, policy integration, and investment in AI infrastructure and skills can unlock opportunities for international and domestic business and state governments, enhancing regional energy transition.

INTRODUCTION

Despite recent advances, the energy sectors of many African countries can be characterized by inefficiency, unreliable supply, and inconsistent access. Such challenges are a major obstacle to economic development and a root cause of the region's poor competitiveness. Recent examples from international business suggest that artificial intelligence (AI) can offer solutions to energy inefficiencies and access in Africa. By offering tools such as predictive analytics, demand forecasting, and smart grid technologies, AI can be leveraged to increase reliability, reduce costs, enhance access, and improve sustainability. Tapping into these technological advances opens new business opportunities for international AI and energy companies and domestic businesses, as well as for within- or cross-sector partnerships. In this paper, we examine how a collaborative business-government governance approach can enable effective AI deployment to improve energy access, efficiency, and sustainability across African countries.

We argue that maximizing the benefits from AI solutions requires policy frameworks that facilitate a collaborative governance of the energy sector in African countries. Collaborative governance is a governing arrangement where one or more public agencies directly engage non-state stakeholders in a collective decision-making process that is formal, consensus-oriented, and deliberative, and that aims to make or implement public policy or manage public programs or assets (Ansell & Gash, 2008: 544). Currently, however, the sector remains dominated by national providers, and the governance gaps have not been readily filled by the private sector. This traditionally 'hard' approach to governance can be complemented with 'soft' approaches that steer voluntary private sector participation in activities that fulfill a public purpose (Eberlein, 2019). If implemented successfully, it can facilitate the integration of private sector players and unlock opportunities for AI-driven solutions in the energy sector.

A COLLABORATIVE GOVERNANCE PERSPECTIVE

Recent developments in business-government relations suggest that business and government can engage in mutual governance of public good provision (Eberlein, 2019). Depending on the relative balance in such provision, the outcomes can range from negative-sum to positive-sum. The traditional view implies a zero-sum condition where the loss of or withdrawal from regulatory authority by the government is compensated by authority gains for business. When the loss is not compensated because businesses lack the ability, motivation, or legitimacy, the outcome is negative-sum, and public issues remain underserved. And when the government introduces indirect means to encourage business conduct that assumes greater responsibility to self-regulate while preserving self-interest, the outcome is positive-sum, as the collaborative governance brings regulatory gains for both parties, and public issues are better addressed.

While a collaborative governance perspective assigns authority to both business and government, government plays an orchestrating role by adopting a mix of 'hard' approaches through regulation and direct participation in the economy and 'soft' approaches through material incentives, non-coercive tools, and encouragement of voluntary contributions. The soft approaches merit particular attention as they can help alleviate the traditional barriers to corporate engagement with the public good. Such approaches often involve multi-stakeholder intermediaries, which can

Table 1. Energy Access Comparison

Indicator	Global	Sub-Saharan Africa	Developed Economies	Source
Population without electricity	666 million	~566 million (≈85% of total)	Negligible	World Bank, 2025
Installed renewable capacity (watts per capita)	478	40	1,100+	World Bank, 2025
Population without cooking access	2.1 billion	4 in 5 families	Negligible	World Bank, 2025
International clean energy finance	$21.6 billion	Concentrated in South Africa ($935M) and Nigeria ($829M)	-	World Bank, 2025; Ecofin Agency, 2025

Source: Ecofin Agency, 2025; World Bank, 2025

provide valuable orientation, enhance potential for learning and knowledge creation, allow the pursuit of political strategies through influence, and help raise the legitimacy of corporate involvement. The resulting collaborative governance approach is much more effective at addressing public issues because it generates synergistic effects, where businesses can pursue more opportunities at reduced risk and uncertainty, while preserving their self-interest and specialization, and government can achieve more with existing resources.

This perspective is very relevant to the implementation of AI solutions in the energy sector in Africa. First, energy provision has been dominated by the public sector. For example, Eskom, South Africa's state-owned power company, generates around 95 percent of South Africa's electricity and approximately 45 percent of electricity across the African continent (ITA, 2024). Second, current governance reflects the negative-sum conditions, where gaps left by the public sector are not taken over by the private sector, and hence energy needs in the economy and society remain underserved. A move toward collaborative governance through greater use of soft steering tools has the potential for a positive-sum outcome.

