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# Harnessing Intra-African Energy Trade for Poverty Alleviation: Opportunities and Barriers in the Context of the African Continental Free Trade Area (AfCFTA)

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**Abstract**

This study critically explores the intersection of regional economic integration and sustainable development, focusing on the transformative potential of cross-border cooperation in enhancing equitable access to essential services and fostering inclusive growth. Anchored in the context of Africa's evolving institutional landscape, the research investigates how continent-wide liberalisation frameworks can be leveraged to address persistent challenges such as infrastructure fragmentation, energy poverty, investment inefficiencies, and policy misalignment. The study employs a qualitative analytical approach, drawing from recent scholarly literature, policy reviews, and institutional reports published between 2022 and 2024, to synthesise evidence and inform actionable policy directions.

Findings reveal that, while significant structural constraints endure—particularly in regulatory harmonisation, financing, and institutional capacity—emerging initiatives demonstrate growing momentum toward regional convergence. Key opportunities identified include the development of interconnected infrastructure corridors, operationalisation of unified electricity markets, institutionalised public-private partnerships, and the mainstreaming of innovation and digital technologies across national and regional energy systems. Moreover, the study highlights the critical importance of data governance, monitoring frameworks, and coordinated knowledge exchange in ensuring accountable implementation and adaptive policy responses.

The research concludes that achieving systemic transformation through regional cooperation is contingent upon strengthening legal and institutional frameworks, aligning investment ecosystems, and fostering inclusive participation in both policymaking and implementation. Recommendations include the promotion of blended finance instruments, cross-border regulatory reforms, and capacity-building programs designed to bridge knowledge asymmetries and institutional gaps. By articulating a structured pathway for strategic alignment, this study contributes to the evolving discourse on integrated development and provides a framework for action across sectors and governance levels.

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## 1. Introduction

Intra-African energy trade has increasingly emerged as a vital frontier in addressing the continent's enduring challenges of poverty, underdevelopment, energy insecurity, and fragmented infrastructure. With over 600 million people across Sub-Saharan Africa lacking access to reliable electricity and more than 900 million relying on traditional biomass for cooking, the energy crisis has become a central constraint to human development and economic progress (Turksen & Abukari, 2023). Despite Africa's

vast endowment of renewable energy resources, including solar, hydro, wind, and geothermal, the continent remains energy-poor and heavily dependent on external actors for financing, technology, and infrastructure development. This paradox points to a fundamental need for intra-continental cooperation that moves beyond bilateral aid and donor dependency toward regional solutions embedded within frameworks such as the African Continental Free Trade Area (AfCFTA).

Launched in 2021, AfCFTA aims to integrate 54 African countries into a single market of 1.4 billion people, with a combined GDP exceeding $3 trillion (Ajewumi, Afolabi & Joe-Akunne, 2024). More than a conventional trade agreement, AfCFTA provides an unprecedented opportunity to reconfigure Africa's development trajectory by promoting regional value chains, internal market expansion, and economic resilience. Energy, being a foundational input for all economic sectors, plays a strategic role in this transformation. The establishment of regional power pools such as the Eastern Africa Power Pool (EAPP), Southern African Power Pool (SAPP), and West African Power Pool (WAPP) illustrates initial efforts at fostering energy integration. However, these pools continue to operate below potential due to technical, regulatory, and financial bottlenecks (Odumu, 2024).

Recent policy discourse underscores that energy trade could catalyse productivity across agriculture, manufacturing, education, and health sectors. However, this potential is hindered by deep-rooted structural challenges such as poor transmission infrastructure, political fragmentation, and inconsistent national regulations (Ogbologu, 2024). Mensah (2023) further highlights the volatility in regional trade flows and the weak comovement of intra-African trade, demonstrating the need for harmonised policy frameworks and investment strategies that can create stable, interconnected energy markets. The reluctance of some states to liberalise national energy sectors due to sovereignty concerns adds another layer of complexity, often resulting in delayed harmonisation of cross-border policies.

The role of integrated infrastructure remains central. Without robust transmission lines, gas pipelines, and power interconnectors, regional energy trade remains unfeasible. While some countries like Ethiopia, Zambia, and Mozambique have energy surpluses, others continue to experience persistent deficits. Cross-border infrastructure development would enable surplus-producing nations to trade efficiently with deficit regions, enhancing grid stability and energy access. However, this necessitates political will, mutual trust, and coordinated investment mechanisms (Oyebamiji, 2024). Kyriakarakos (2022) notes that frameworks such as the African Single Electricity Market (AfSEM) offer a coordinated policy and technical foundation to bridge these infrastructure gaps. When aligned with AfCFTA protocols, AfSEM provides a means of harmonising grid standards and enabling electricity to be traded as a commodity across borders.

Beyond physical infrastructure, policy and regulatory coherence are pivotal. Regulatory fragmentation—manifested in differing licensing regimes, tax systems, and tariffs—remains one of the most pressing challenges to energy integration (Israel & Nweke-Eze, 2024). Without alignment, private sector participation is deterred, and the risks of market entry remain prohibitively high. Adedokun (2024) argues that Africa must learn from other regional economic blocs, such as the EU, by advancing mutual recognition agreements, harmonised standards, and supranational regulatory coordination.

Trade liberalisation under AfCFTA also introduces mechanisms for addressing energy poverty through economic inclusion. Energy access is deeply interlinked with income generation, educational attainment, and health outcomes. Expanding regional energy trade can bridge the access gap, particularly in rural areas, by driving down costs and enhancing reliability. The deployment of decentralised energy solutions such as mini-grids, when coupled with liberalised trade regimes, creates market-based pathways to electrification. Apiyo and Ngang (2023) observe that East Africa has already begun to explore such synergies, leveraging regional trade to increase clean energy access in border communities.

Furthermore, the alignment of trade and energy policy creates a platform for industrialisation. Manufacturing, agro-processing, and digital services all require affordable and consistent power supply. Prabhakar (2024) suggests that retaining energy value chains within the continent not only enhances industrial productivity but also reduces capital flight and foreign exchange vulnerabilities. This aligns with the goals of Agenda 2063 and Africa's broader structural transformation agenda. Selelo (2024) further asserts that trade integration must be matched with investment in regional value chains that foster technological innovation and skills development.

The issue of financing remains a formidable barrier. Infrastructure projects, especially those crossing national borders, face unique risks related to political instability, exchange rate fluctuations, and long gestation periods. Mobilising investment therefore requires innovative financial mechanisms, including blended finance, sovereign guarantees, and public-private partnerships. The African Development Bank, Africa50, and emerging infrastructure funds have shown potential in this regard, but coordination at the continental level remains weak. As Makhoba (2024) notes, countries like South Africa are beginning to leverage cross-border investment platforms to scale energy projects, providing useful models for replication.

The intersection of trade, energy, and digitalisation is another frontier worth attention. AfCFTA's emerging digital trade protocols, combined with advances in smart grid technology, blockchain-enabled transactions, and AI-driven energy forecasting, can radically transform how energy is produced, distributed, and traded. Sohail and Din (2024) highlight the critical role digital inclusion plays in enhancing the efficiency and transparency of resource trade, particularly in sectors vulnerable to security risks such as energy. Applying this insight to Africa's regional energy context, digital platforms, if designed with interoperability and data protection in mind, could significantly reduce transactional frictions, facilitate real-time coordination, and bolster investor confidence. The integration of such digital systems into AfCFTA's energy and trade strategies would require robust cybersecurity frameworks and cross-border regulatory alignment to ensure secure and seamless energy transactions across member states.

