

Financing Infrastructure in Africa: Innovative Mechanisms to Boost Industrial Growth and Continental Integration.

Evidence from and Ethiopia, Rwanda, South Africa, Algeria

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ABSTRACT

This paper aims to provide a thorough analysis of infrastructure financing in Africa by examining innovative and sustainable mechanisms that can promote industrial growth and enhance continental integration amid the continent's ongoing economic and financial changes.

The persistent structural challenges African countries face in mobilizing sufficient resources for key infrastructure projects highlight the significance of this topic. Limited fiscal space, growing debt levels, and overdependence on external loans have increased the need for alternative, resilient, and inclusive financing models that can ensure both financial sustainability and development impact.

The study seeks to fill a significant gap in African economic literature, which often overlooks the interconnections between infrastructure financing, industrialization, and regional integration. By adopting a descriptive–analytical approach combined with a comparative method, the research draws on successful global and regional experiences, including those of Singapore, Canada, China, Ethiopia, Rwanda, South Africa, and Algeria. These countries have demonstrated the viability of innovative instruments such as public–private partnerships, sovereign wealth funds, green finance, and developmental Sukuk in mobilizing long-term capital while mitigating financial risks.

The findings of this research emphasize the necessity of adopting an integrated regional framework for infrastructure financing, supported by joint financial platforms among African states and harmonized legislative and regulatory mechanisms that attract both domestic and international investors. Moreover, the study highlights the critical role of the African private sector in driving industrial transformation and recommends the adoption of flexible and context-specific financial tools aligned with national development priorities. Ultimately, this paper contributes to the broader discourse on Africa's sustainable development agenda by positioning infrastructure financing not merely as a technical challenge but as a strategic lever for industrial competitiveness, regional solidarity, and continental resilience.

1. Introduction

Infrastructure is a fundamental pillar of any comprehensive and sustainable development strategy, particularly in developing countries and emerging economies. Today, the African continent is facing a multitude of developmental challenges, chief among them being weak productive capacities, limited logistical connectivity, and uneven levels of industrial growth across its regions. Within this context, infrastructure financing emerges as a critical driver capable of

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catalyzing transformative economic performance—not only at the national level but also as a means to advance continental integration, in line with the African Union’s Agenda 2063.

Despite the increasing number of African and international initiatives aimed at supporting infrastructure development, a significant financing gap remains. Specialized economic reports indicate that Africa requires annual infrastructure investments ranging from \$ 130 billion to \$ 170 billion, with a financing deficit exceeding \$ 60 billion each year (AfDB, 2022). This reality raises an urgent question regarding the need for innovative financing mechanisms, beyond traditional models based on debt and rentier policies toward more sustainable and participatory solutions, including public–private partnerships (PPPs), green finance, sovereign wealth funds, and developmental Sukuk.

This research derives its importance from its attempt to explore successful models and innovative approaches that can help African countries close the infrastructure-financing gap while simultaneously achieving productive transformation and continental integration. Its benefit lies in offering a multidimensional analytical perspective grounded in an assessment of the African reality and enriched by international best practices tailored to the region’s developmental specificities.

Accordingly, this study seeks to address the following question:

How can Africa adopt innovative financing mechanisms to develop infrastructure in ways that support industrial growth and promote continental integration?

The objectives of the research are to:

- Analyze the structural and financial barriers to infrastructure financing in Africa.
- Explore non-traditional financing mechanisms capable of addressing the investment shortfall.
- Evaluate the applicability of international models to the African context.
- Offer strategic recommendations for policymakers at both national and continental levels.

2. Theoretical and Conceptual Framework

2.1. Concept of Infrastructure Financing

Infrastructure financing refers to the mobilization of capital for the development and maintenance of fundamental physical and organizational structures required for the functioning of an economy, such as transport systems, energy grids, water supply, telecommunications, and logistics. In the African context, infrastructure investment is not only an economic necessity but also a geopolitical priority for regional integration and industrial competitiveness (Calderón & Servén, 2010).

Traditional financing models in Africa have heavily relied on public budgets and concessional loans from multilateral development banks. However, such sources are increasingly insufficient given the scale of infrastructure needs and fiscal constraints facing African governments (AfDB, 2018). This has prompted a shift toward exploring more diversified and sustainable financing mechanisms.

2.2. Innovative Financing Mechanisms: Definitions and Classifications

Innovative financing encompasses a broad range of non-traditional instruments and institutional arrangements designed to increase the volume and effectiveness of investment in infrastructure. These include public–private partnerships (PPPs), sovereign wealth funds, green and climate bonds, blended finance, and Islamic finance instruments such as sukuk (World Bank, 2020).

According to OECD (2015), innovation in infrastructure finance should not be understood merely as creating new instruments, but also as improving risk-sharing frameworks, enabling local capital markets, and mobilizing domestic savings. For instance, PPP schemes allow governments to share long-term project risks with private investors, while green bonds facilitate the financing of environmentally sustainable infrastructure such as renewable energy and climate-resilient roads.