LIMITATIONS IN THE AFRICAN CONTEXT

Several factors underline the key driving forces for the prevailing negative-sum condition in the African energy sector from the perspective of AI utilization.

AI INFRASTRUCTURE

A major limitation in deploying AI in Africa's energy sector is the lack of reliable electricity access and digital infrastructure. Table 1 highlights the sizable gap in energy access between Sub-Saharan Africa—the countries south of the Sahara Desert — and the rest of the world. Most importantly, 666 million people worldwide remain without electricity, with 85% of them in Sub-Saharan Africa.

FINANCIAL CONSTRAINTS

The financial investment required to implement AI tools and training can be a major deterrent, especially for countries navigating competing development priorities. For many African governments, it is difficult to justify redirecting funds from pressing issues like healthcare, food security, or basic education toward high-tech innovation that may seem abstract or long-term in payoff. Even if global companies make strides, many governments lack the financial agility to execute those plans without external funding or strategic partnerships. Yet, of the USD 21.6 billion that was mobilized in 2023, a drop from USD 28.4 billion in 2016, only South Africa and Nigeria ranked among the top five global recipients (Table 1).

REGULATORY UNCERTAINTY

Regulatory uncertainty stems from frequent or unpredictable changes in laws, regulations, or enforcement practices that generate risks for firms and constrain strategic decision-making (Hoffmann, Trautmann, & Hamprecht, 2009). Such uncertainty often manifests in shifting taxation, licensing requirements, or inconsistent enforcement, which deters sustained investment or commitment to AI projects requiring long-term infrastructure. For example, in South Africa, recurring governance challenges at Eskom eroded investor confidence (ITA, 2024). Moreover, Sub-Saharan Africa is a difficult region for private sector operations in general, averaging a score of 51.8 (out of 100) on the World Bank's Doing Business Index in 2020. Furthermore, Africa is not a homogeneous continent, with different regions struggling with poverty, conflicts, post-colonization transition, and border adjustments, all of which augment regulatory uncertainty.

AI LITERACY

The concept of AI literacy, or the ability to interact with and implement AI-generated recommendations, is critical. In the case of Edgecom Energy's platform, the AI copilot makes real-time recommendations for energy adjustments. However, those insights are only valuable if facility man-

agers, technicians, and operations teams know how to interpret and apply them.

OPPORTUNITIES FOR BUSINESS AND GOVERNMENT

Adopting a collaborative governance approach to leverage AI in national energy sectors across Africa presents new opportunities for both business and government.

OPPORTUNITIES FOR INTERNATIONAL BUSINESS

An improved governance climate opens opportunities for global AI and energy companies to invest in the energy sector in Africa. In some cases, energy companies enhance their AI capabilities through acquisitions or partnerships to improve their global prospects. For example, ABB's investment in Edgecom allows the energy company to optimize energy systems through real-time data and predictive analytics (ABB, 2025). For Africa to successfully receive such investments, partnerships between state-owned firms and global firms will be essential.

In other cases, energy companies are already leveraging AI capabilities to pursue new opportunities in Africa. For example, Husk Power Systems' business model is centered around hybrid minigrids that combine solar power and other renewable sources such as biomass to provide off-grid electricity solutions in underserved rural areas in Asia and Africa (Mitchell, 2025). Unlike opportunities to improve the efficiency of current providers, these private-sector opportunities directly address gaps in public provision. Yet, the effectiveness and dissemination of such solutions across Africa can be enhanced when foreign firms receive assistance in adapting their offerings to local needs.

OPPORTUNITIES FOR DOMESTIC BUSINESS

Domestic energy businesses in Africa can tap into AI capabilities directly. Their advantage is familiarity with local market and non-market conditions. For example, Engie Energy Access in Kenya partnered with Atlas AI to identify and target rural consumers for solar access using predictive data (Atlas AI, 2025). This and similar roles of domestic businesses can facilitate the need for intermediaries in government orchestration.

OPPORTUNITIES FOR AFRICAN GOVERNMENTS

Leveraging AfCFTA: The African Continental Free Trade Area (AfCFTA) can provide the hard regulatory foundation to drive AI adoption in Africa. By facilitating cooperation between African governments, businesses, and international AI and energy companies, the free trade area can help nurture talent and create local innovations that cater specifically to Africa's energy sector (World Bank, 2023). To address the challenge of the lack of uniform standards and systems, the AfCFTA, in partnership with the African Organization for Standardization (ARSO), encourages the harmonization of standards and regulations, which can directly support the deployment of AI technologies. Harmonized standards reduce technical barriers, enable interoperability of AI-powered solutions, and accelerate deployments of AI-powered energy systems among key stakeholders (ARSO, 2022), summarized in Table 2 along with their respective roles.