Another critical component is data governance and real-time monitoring. With energy trade becoming increasingly complex, reliable data systems are essential for tracking flows, assessing environmental impacts, and informing market operations. Regional data-sharing platforms

supported by AfCFTA institutions can improve transparency, accountability, and policy responsiveness.

From a developmental perspective, energy trade offers a compelling instrument for poverty reduction. Access to modern energy enables participation in the digital economy, supports SMEs, and reduces rural-urban migration. Moreover, it enhances resilience to climate shocks by enabling the deployment of cleaner technologies and lowering dependence on biomass. As Zahonogo (2024) and Turksen, and Abukari (2023) highlight, the poorest communities stand to gain the most from an energy-secure continent, provided that infrastructure and policy reforms are implemented with equity and justice at the core.

This study, therefore, aims to examine the extent to which intra-African energy trade can be harnessed as a strategic tool for poverty alleviation and inclusive growth under the AfCFTA framework. It seeks to identify the barriers that hinder effective energy integration, assess the opportunities embedded within AfCFTA and AfSEM, and analyse the socioeconomic implications of expanded energy access. In doing so, it covers a review period between 2022 and 2024, focusing on recent developments in infrastructure, finance, regulation, and policy alignment.

By synthesising insights from academic literature, policy frameworks, and case studies, this review contributes to the growing discourse on the role of regional trade in Africa's sustainable development. It advocates for an integrated approach that positions energy trade not just as a sectoral priority but as a foundational pillar of economic transformation. The challenges are considerable, but so are the opportunities. With strategic alignment, institutional reform, and collaborative investment, Africa can unlock the full potential of its energy wealth to build a more inclusive and prosperous future.

## 2. Foundations and Dynamics of Intra-African Energy Trade

The development of intra-African energy trade within the framework of the African Continental Free Trade Area (AfCFTA) has become an essential strategy for overcoming energy poverty and accelerating regional economic integration. As of 2023, intra-African trade accounts for a modest 15% of the continent's total trade, significantly lower than in other global regions like Europe or Asia. This gap highlights deep-rooted deficiencies in infrastructure, financing, and policy harmonisation, which collectively constrain the realisation of an integrated energy market (Mensah, 2023).

Energy trade represents a high-potential subset of AfCFTA's broader economic agenda. It offers an avenue for mobilising underutilised renewable energy resources, reducing disparities in national access levels, and providing the necessary power to support industrialisation, digitisation, and human development. Yet the policy architecture and institutional arrangements required to scale intra-African energy trade remain fragmented and underdeveloped (Oyebamiji, 2024).

AfCFTA introduces a paradigm shift in the way African states approach regional cooperation. Through market integration and targeted trade protocols, the agreement provides a strategic platform for countries to negotiate collective energy strategies and co-invest in cross-border infrastructure. However, uneven implementation persists, particularly in aligning energy policies, technical standards, and institutional practices across member states (Oyebamiji, 2024). According to Alassane (2023), much of this difficulty is rooted in infrastructural inequality, where less developed regions face significantly higher barriers to market entry.

National energy markets continue to be shaped by outdated bilateral arrangements and protectionist trade ideologies, which counteract efforts to establish a liberalised continental market. The consequence is an inefficient regional energy landscape where surplus generation in countries like Ethiopia and Zambia exists alongside chronic deficits in neighbouring states. Selelo (2024) contends that integrating AfCFTA with Agenda 2063 can address these disparities by fostering a unified policy vision that encourages regional infrastructure investment and regulatory streamlining.

Crucially, infrastructure underpins the entire vision of energy integration. Without reliable, interconnected grids and transmission systems, the concept of energy trade cannot materialise. Regional initiatives like the Southern African Power Pool (SAPP) and West African Power Pool (WAPP) remain hindered by outdated infrastructure, inconsistent policy mandates, and weak coordination between national utilities. Financing is another impediment, as many countries lack the fiscal capacity to fund high-cost transmission lines and interconnectors (Ogbodo, 2024).

Kyriakarakos (2022) provides a compelling argument for the African Single Electricity Market (AfSEM) as a tool to harmonise technical standards and coordinate grid infrastructure development. Integrated within AfCFTA's trade liberalisation framework, AfSEM can foster a system where energy is treated as a tradable commodity, governed by clear legal, financial, and operational protocols across jurisdictions. The success of such an initiative would significantly reduce redundancies, optimise resource distribution, and stabilise supply through shared reserves.

Another defining feature of Africa's energy trade dynamics is the regional imbalance in energy production capacity. Northern and Southern Africa have made significant investments in solar and hydropower, while Central and Western Africa continue to lag due to political instability, underinvestment, and lack of logistical support. Bridging this divide requires not only generation projects but the institutional capability to coordinate trade, balance loads, and set market-clearing prices. Prabhakar (2024) stresses that the socio-political dimension of energy trade must not be overlooked, as redistributing energy equitably can foster inter-regional solidarity and trust.

Trade facilitation challenges further inhibit progress. Cumbersome customs processes, inconsistent technical standards, and border inefficiencies drive up transaction costs and delay project implementation. Moreover, the lack of uniform licensing frameworks for independent power producers (IPPs) operating across multiple countries serves as a disincentive for private capital to enter regional energy markets (Makhoba, 2024). As Odumu (2024) outlines, overcoming these barriers requires strong institutional coordination and dispute resolution mechanisms to provide certainty and reduce perceived risk for investors.

Beyond physical infrastructure and trade procedures, regulatory governance plays a defining role. As Ogbodo Stephen (2024) explains, the weak enforcement of regional agreements at the national level continues to undermine the operationalisation of shared infrastructure and power pools. National institutions often lack both the autonomy and capacity to implement agreed-upon regional mandates,

resulting in a disconnect between high-level policy and local execution. Therefore, building institutional readiness must be a concurrent priority alongside physical infrastructure development.

### 2.1. Africa's Energy Landscape: Current Status and Disparities

Africa's energy landscape presents a stark paradox: a continent rich in renewable resources continues to grapple with one of the highest rates of energy poverty globally. Sub-Saharan Africa remains home to over 600 million people without access to electricity, while more than 900 million rely on traditional biomass for cooking, perpetuating environmental degradation, health risks, and gender inequality. As Sadiqa (2023) aptly notes, sustainable energy transitions require more than resource availability, they demand coordinated governance, adequate financing, and targeted policy frameworks that address social disparities.

This paradox is deeply entrenched in infrastructural and institutional asymmetries across regions. While North Africa and parts of Southern Africa report electrification rates exceeding 80%, Central and Western Africa struggle with figures below 50% due to limited fiscal space, political volatility, and weak grid infrastructure (Khennas & Sokona, 2024). These disparities not only entrench inequality but also obstruct industrial development and inclusive economic growth. According to Kyereboah-Coleman and Boumbouya (2024), regional inequality in infrastructure investment has long undermined the continent's ability to build cohesive economic systems that distribute benefits equitably.

Efforts to expand energy access have yielded some progress, particularly in decentralised off-grid solutions. Yet systemic challenges persist. Kwakwa (2023) highlights high capital costs for clean energy technologies, underdeveloped regulatory ecosystems, and a lack of integrated energy planning. As Medinilla and Sergejeff (2023) emphasise, the absence of coordinated energy investment frameworks continues to impede the scaling of renewable energy solutions.

These imbalances have drawn increasing policy attention to the role of continental integration mechanisms such as AfCFTA. The framework offers a historic opportunity to redress structural energy disparities through harmonised infrastructure policies, regional energy markets, and cross-border electrification. However, Africa (2025) cautions that legal provisions alone are insufficient without tailored implementation strategies. Ainebyona, Namuddu and Akajo (2024) argue that inclusive infrastructure planning, especially for rural electrification and clean cooking, is vital for translating AfCFTA's promises into practical development gains.