Studies show that countries that successfully implemented innovative infrastructure financing (e.g., South Korea, China, India, and South Africa) had strong regulatory frameworks, transparent project pipelines, and supportive institutional ecosystems (WEF, 2021).

2.3. Infrastructure as a Catalyst for Industrial Growth and Productive Transformation

Infrastructure plays a vital role in enhancing productivity, reducing transaction costs, and enabling economies of scale, critical conditions for industrial take-off. According to the United Nations Economic Commission for Africa

(UNECA, 2020), infrastructure bottlenecks remain one of the top impediments to structural transformation across the continent.

Productive transformation, in this context, refers to the shift from low-productivity sectors (such as primary commodities) to higher-value-added manufacturing and services. Reliable and modern infrastructure facilitates this transformation by improving market access, integrating supply chains, and attracting industrial investment (Dethier & Moore, 2012).

2.4. Infrastructure and Continental Integration in Africa

The African Union's Agenda 2063 and the Program for Infrastructure Development in Africa (PIDA) underscore the strategic importance of infrastructure in achieving regional connectivity, trade integration, and collective resilience. The implementation of the African Continental Free Trade Area (AfCFTA) further increases the demand for cross-border transport corridors, digital infrastructure, and energy interconnections (UNECA, 2022).

Infrastructure financing is thus not an isolated technical issue but a foundational element in the broader project of African integration. According to a study by Foster and Briceño-Garmendia (2010), improving regional infrastructure could boost intra-African trade by up to 25%, particularly if coordinated through regional economic communities (RECs) and continental financial mechanisms.

3. Analysis of the Current Landscape of Infrastructure Financing in Africa: Gaps and Structural Challenges

3.1 Overview of Infrastructure Gaps in Africa

Infrastructure deficits continue to be a major barrier to economic growth and regional integration in Africa. According to the African Development Bank (2023), the continent needs between \$130 billion and \$170 billion annually for infrastructure investment but faces a consistent financing gap of over \$68 billion to \$108 billion each year.

A closer look at selected African countries shows wide disparities in both infrastructure quality and financing capacity:

Table N°01: Infrastructure and Financing Indicators (Annual Value in USD and Percentage of GDP)

Country	Infrastructure Quality Index (0–100)	Annual Infrastructure Investment (% of GDP)	Main Financing Source
South Africa	62.4	5.0%	Public Budget + PPPs
Rwanda	57.8	6.1%	Sovereign Bonds + Donor Support
Kenya	55.1	5.6%	Infrastructure Bonds + PPPs
Senegal	53.7	4.9%	Blended Finance + IFIs
Algeria	60.5	4.3% (Est. 2022)	Public Budget + State Oil Revenues
Nigeria	45.3	3.2%	Oil-backed Loans + Multilateral Support

Source: African Development Bank (AfDB, 2023); World Economic Forum (WEF, 2022); National Ministries of Planning, Algeria 2022.

This table highlights a significant disparity in infrastructure quality indices and annual investment levels among the selected African countries. While nations like South Africa and Algeria score relatively high (above 60 points) in infrastructure quality, their annual financing gaps remain considerable. This suggests a heavy dependence on traditional funding sources, such as public budgets or resource revenues, with limited use of innovative financing mechanisms. In contrast, countries like Rwanda and Kenya, despite having lower quality scores, demonstrate greater initiative in mobilizing resources through sovereign and infrastructure bonds as well as PPPs. From a research perspective, the size of the financing gap is not solely determined by the size of the economy or the existing infrastructure quality but is heavily influenced by the country's ability to diversify financing tools and create an attractive investment climate.

3.2. Conceptual Framework for Closing Africa's Infrastructure Gap: Key Enablers

Africa faces a profound infrastructure deficit, estimated to be between \$130 billion and \$170 billion annually, which substantially constrains the continent's economic growth and integration. Addressing this gap is essential to unlocking Africa's development potential and achieving sustainable economic transformation. Four interrelated enablers are crucial to effectively closing this infrastructure gap: Regional Funds, Regulatory Harmonization, Risk Mitigation, and Continental Platforms.

a. Regional Funds

Regional funds are pivotal financial instruments mobilizing resources across African countries to support large-scale infrastructure projects. These funds pool domestic capital from pension funds, sovereign wealth funds, and development banks, creating a sustainable financing base tailored to Africa's unique needs.

- **Magnitude of Capital:** Africa possesses over \$1.1 trillion in domestic capital reserves, representing a vital source to finance infrastructure investments internally rather than relying solely on external sources.(africafc,2025)
- **Role in Project Financing:** Regional funds such as those facilitated by institutions like the African Development Bank (AfDB), Africa50, and the NEPAD Infrastructure Project Pipeline provide concessional and commercial capital essential for bridging financing gaps.(au-pida,2024)
- **Impact:** These funds support cross-border infrastructure projects in energy, transport, and ICT sectors, which are fundamental for boosting regional integration and economies of scale.

b. Regulatory Harmonization

Regulatory harmonization entails aligning and integrating policies, legal frameworks, and standards across African countries to foster a seamless environment for infrastructure development and business operations.