Integrating AI policy: Leveraging AI in the energy sector depends on broader AI policies. Each African country's approach to AI is unique, with some having national strategies, while others are at various early stages of developing such. For example, South Africa's National AI Policy Framework emphasizes talent development, ethical AI, and data privacy (FWB, 2024), while Kenya's National AI Strategy focuses on building digital infrastructure, fostering research, and using AI for sustainable development (ICT, 2025). To stimulate private-sector participation in AI-based solutions for the energy sector, these frameworks must be integrated with economic development and foreign investment policies.

Creative financing models: To provide incentives for the private sector, governments can encourage creative financing models like public–private partnerships, regional tech funds, or development grants. For example, Nithio, a climate fintech, was created specifically to facilitate financing for sustainable energy in Africa. Throughout eleven investments during 2023, over 400,000 people experienced improved energy access (Nithio, 2023). Moreover, African enterprises have pioneered pay-as-you-go (PAYG) models that integrate solar hardware with mobile payments, making all-grade energy accessible to households and small firms otherwise excluded from traditional financing. Additionally, governments can act as catalysts for foreign firms that seek financing from various sources for investment in Africa.

Workforce development*:* For Africa to leverage AI in the energy sector effectively, AI literacy must become a priority in education and training. Layered training strategies for technicians, managers, and administrators, along with updated curricula in higher education institutions to integrate data analytics and AI-specific tools for real-world applications, will promote the development of needed workforce skills.

Promotion of energy sustainability*:* Developing a more efficient energy sector through AI that is also more sustainable will address at least two challenges. One is the resource intensity of AI. The other is the related long-term pressure for sustainable development in Africa and the world. While the stock of carbon emissions is due mostly to the activities of developed countries, current emissions originate predominantly from emerging economies. Africa can avoid a similar path of development. A practical illustration is Ethiopia's Grand Ethiopian Renaissance Dam (GERD), the largest hydropower Project in Africa at 6,450 MW. GERD demonstrates how large-scale renewable projects can expand dispatchable baseload capacity, creating opportunities for AI-enabled grid optimization and regional electricity trade (International Hydropower Association, 2023).

Table 2. Key Stakeholders in Africa's Energy Transition

Stakeholder Type	Examples	Role in Energy/AI Deployment	Source
National Governments	Kenya, South Africa, Nigeria	Develop AI strategies, regulate energy markets, fund infrastructure	Ministry of Information, Communications and Technology (ICT), Kenya, 2025; FWB, 2024
Regional Organizations	AfCFTA, ARSO	Harmonization of standards, regional trade facilitation, cross-border energy policies	African Organization for Standardization, 2022; World Bank, 2023
African Private Firms	M-KOPA (Kenya), Bboxx, Nithio	Off-grid solar, pay-as-you-go energy models, climate finance solutions	Atlas AI, 2025; Nithio, 2023
Multinational Enterprises (MNEs)	ABB, Huawei, Goldman Sachs	AI-driven energy management, infrastructure FDI, financing models	ABB, 2025; Goldman Sachs Asset Management, 2024
Public–Private Partnerships	Ethiopia's Grand Renaissance Dam (PPP), Morocco's Noor Solar Complex	Joint financing, large-scale renewable deployment, technology transfer	Baskaran & Coste, 2024; World Bank, 2023

Source: ABB, 2025; African Organization for Standardization, 2022; Atlas AI, 2025; Baskaran & Coste, 2024; FWB, 2024; Goldman Sachs Asset Management, 2024; Ministry of Information, Communications and Technology (ICT), Kenya, 2025; Nithio, 2023; World Bank, 2023.

CONCLUSION

This article highlights how state governments can complement their traditionally hard governance approaches with soft steering tools to generate practical solutions for leveraging AI solutions in Africa's energy transition. Because countries in Africa are not uniform, future research could compare experiences across the 55 African countries and reveal why some countries succeed, while also accounting for the stage of AI policy development. Moreover, it is worth examining the strategies of domestic versus multinational firms, as well as novel applications of finance models for decentralized renewables. Such work will inform actionable strategies for achieving sustainable, AI-enabled energy systems across the continent.

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