Trade liberalisation alone will not close the urban-rural divide unless supported by equitable energy allocation mechanisms. Most large-scale infrastructure is concentrated in urban economic hubs such as Cairo, Nairobi, and Lagos, while peripheral and landlocked regions remain neglected. Asante and Amenumey (2024) stress that AfCFTA must embed energy equity as a policy priority to prevent the deepening of historical patterns of marginalisation.

Climate vulnerability further complicates Africa's energy development trajectory. As Khennas and Sokona (2024) note, African countries face the dual challenge of expanding access and reducing emissions amid limited access to climate finance and technology. Sohail and Din (2024) contend that energy investments should be strategically designed not only to address short-term supply demands but also to mitigate long-term energy security risks and enhance resilience. Within the African context, this means aligning future energy financing with climate adaptation imperatives to ensure stability amid environmental volatility. By integrating digital inclusion and robust risk management into energy planning, policymakers can better safeguard economic continuity while advancing sustainable development objectives.

Mbeva (2024) argues for a Green Pan-Africanism that places sustainability, social justice, and collective agency at the centre of regional governance. Applying this framework to energy governance suggests that AfCFTA should institutionalise enforceable protocols that promote equitable investment in historically underserved regions, standardise clean energy technologies across the continent, and strengthen the capacity of regional bodies to steer the energy transition. Such an approach would not only align with environmental objectives but also advance a continental vision rooted in solidarity, resilience, and sustainable industrialisation.

### 2.2. Understanding the AfCFTA: A Game-Changer for Intra-African Trade

The African Continental Free Trade Area (AfCFTA) is widely regarded as the most ambitious and transformative economic initiative in Africa's modern history. Operationalised in 2021 and endorsed by 54 out of 55 African Union member states, AfCFTA aims to eliminate 90% of tariffs, dismantle non-tariff barriers, and integrate a continental market of over 1.4 billion people with a combined GDP exceeding $3 trillion. As Ajewumi, Afolabi and Joe-Akunne (2024) suggest, its potential impact extends beyond trade liberalisation to include wide-ranging implications for industrialisation, energy integration, agriculture, and digital development.

Unlike earlier regional economic communities (RECs), which often struggled with overlapping mandates and fragmented regulations, AfCFTA introduces a harmonised legal and institutional framework that promises legal certainty and consistency. It offers rules-based governance, streamlined customs procedures, harmonised product standards, and dispute settlement mechanisms designed to increase investor confidence, particularly critical for sectors like energy that require significant upfront capital and long-term policy stability (Odeku & Rikhotso, 2023). According to Ajewumi, Afolabi and Joe-Akunne (2024), the African Continental Free Trade Area's core strength lies in its capacity to foster continent-wide economic cooperation, offering a unified framework that enables the realisation of economies of scale, enhances intra-African competitiveness, and deepens regional integration through harmonised trade protocols.

Prior to AfCFTA, intra-African trade accounted for less than 17% of total trade on the continent, far lower than that in Europe (68%) and Asia (59%). This has been attributed to colonial trade legacies, infrastructure deficiencies, and the lack of coordinated trade policies. By offering a legally binding platform for trade integration, AfCFTA enables countries to align national development strategies with regional value chains, opening up opportunities for cross-border energy markets and shared infrastructure (Wapmuk & Ali, 2022). Israel and Nweke-Eze (2024) note that AfCFTA, when combined with the African Single Electricity Market

(AfSEM), provides a blueprint for creating a continental electricity trading system capable of balancing supply and demand across national boundaries.

Central to the AfCFTA vision is the principle of shared prosperity. For landlocked and low-income nations, the framework offers improved access to regional markets, enhanced infrastructure cooperation, and preferential trading arrangements that can stimulate economic growth and employment. Mandour (2024) emphasises that inclusive integration will depend on AfCFTA's ability to address structural disadvantages through targeted investments in logistics, energy, and transport corridors. Odumu (2024) further underscores the importance of linking the trade agenda to energy investment and infrastructure financing to fully unlock the potential of regional value chains.

AfCFTA's transformative potential is reinforced by its alignment with complementary continental strategies, including Agenda 2063, the Programme for Infrastructure Development in Africa (PIDA), and AfSEM. These initiatives collectively form a policy architecture aimed at promoting sustainable development through infrastructure connectivity and economic resilience. Arbouch and Pelkes (2024) note that synergy between AfCFTA and the EU's Global Gateway initiative also presents new pathways for mobilising private capital and development financing toward energy and infrastructure development.

Furthermore, the agreement establishes a cooperative foundation for addressing long-standing trade asymmetries while strengthening regional institutions and creating mechanisms for monitoring progress. Akamobi, Usifoh, and Ejefobihi (2024) argue that for the AfCFTA to yield its full economic benefits, infrastructural integration and regulatory alignment must be prioritised. These elements are essential to unlocking economies of scale, facilitating seamless intra-African trade, and reducing the continent's reliance on external markets.

### 2.3. State of Energy Infrastructure and Cross-Border Connectivity

According to Machado Carvalho and Rodrigues (2023), achieving regional integration in sectors such as energy requires substantial investment in cross-border infrastructure and a shift from fragmented, nation-centric development models to coordinated regional planning. In the African context, the success of the African Continental Free Trade Area (AfCFTA) hinges on the establishment of interconnected and modern energy transmission networks. Despite the continent's abundant energy resources, decades of underinvestment and siloed national policies have left electricity systems disjointed. Consequently, regional power pools remain largely underutilised, and cross-border electricity trade is limited and inconsistent.

The absence of harmonised technical standards and regulatory frameworks further exacerbates the issue. Erhahon, Oseni, and Ehanmo (2024) observe that the lack of a unified regulatory architecture across the continent has prevented countries from capitalising on surplus energy generation in some regions to offset deficits in others. Instead, countries often duplicate efforts or pursue isolated projects, resulting in inefficiencies and lost economic opportunities. This disconnect is particularly acute in Sub-Saharan Africa, where many nations remain energy-insecure despite proximity to energy-abundant neighbours.

Recent efforts by AfCFTA and the African Single Electricity Market (AfSEM) seek to redress these challenges. AfSEM's Ten-Year Transmission Network Development Plan, aligned with AfCFTA's trade liberalisation goals, represents an ambitious push to build cross-border interconnectors and establish an integrated continental energy grid. As Israel and Nweke-Eze (2024) explain, this initiative aims to facilitate seamless energy trade through harmonised protocols and cross-jurisdictional investment mechanisms. However, the success of such efforts will depend heavily on political will, financing, and regulatory coordination among African Union member states.

According to Arbouch and Pelkes (2024), in 2022, only 51% of the population in Sub-Saharan Africa had access to electricity—underscoring the deep infrastructure gap and the urgent need for regional approaches. Cross-border energy trade can serve as a catalytic solution, especially for landlocked and energy-deficient states that lack the scale to support large-scale domestic energy investments. However, without adequate investment in high-voltage transmission lines, substations, and smart grid technologies, energy trade under AfCFTA will remain aspirational rather than operational.

Institutional fragmentation and inconsistent political will continue to undermine efforts toward cohesive regional integration. Samunderu (2024) notes that while the AfCFTA establishes a robust legal framework for advancing market liberalisation, practical implementation is frequently stalled by divergent national interests and limited regulatory coordination. Many member states treat their strategic sectors, including energy, as protected domains, showing reluctance to cede control to supranational institutions. This protective stance impedes the formation of unified governance structures necessary for the seamless operation of integrated markets. Consequently, investor confidence is weakened by regulatory uncertainty and fragmented enforcement, posing a significant barrier to realising the full potential of continent-wide energy cooperation.

Thus, Africa's energy infrastructure is not only a technical concern but a continental strategic imperative. Building robust, interconnected systems is essential for achieving AfCFTA's broader goals of industrialisation, inclusive growth, and sustainable development. Cross-border energy connectivity must be viewed not as an end in itself, but as the backbone of Africa's economic transformation in the 21st century.

### 2.4. Regulatory and Policy Fragmentation

Nagu (2023) highlights that the successful implementation of the African Continental Free Trade Area (AfCFTA) depends heavily on the harmonisation of policies, regulatory frameworks, and institutional capacities across member states. In the context of energy market integration, the persistence of diverse national laws, contrasting regulatory approaches, and misaligned institutional frameworks continues to hinder the establishment of a unified continental energy system. This regulatory fragmentation presents a significant challenge to realising AfCFTA's broader objectives of cohesive trade integration, industrial growth, and equitable access to sustainable energy.

Erhahon, Oseni, and Ehanmo (2024) identify that many African nations continue to operate isolated and protectionist energy regulations that conflict with the regional goals of market liberalisation and cross-border trade. These nationalistic frameworks contribute to a patchwork of

licensing regimes, tariff structures, technical standards, and legal definitions, which deter private sector investment and delay project implementation. Without regulatory alignment, efforts to facilitate intra-African electricity trade through power pools or joint infrastructure projects remain marginal and unsustainable.

Furthermore, there is a striking disconnect between national energy policies and regional commitments under AfCFTA and AfSEM (African Single Electricity Market). As Israel and Nweke-Eze (2024) argue, aligning national strategies with regional energy frameworks is essential for accelerating energy market integration. However, current policy landscapes are characterised by conflicting priorities, institutional overlap, and limited political will. These inconsistencies create administrative uncertainty, which undermines investor confidence and constrains the operationalisation of cross-border electricity infrastructure.

The absence of binding legal mechanisms to enforce regulatory compliance among member states presents a critical obstacle to the effective operationalisation of regional integration frameworks. As Samunderu (2024) observes, while AfCFTA outlines a comprehensive legal foundation for trade liberalisation, it falls short of establishing supranational regulatory authority capable of ensuring uniform implementation across diverse national jurisdictions. Consequently, many states endorse regional protocols but fail to integrate them into domestic legislation or harmonise them with existing sectoral policies. This disconnect undermines policy coherence and renders many regional agreements functionally ineffective, limiting the potential for truly integrated markets.

Achancho (2023) notes that the diversity of legal traditions inherited from colonial rule further complicates harmonisation efforts. Civil law, common law, and mixed legal systems exist side by side across the continent, making the standardisation of energy and trade-related laws particularly difficult. In this context, legal harmonisation efforts must consider not only policy alignment but also foundational legal compatibility and institutional readiness. These legal mismatches also compound non-tariff barriers, increasing transaction costs and discouraging the participation of regional and international energy actors.

The current fragmented regulatory environment is, therefore, a significant bottleneck for energy integration under AfCFTA. To overcome it, the continent must transition from a system of parallel national efforts to a unified legal and regulatory ecosystem. This requires strong leadership from the AfCFTA Secretariat, the African Union, and regional economic communities, alongside deliberate efforts by member states to harmonise laws, eliminate policy contradictions, and empower regional regulators with enforcement capacity.

### 2.5. Barriers to Intra-African Energy Trade

Ogbologu (2024) asserts that while the African Continental Free Trade Area (AfCFTA) embodies a transformative agenda aimed at enhancing regional integration and cross-border trade, its implementation faces significant structural and policy-related challenges. These enduring barriers have constrained Africa's ability to fully harness the opportunities presented by intra-continental energy trade. As a result, progress toward achieving equitable electricity access and comprehensive energy integration across the continent remains limited.

One of the most persistent challenges lies in tariff and non-tariff barriers (NTBs) that affect the movement of energy goods, services, and infrastructure components. Oyebamiji (2024) notes that energy trade across African borders is frequently delayed or blocked due to inconsistent customs procedures, excessive border checks, and overlapping national regulations. These NTBs increase transaction costs, reduce the competitiveness of cross-border power deals, and disincentivise investment in regional transmission projects. In the energy sector, where capital costs are already high, such trade frictions present significant hurdles.

Additionally, colonial-era infrastructural legacies remain a serious impediment. Much of Africa's energy transmission infrastructure was designed to export natural resources to global markets rather than connect neighbouring countries for shared development. As Odumu (2024) argues, this legacy has contributed to a lopsided energy grid that favours coastal export routes over interregional connectivity. As a result, many landlocked and energy-deficit countries lack adequate transmission lines to tap into surplus energy from neighbours, even when supply exists.

Policy misalignment between national and regional frameworks compounds the issue. While AfCFTA and the African Union advocate for harmonised regulations and integrated markets, national governments continue to operate under siloed energy policies and protectionist approaches to strategic infrastructure (Ogbodo, 2024). These divergent policies undermine collective planning, delay grid interconnection projects, and stifle the operationalisation of power pools such as the Southern African Power Pool (SAPP) and West African Power Pool (WAPP). Without clear, enforceable rules across borders, private investors face too much uncertainty to commit capital to cross-border energy ventures.

Institutional capacity is another major barrier. Many African states lack the technical and bureaucratic strength to design, negotiate, and implement cross-border energy trade agreements. According to Ajewumi, Afolabi and Joe-Akunne (2024), this institutional deficit often results in stalled negotiations, poor contract enforcement, and suboptimal maintenance of regional infrastructure. Moreover, weak data systems and lack of interoperability across national utilities further complicate forecasting, pricing, and scheduling in a regionally coordinated electricity market.

Addressing these barriers requires more than political commitment, it demands harmonised legal frameworks, dedicated infrastructure financing mechanisms, regional regulatory authorities, and capacity building at national and supranational levels. Until these systemic issues are resolved, intra-African energy trade will remain limited in scope and effectiveness, undermining both the development objectives of AfCFTA and the continent's broader push toward sustainable and inclusive growth.

### 2.6. Opportunities through Regional Energy Cooperation

Atkinson and Potvin (2022) argue that the African Continental Free Trade Area (AfCFTA) offers a scalable and transformative framework for enhancing regional cooperation, particularly in strategic sectors such as energy. As a cornerstone of economic development, energy can significantly benefit from coordinated governance mechanisms that transcend national boundaries. By promoting integrated electricity markets, standardising regulatory systems, and investing in shared infrastructure,

AfCFTA can enable African states to overcome systemic fragmentation, optimise resource allocation, and collectively accelerate sustainable industrialisation and poverty reduction.

Africa's regional energy cooperation potential lies in its diverse resource distribution. While Central Africa has vast hydropower potential, North Africa is abundant in solar, and East Africa in geothermal resources. However, these resources are often concentrated far from population and industrial centres. Through cross-border infrastructure investment and coordinated market frameworks, surplus energy from one region can meet deficits in another. Ajewumi, Afolabi and Joe-Akunne (2024) argue that AfCFTA provides a legally binding trade platform that could standardise energy trade rules and incentivise transnational energy infrastructure, thus improving energy security across the continent.

One of the most promising initiatives in this regard is the African Single Electricity Market (AfSEM), which is structured to align closely with AfCFTA's liberalisation goals. According to Israel and Nweke-Eze (2024), AfSEM enables electricity trade under a harmonised framework supported by regional power pools. Its potential lies not only in reducing costs and increasing access but also in encouraging private investment into renewable energy infrastructure. This strategic alignment with AfCFTA allows energy trade to become a core pillar of the continent's broader economic integration.

Regional energy cooperation enables the achievement of economies of scale that are beyond the reach of individual nations acting alone. Samunderu (2024) explains that pooled investments in energy generation and transmission infrastructure not only reduce redundancy and unit costs but also distribute financial and operational risks among multiple stakeholders. This approach is particularly advantageous for smaller or fiscally constrained economies, which may lack the capacity to develop large-scale infrastructure independently. By participating in collaborative frameworks such as the East African Power Pool (EAPP) and the Southern African Power Pool (SAPP), these countries gain access to otherwise unattainable assets. Additionally, interconnected energy systems contribute to greater market stability by mitigating price volatility and enhancing resilience against climate-induced supply disruptions.

Beyond infrastructure and trade, regional energy cooperation supports diplomatic and institutional capacity building. Abang (2024) highlights the role of Regional Economic Communities (RECs) in facilitating technical knowledge transfer, standardisation of regulations, and dispute resolution mechanisms within energy markets. These institutions serve as crucial intermediaries between national governments and continental bodies, translating political consensus into actionable regional projects.

Thus, AfCFTA, in conjunction with AfSEM and RECs, presents a transformative opportunity to reconfigure Africa's energy geography from isolated grids into interconnected markets. If backed by coherent policies and sustained political will, regional energy cooperation under AfCFTA could become one of the most impactful drivers of Africa's economic transformation in the coming decades.

### 2.7. Energy Access and Its Role in Poverty Alleviation

Casati *et al*. (2023) highlight that access to clean and affordable energy is a fundamental enabler of social and economic development in Sub-Saharan Africa, with direct implications for poverty alleviation, health, education, and livelihoods. Despite this, over 600 million people across the continent, primarily in rural areas, remain without electricity as of 2023, severely limiting progress toward inclusive development. This persistent energy poverty undermines the potential of transformative frameworks such as the African Continental Free Trade Area (AfCFTA). As such, embedding energy access at the core of AfCFTA's implementation is not only essential for development, but also critical for fostering inclusive, trade-led economic growth.

Energy poverty has far-reaching implications for human development, influencing everything from food security and healthcare access to educational outcomes and entrepreneurial opportunities. Drawing from comparable dynamics, Sadiqa (2023) demonstrates that well-designed policy interventions, particularly those aimed at reducing the cost of energy technologies, can significantly improve affordability and accessibility for underserved populations. In contexts where social and gender equity are tightly linked to energy access, lowering barriers to clean energy technologies such as solar panels and efficient cooking solutions can yield widespread socioeconomic benefits. Translating these insights to a continental framework like AfCFTA, trade facilitation measures that reduce tariffs and streamline import processes for energy-related goods can serve as practical instruments for combating energy poverty while enabling broader market participation and inclusive growth.

Furthermore, energy access is a foundational requirement for rural development, which remains a critical battleground in Africa's poverty alleviation agenda. Olalekan, Adeleye and Haibin (2024) argue that modern energy infrastructure directly enhances rural productivity by powering agro-processing, reducing post-harvest losses, and enabling digital inclusion. These outcomes not only improve household incomes but also create multiplier effects across local economies, reinforcing AfCFTA's objectives of economic diversification and industrialisation.

Kwakwa (2023) highlights that energy poverty is closely linked to systemic inequalities, particularly gender disparities and the marginalisation of rural communities. Women and girls, in particular, bear a disproportionate burden in energy-poor settings, spending hours collecting firewood and facing health risks from indoor air pollution. Therefore, improving energy access under AfCFTA is not only an economic strategy but also a gender equity and public health intervention. Policies that promote decentralised renewable energy systems, such as mini-grids and solar home kits, have the potential to address last-mile energy access in a cost-effective and climate-resilient manner.

At the institutional level, frameworks like the African Single Electricity Market (AfSEM) provide a platform to integrate energy access strategies with regional trade dynamics. Israel and Nweke-Eze (2024) note that AfSEM, in alignment with AfCFTA, is designed to harmonise energy trade regulations, reduce technical barriers, and support cross-border electricity

access through regional power pools. These integrated markets can help distribute surplus electricity from energy-rich countries to underserved regions, reducing costs and increasing efficiency in energy delivery.

### 2.8. Public-Private Partnerships and Institutional Collaboration

Olayele (2022) underscores the importance of public-private policy partnerships as a mechanism for addressing complex development challenges in Africa, particularly within the framework of regional integration initiatives like the African Continental Free Trade Area (AfCFTA). In the energy sector, where infrastructure demands are both capital-intensive and technically complex, such partnerships are crucial for mobilising resources, sharing risks, and enhancing implementation capacity. The development of transmission lines, generation facilities, and cross-border energy interconnectors requires collaborative models that go beyond traditional state-led approaches. Consequently, institutional cooperation between governments, private investors, and regional bodies becomes indispensable to achieving AfCFTA's infrastructure and energy objectives.

Cave (2024) emphasises that while AfCFTA creates a favourable legal framework for cross-border trade, actual implementation of energy integration projects will rely heavily on accountable, transparent, and compliant PPPs. Regulatory fragmentation, procurement inefficiencies, and contract enforcement issues have historically dissuaded investors from engaging in African infrastructure projects. Therefore, strengthening governance structures and ensuring regulatory clarity is critical to attracting long-term private capital into energy ventures aligned with AfCFTA priorities. Beyond finance, institutional collaboration plays a catalytic role in streamlining policy coordination and project execution. Israel and Nweke-Eze (2024) argue that institutions like the African Union Commission, African Development Bank, and regional economic communities must actively collaborate to harmonise energy standards and build cross-border regulatory consensus. In the case of the African Single Electricity Market (AfSEM), such cooperation ensures that policy instruments developed under AfCFTA are operationalised through technically sound, politically supported, and regionally coherent mechanisms.

Furthermore, Jaïdi, Byiers, and El Yamani (2024) note that public-private partnerships, when well-structured, can deliver both investment and innovation to address Africa's energy access deficit. Innovative instruments such as blended finance, partial risk guarantees, and results-based financing can de-risk energy investments in fragile or low-income countries. Such tools, combined with predictable policy environments, create a robust ecosystem for private sector participation in energy projects with long-term social returns. Institutional coherence is vital for strengthening capacity across Africa's energy landscape. As Samunderu (2024) highlights, many national agencies tasked with managing energy infrastructure are hampered by inadequate funding and a shortage of technical expertise, which delays project development and undermines financial viability. To address these deficiencies, regional bodies and international development partners must invest in structured knowledge-sharing mechanisms, targeted training initiatives, and collaborative project development frameworks. These measures can significantly enhance human capital within public institutions and improve project preparation standards. Moreover, the growth of indigenous financial institutions and African-focused infrastructure funds signals a positive shift toward mobilising domestic resources for strategic energy investments, thereby reducing reliance on external capital flows.

### 2.9. Environmental Sustainability and the Just Energy Transition

Nzimande and Khambule (2022) argue that a just energy transition must simultaneously address environmental, social, and economic dimensions to ensure that the shift to low-carbon systems does not deepen existing inequalities. In the context of the African Continental Free Trade Area (AfCFTA), this means that strategies aimed at decarbonisation must be designed to promote social equity and inclusivity, particularly for communities already burdened by energy poverty and climate vulnerability. The just transition framework offers Africa both a significant challenge and a transformative opportunity, to align climate goals with developmental imperatives while safeguarding the rights and livelihoods of marginalised populations.

Muza (2024) emphasizes that for the energy transition in Africa to be truly transformative, it must be anchored in inclusive governance frameworks that prioritise social equity alongside environmental sustainability. This requires a deliberate shift from top-down infrastructure deployment to participatory policymaking that actively involves communities—especially those in marginalized and fossil fuel-dependent regions. Ensuring that the most energy-deprived populations benefit first from clean energy investments is critical to correcting historical imbalances and promoting social justice. Retraining initiatives, equitable compensation mechanisms, and inclusive stakeholder engagement are essential components of this approach. Within the broader context of regional integration, such as AfCFTA, adopting inclusive energy governance is imperative for the agreement to serve not merely as a trade facilitation tool, but as a catalyst for equitable and sustainable development across the continent.

South Africa serves as an illustrative case for understanding both the opportunities and challenges associated with a just energy transition. Booyens *et al*. (2024) explore how the country's shift toward sustainable electricity, particularly within sectoral contexts such as tourism—reflects broader efforts to reconfigure high-carbon energy systems in favour of low-emission alternatives. Central to this transition is the targeting of coal-reliant regions for renewable energy development and associated workforce reskilling. While these initiatives align with the goals of regional frameworks like AfCFTA, they are met with practical challenges including local resistance, institutional capacity constraints, and unequal resource distribution. The case demonstrates that national policies must be strategically integrated with continental trade and development agendas to realise inclusive and environmentally sustainable transformation across sectors.

Khennas and Sokona (2024) emphasise that Africa's energy transition cannot merely replicate Western decarbonisation trajectories. Instead, it must be tailored to the continent's structural constraints and development priorities, including energy access, employment, and industrialisation. For AfCFTA to support this customised transition, regional trade rules must incentivise low-carbon technologies, remove trade barriers on renewable energy equipment, and channel

investment into green infrastructure. Energy interconnectivity projects under AfSEM (African Single Electricity Market) can also reduce emissions by enabling electricity trade from clean sources across borders.

Ramluckun, Malumbazo. and Ngubevana (2024) recommend that African countries adopt a blended energy governance model that integrates global best practices with local knowledge and context. Within AfCFTA, this means that climate action must be mainstreamed across trade protocols, investment charters, and industrial development policies. Green public procurement, carbon pricing, and environmental impact assessments should become standard components of regional projects.

## 3. Pathways and Policy Directions to Accelerate Intra-African Energy Trade

Accelerating intra-African energy trade under the African Continental Free Trade Area (AfCFTA) requires a coherent set of policy pathways that address long-standing bottlenecks while embracing strategic opportunities for integration. The goal is not only to liberalise trade in energy goods and services but also to create an interconnected infrastructure and regulatory ecosystem that supports sustainable, efficient, and equitable access to energy across the continent.

A central priority is the harmonisation of national energy policies and technical standards across member states. Without standardised tariffs, grid codes, and investment protocols, cross-border electricity trade will remain disjointed and inefficient. Odumu (2024) stresses that coordinated trade and energy strategies are essential to operationalising the African Single Electricity Market (AfSEM) and ensuring that power pools function optimally. Harmonised frameworks would facilitate power purchase agreements, streamline licensing processes, and promote confidence among private investors.

Another critical direction is the elimination of non-tariff barriers (NTBs) that currently obstruct the movement of energy technologies, infrastructure components, and services. Oyebamiji (2024) identifies excessive customs procedures, uncoordinated tax regimes, and port inefficiencies as major obstacles to intra-African energy commerce. Removing these NTBs through digital trade platforms, regional customs harmonisation, and trade facilitation agreements will significantly reduce the cost and complexity of regional energy transactions.

Infrastructure investment must also be significantly scaled up and strategically aligned with AfCFTA's trade corridors. Ogbologu (2024) argues that most of Africa's transmission infrastructure was historically designed to export raw materials rather than enable regional exchange. Therefore, reorienting investment toward interconnection projects—such as cross-border high-voltage transmission lines and regional substations—is vital. Development finance institutions and sovereign wealth funds must be mobilised alongside public-private partnerships to close the continent's estimated $100 billion annual infrastructure financing gap.

Institutional capacity-building is equally critical to the implementation of integrated energy markets. Many energy regulatory authorities across Africa face technical and administrative limitations that undermine their ability to enforce cross-border contracts and engage in regional coordination. Samunderu (2024) emphasises the need for regional energy regulatory bodies to be empowered with legal authority, dispute resolution mechanisms, and data-sharing platforms to ensure effective market surveillance and integration. Additionally, training programs and knowledge transfer among national agencies would ensure long-term technical sustainability.

### 3.1. Strengthening Policy and Institutional Frameworks

The realisation of intra-African energy trade under the African Continental Free Trade Area (AfCFTA) is contingent on the development of robust, harmonised, and responsive policy and institutional frameworks. These frameworks are essential for coordinating national energy agendas with regional trade goals, enhancing regulatory coherence, and ensuring that infrastructure development is anchored in long-term strategic planning. Despite the progress of AfCFTA, most African countries still operate in fragmented legal and institutional environments, slowing the pace of cross-border energy exchange and investment.

Kyriakarakos (2022) underscores the importance of harmonising electricity markets as a prerequisite for efficient energy trade. The African Single Electricity Market (AfSEM) offers a framework for coordinated operations, but its success hinges on the alignment of national energy policies and technical standards. The current lack of interoperability between grid systems and regulatory authorities across borders exacerbates inefficiencies and delays. Institutional reform must include the standardisation of grid codes, cross-border licensing regimes, and regional monitoring systems to support seamless electricity trade.

Institutional coherence is also central to reducing administrative barriers and enhancing trust among market actors. Odumu (2024) highlights that AfCFTA, while legally ambitious, lacks enforcement capacity without empowered institutions at both national and regional levels. For policy to be effective, African governments must invest in strengthening national regulatory bodies, improving technical capacity, and creating joint committees or regional secretariats to oversee energy cooperation. These bodies should be given legal authority to enforce rules, resolve disputes, and facilitate investment across borders.

Additionally, transparency and accountability must be embedded within institutional processes to attract private sector participation. As Oyebamiji (2024) points out, public institutions in many African countries face reputational challenges due to weak enforcement, corruption, and inconsistent application of regulations. To address these concerns, institutional frameworks must be digitised, rule-based, and insulated from political interference. Clear mandates, performance indicators, and stakeholder engagement mechanisms can also boost institutional credibility and facilitate long-term investor confidence in energy projects.

Samunderu (2024) advocates for the creation of a continental regulatory authority that operates beyond the confines of existing regional economic communities (RECs) to enhance coherence in Africa's liberalised markets. Such a supranational mechanism would be instrumental in promoting policy alignment, mediating cross-border disputes, and ensuring compliance with trade and market integration protocols under frameworks like AfCFTA and AfSEM. Drawing parallels with the European Union's internal market governance, Samunderu emphasises that a centralised regulatory body can uphold regional consistency while respecting national sovereignty, ultimately facilitating deeper integration and smoother implementation of

continent-wide trade and infrastructure initiatives.

### 3.2. Promoting Innovation, Technology Transfer, and Digitalization

Lemma (2024) highlights that the African Continental Free Trade Area (AfCFTA) presents a critical platform for embedding digitalisation, innovation, and technology transfer into the continent's broader economic transformation agenda. In the context of regional energy integration, these components are vital for developing a competitive and future-ready energy trade framework. By incorporating digital technologies and fostering innovation across infrastructure planning, policy design, and implementation, African countries can bridge existing technological divides, stimulate investment flows, and promote the long-term sustainability and resilience of energy markets under AfCFTA.

Arenas and Coulibaly (2022) emphasise that strategic integration into global value chains requires more than infrastructure—it demands policy coordination, innovation ecosystems, and institutional reform. Applying these insights to the African context, special economic zones (SEZs) aligned with AfCFTA objectives offer a pathway for enhancing regional trade in value-added energy technologies such as solar panels, grid storage systems, and smart metering devices. These zones can serve as catalysts for local manufacturing and technological upgrading. However, their effectiveness is contingent upon the establishment of digitised trade facilitation systems, harmonised technical regulations, and a continental policy framework that enables seamless technology transfer and regional knowledge spillovers.

Digitalization is also a powerful enabler of efficiency and transparency in energy trade. Israel and Nweke-Eze (2024) highlight the African Single Electricity Market (AfSEM) as an important initiative where digital tools—such as smart grids, blockchain-enabled metering, and automated power trading platforms—are already being tested. These innovations help to optimise electricity flows, reduce transaction costs, and facilitate real-time trading of energy across countries. They also increase system resilience by improving forecasting, demand-response mechanisms, and cyber-physical system integration.

Cariolle and Carroll (2022) highlight the transformative potential of digital technologies in expanding access to essential services across Sub-Saharan Africa, particularly in underserved communities. In the context of decentralised energy systems, digital finance solutions—such as mobile-based microcredit and pay-as-you-go solar platforms—offer scalable and affordable mechanisms to address widespread energy poverty. However, the authors caution that without strategic safeguards, increasing reliance on externally owned digital infrastructure may deepen technological dependency and limit local innovation. To counter this, it is essential that regional trade frameworks like AfCFTA incorporate policy provisions that support indigenous technological development, prioritise local data governance, and promote co-innovation between public and private sectors to ensure that digital progress translates into sustainable and autonomous development pathways.

Building effective innovation systems demands targeted investment in human capital, and comprehensive institutional support for science, technology, and research. Harris (2023) critiques the persistent reliance on donor-driven skills development in Africa, arguing that such models often perpetuate dependency rather than fostering indigenous innovation and long-term autonomy. Within the context of AfCFTA, this concern underscores the urgency of reorienting technological capability building toward homegrown strategies. These should prioritise continental ownership of knowledge systems, support for African universities and research institutions, and the cultivation of startup ecosystems in high-impact sectors like clean energy. A coordinated continental approach to science and technology would also strengthen Africa's voice in global digital governance, promote intra-African collaboration on intellectual property, and reduce structural vulnerabilities associated with externally led development agendas.

The intersection of innovation, digitalization, and technology transfer offers Africa a unique chance to leapfrog outdated systems and develop future-ready energy trade infrastructure. With AfCFTA providing the legal and institutional scaffolding, African governments must now prioritise the creation of a harmonised digital energy market that promotes local innovation, ensures equitable access to technological benefits, and positions the continent as a globally competitive actor in clean energy trade.

### 3.3. Financial Mechanisms and Investment Facilitation

Chirwa (2023) notes that the successful realisation of the African Continental Free Trade Area (AfCFTA) depends not only on trade liberalisation but also on the establishment of effective financial frameworks that align economic growth with sustainability objectives. In the context of intra-African energy trade, this alignment necessitates the development of strong investment facilitation strategies and innovative financial instruments. Given the capital-intensive nature of energy infrastructure—such as power generation facilities, transmission networks, and regional power pools—attracting both public and private investment requires long-term policy coherence, risk mitigation tools, and continental coordination. The AfCFTA Investment Protocol represents a pivotal step toward building a harmonised legal and financial ecosystem that can drive infrastructure development and support Africa's broader energy transition goals.

Odumu (2024) emphasises that harmonised financial frameworks, streamlined regulatory procedures, and risk-mitigating investment vehicles must be embedded in AfCFTA's operational structures. These tools should include sovereign guarantees, partial risk and credit guarantees, and blended finance models to attract institutional investors into energy trade infrastructure. Africa's energy sector has long been underfinanced due to high perceived risks, weak creditworthiness of utilities, and inconsistent legal protections. The Investment Protocol must provide enforceable protections to investors while ensuring policy stability across borders.

Kandjii (2023) identifies the intra-African investment facilitation protocol as a transformative component of AfCFTA, especially in the Southern African Development Community (SADC). This protocol calls for the removal of bureaucratic and legal constraints on capital flows, simplifying investment approval processes, and ensuring investor dispute mechanisms. It further supports alignment with the SADC Finance and Investment Protocol and encourages joint ventures across borders. In the context of energy, such harmonisation would enable cross-border equity participation in grid projects, power generation, and renewable energy initiatives.

Financial inclusion is also an essential pillar in unlocking local and regional energy markets. Warikandwa (2023) argues that increased access to financial services among micro, small, and medium-sized enterprises (MSMEs) in the energy value chain—particularly in renewable energy distribution—will accelerate the expansion of decentralized systems and off-grid access. This will, in turn, promote intra-African trade in solar home systems, batteries, and digital energy technologies. Digital finance platforms, credit scoring tools, and fintech partnerships should be scaled to deepen access to working capital and long-term financing for smaller energy actors.

Ajewumi, Afolabi and Joe-Akunne (2024) suggest that effective investment facilitation requires integrated regional capital markets and development finance coordination. African stock exchanges, sovereign wealth funds, and pension funds can be key sources of capital if investment guidelines are adjusted to permit long-term infrastructure holdings. Furthermore, the AfCFTA Secretariat must work closely with institutions like the African Development Bank and Africa50 to structure bankable projects, build project pipelines, and ensure transparency in procurement and fund disbursement.

### 3.4. Enhancing Capacity Building and Knowledge Exchange

Capacity building and knowledge exchange are critical enablers for the effective implementation of the African Continental Free Trade Area (AfCFTA), particularly in sectors like energy where technical complexity, regulatory disparity, and institutional gaps remain persistent. Sustainable and inclusive energy trade across African borders requires more than infrastructure; it demands well-trained personnel, effective institutions, and a culture of regional learning and cooperation. As AfCFTA evolves from policy to implementation, the systematic enhancement of human and institutional capacities is essential.

Ajewumi, Afolabi, and Joe-Akunne (2024) stress that without deliberate investment in knowledge systems, the continent risks institutional fragmentation, weak enforcement, and suboptimal trade gains. Their study highlights that a large number of trade officials, energy regulators, and border personnel still lack the technical expertise required to navigate and operationalise AfCFTA's complex provisions. This gap undermines the execution of harmonised energy trade protocols and the smooth movement of energy goods and services across borders.

Regional Economic Communities (RECs) play a pivotal role in bridging these gaps. According to Abang (2024), RECs can facilitate diplomatic and technical cooperation by providing platforms for peer learning, technical harmonisation, and collective negotiation strategies. In the energy sector, this could include standardising regulatory practices, sharing operational best practices from successful power pools, and coordinating on project finance and procurement systems. Such regional exchanges can prevent duplication, reduce transaction costs, and accelerate collective progress toward market integration.

Ofori-Amoah (2024) emphasises the importance of embedding knowledge production and capacity development within the broader framework of regional trade integration. He argues that for initiatives like AfCFTA to realise their transformative potential, there must be deliberate investment in institutional learning and human capital formation. This includes fostering partnerships between academic institutions, research centres, and regional trade organisations to co-create indigenous curricula tailored to Africa's developmental context. Priority areas should include renewable energy, infrastructure finance, trade policy, and regulatory governance. Such programmes are essential to cultivating a new generation of African professionals equipped to manage cross-border energy corridors, lead trade negotiations, and develop technologies that address local challenges while reducing reliance on external expertise.

Beyond formal education and training, capacity building must also embrace knowledge sharing through digital platforms, workshops, joint ventures, and secondments. Turksen and Abukari (2023) argue that for Africa to lead its own clean energy transition, policy coherence must be underpinned by continuous dialogue between trade, energy, and environmental stakeholders. Digital knowledge repositories, regional conferences, and structured mentorship between newer and more established agencies can facilitate this ecosystem of institutional learning and continuous improvement.

### 3.5. Data, Monitoring, and Impact Assessment Systems

The success of intra-African energy trade under the African Continental Free Trade Area (AfCFTA) hinges on the establishment of robust data systems, continuous monitoring frameworks, and effective impact assessment tools. While policy frameworks and infrastructure investment form the foundation for trade integration, their long-term viability and success are determined by the capacity to generate, interpret, and act on evidence-based insights. Monitoring and evaluation systems are not merely technical requirements—they are strategic assets that enhance accountability, guide resource allocation, and improve adaptive policymaking.

Odumu (2024) argues that data scarcity remains one of the most significant bottlenecks for intra-African trade, particularly in energy. Accurate, granular, and timely data on electricity flows, pricing, grid stability, and infrastructure capacity is vital for forecasting demand, identifying investment gaps, and optimising power distribution across regions. However, national data systems in many African countries remain underdeveloped or siloed, making it difficult to consolidate regional overviews or inform continent-wide policy initiatives.

To address these gaps, Warikandwa (2023) suggests the development of harmonised digital platforms across AfCFTA member states to collect and analyse trade and energy data. These platforms should integrate national statistics, utility data, and private sector inputs to create a central repository accessible to policymakers, regulators, investors, and civil society. Moreover, such systems must be designed to support interoperability, transparency, and disaggregation by sector, gender, and geography to enhance equity-focused analysis.

Monitoring systems are equally critical for real-time tracking of policy implementation and infrastructure development. Abang (2024) highlights the role of Regional Economic Communities (RECs) in supporting joint monitoring frameworks for energy corridors and trade zones. By standardising metrics and reporting timelines, RECs can ensure consistency across regions and facilitate benchmarking. Furthermore, regional peer-review mechanisms can enhance accountability and stimulate competition among member states to achieve integration targets.

At the institutional level, initiatives such as the African

Single Electricity Market (AfSEM) provide useful examples of integrated monitoring. Israel and Nweke-Eze (2024) note that AfSEM's platform is equipped to track electricity flows, market participation, and grid performance across borders. Leveraging such initiatives, AfCFTA can embed data-driven governance into its operational DNA—ensuring that trade liberalisation is aligned with development outcomes and that deviations are addressed proactively.

Impact assessment systems must also go beyond economic indicators to evaluate social, environmental, and gendered outcomes of energy trade. Tools such as cost-benefit analyses, socio-economic impact evaluations, and carbon footprint assessments are vital for ensuring that energy integration under AfCFTA contributes to inclusive growth, sustainability, and climate resilience. These systems must be integrated from the design phase of projects and policies, not retrofitted after implementation.

### 3.6. Future Research Directions

Despite significant progress in implementing the African Continental Free Trade Area (AfCFTA), knowledge gaps remain in understanding how intra-African energy trade can be optimally scaled, regulated, and monitored to achieve inclusive development goals. Addressing these gaps through future research is essential to guide policymaking, support institutional design, and promote investment alignment across the continent's complex energy landscape.

Oyebamiji (2024) argues that while policy frameworks exist, the nuances of sector-specific implementation, particularly in energy, are under-researched. Future studies should focus on empirically assessing how non-tariff barriers (NTBs) and legacy infrastructure systems constrain the scalability of regional energy markets. For instance, limited analysis exists on how soft barriers such as cross-border bureaucracy, legal fragmentation, and institutional distrust specifically affect the deployment of clean energy infrastructure in border regions. A comparative analysis of high-performing and underperforming regional power pools could yield valuable insights into design best practices.

Odumu (2024) stresses the need for interdisciplinary research that links trade liberalisation with environmental sustainability, governance reform, and equitable access. As energy systems are deeply interconnected with climate resilience and industrial policy, researchers must explore synergies between AfCFTA and continental frameworks such as the African Single Electricity Market (AfSEM), the Programme for Infrastructure Development in Africa (PIDA), and Agenda 2063. Moreover, policy evaluation studies could examine how harmonised regional standards influence investor behaviour, project bankability, and cross-border collaboration.

Mensah (2023) highlights the importance of modelling and forecasting intra-African energy trade flows under different policy and market conditions. His work on trade comovements and shock transmission underscores the relevance of macroeconomic volatility in trade performance. Building on such approaches, future research should simulate energy trade scenarios across regional blocs, incorporating variables such as renewable energy availability, geopolitical risk, currency fluctuation, and infrastructure bottlenecks. These models can serve as decision-support tools for policymakers and regional economic communities (RECs).

Israel and Nweke-Eze (2022) emphasize the urgent need for future research into data governance and digital infrastructure development as critical enablers of regional electricity trade. Particular attention should be directed toward technologies such as smart grids, blockchain-enabled metering, and demand-side forecasting tools, which are increasingly central to managing complex energy networks. Further research is required to explore the institutional architecture necessary for deploying interoperable platforms that can ensure data privacy, cybersecurity, and real-time responsiveness across borders. In light of AfCFTA's evolving digital trade protocols, the intersection of artificial intelligence, decentralised ledger technologies, and digital finance warrants careful academic and policy exploration to determine its long-term viability in Africa's energy systems.

In addition, longitudinal studies assessing the socio-economic impact of regional energy integration are scarce. Future research should monitor the distributional effects of trade liberalisation on employment, gender equity, rural electrification, and local entrepreneurship within the energy sector. Case studies from pilot cross-border projects can provide grounded lessons on community engagement, conflict mitigation, and public acceptance—factors often overlooked in high-level policy discourse.

## 4. Conclusion

This study has provided a comprehensive examination of how regional integration can be harnessed to address systemic developmental challenges, particularly those related to infrastructure deficits, policy fragmentation, and social inequality. Guided by a set of clearly defined objectives, the analysis explored the intersections of economic cooperation, institutional frameworks, financial ecosystems, and innovation within a rapidly evolving continental landscape. Each section of the paper contributed to uncovering critical dynamics, offering both conceptual clarity and actionable insights.

A central outcome of the research is the identification of structural inefficiencies that continue to hinder the seamless movement of key resources across borders. These include fragmented regulations, limited interconnectivity, and insufficient investment coordination. Yet, the findings also point to notable progress and untapped potential. Emerging platforms for cross-border collaboration, the growing alignment of regional and national policies, the rise of decentralised financing tools, and the proliferation of digital infrastructure signal a promising shift toward coordinated, scalable solutions.

Furthermore, the research demonstrated that addressing these constraints is not merely a technical goal—it is integral to achieving long-term, inclusive development. Equitable access to basic services, enhanced productivity, industrial growth, and environmental resilience all hinge on a system that is supported by strong institutions, responsive policy, and sustained knowledge exchange. When implemented effectively, regional cooperation frameworks offer far more than economic benefits—they lay the groundwork for structural transformation.

To build on these findings, several recommendations emerge. These include enhancing legal and regulatory harmonisation, increasing support for regional investment platforms, strengthening institutional capacity, and embedding continuous monitoring and evaluation into all levels of implementation. Additionally, fostering innovation ecosystems and reinforcing South–South collaboration will be crucial in accelerating results.

Ultimately, the study affirms that coordinated action, strategic foresight, and institutional maturity are essential to unlocking the continent's collective potential. With deliberate effort, this evolving integration framework can serve as a catalyst for sustainable, inclusive, and long-term development.

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