- **Necessity:** Fragmented and inconsistent regulations impose high transaction costs, deter investment, and delay project execution.(nuclearbusiness-platform,2021)
- **Benefits:** Harmonized regulatory frameworks facilitate cross-border infrastructure initiatives by streamlining licensing, reducing legal risks, and ensuring regulatory predictability. This is especially critical in sectors like energy, where regional power pools depend on unified regulatory oversight.(au,2021)
- **Examples:** The African Continental Free Trade Area (AfCFTA) and coordinated energy market frameworks serve as cornerstones of this effort, targeting integration across 1.3 billion people and a \$3.4 trillion combined GDP.(uneca,2023)

c. Risk Mitigation

Risk mitigation addresses the multifaceted financial, political, and operational risks that jeopardize infrastructure projects, making them less appealing for investors.

- **Challenges:** Projects in Africa often encounter political instability, currency volatility, and regulatory uncertainties, which significantly elevate risks for private investors. (inafrika,2022)
- **Strategies:** The implementation of insurance mechanisms, loan restructuring, political risk guarantees, and tailored financial instruments is essential to protecting investments and extending debt tenures. (au-pida,2020)
- **Outcomes:** Successful risk mitigation has demonstrated improved project viability and has catalyzed increased private capital flows into infrastructure across African nations. (inafrika,2022)

d. Continental Platforms

Continental platforms encapsulate overarching frameworks and initiatives designed to coordinate infrastructure planning, financing, and implementation at continental and regional levels.

- **Examples:** Notable platforms include the Program for Infrastructure Development in Africa (PIDA), African Continental Free Trade Area (AfCFTA), and the African Union Development Agency (AUDA-NEPAD). (Africa Europe Foundation)
- **Functions:** These platforms provide strategic coordination, policy alignment, and monitoring of infrastructure projects, ensuring resource optimization and synergy across sectors such as transport, energy, digital infrastructure, and water. It is estimated that this could potentially increase from 15% to over 30% of total trade with improved infrastructure. (uneca,2022)

The effectiveness of these enablers lies in their seamless integration; for instance, regional funds can best allocate capital when supported by robust regulatory frameworks that mitigate risk and are aligned under continental platforms that coordinate initiatives across borders.

Table N°02: Supporting Data and Visual Tools

Indicator	Statistic/Fact	Source
Annual Infrastructure Need	\$130-\$170 billion	nepad+2
Financing Gap	\$68-\$108 billion	au-pida+2
Domestic Capital Pool	Over \$1.1 trillion	africafc
Intra-African Trade Potential Increase	From 15% to 33% with better infrastructure	uneca
Energy Capacity Added in 2024	6.5 GW (compared to 18 GW in India, 48.6 GW in US)	africafc

Source : <https://www.africaeuropefoundation.org/areas-of-action/new-report-calls-for-unlocking-dollar170-billion-annually-to-meet-africa-s-infrastructure-needs>

Africa's infrastructure gap requires a multifaceted approach, centered on mobilizing regional funds, harmonizing regulations, mitigating investment risks, and leveraging continental platforms. Together, these enablers create a powerful framework that addresses financial constraints, administrative barriers, and operational challenges, thereby positioning Africa to fulfill its tremendous development potential through sustainable infrastructure growth.

3.3 Key Challenges in Financing African Infrastructure

Several systemic barriers contribute to the infrastructure-financing gap in Africa:

- **Heavy reliance on public budgets:** Over 70% of infrastructure projects are still financed through national public expenditure, which is often constrained by fiscal pressures and debt sustainability concerns (UNECA, 2022).
- **Weak project preparation capacity:** Many African countries lack technical and institutional frameworks to prepare bankable, large-scale infrastructure projects attractive to private investors (WEF, 2021).
- **Low credit ratings and investor risk perceptions:** High sovereign risk premiums and weak creditworthiness reduce access to international capital markets.
- **Fragmented regional planning:** There is limited coordination between countries in infrastructure development, which undermines economies of scale and reduces the viability of cross-border projects (PIDA, 2023).

Table n°03: Estimated Annual Spending Range (Based on the Continental Range of USD 130–170 Billion per Year)

Sector	Share of total needs (%)	Estimated annual needs (USD billion)
Transport (roads, rail, ports)	35–45%	45–77
Energy (generation, grids, renewables)	25–35%	33–60
ICT / Digital infrastructure	10–18%	13–31
Water & sanitation	10–15%	13–25
Total (continent)	100%	~130–170 (AfDB range commonly cited)

Source: African Development Bank (AfDB) (2018). African Economic Outlook 2018: Infrastructure and Industrialization. Abidjan: AfDB. Program for Infrastructure Development in Africa (PIDA) (2021). Continental Infrastructure Needs Assessment. Addis Ababa: African Union Commission, NEPAD Agency, AfDB, UNEC

The second table highlights the sectoral composition of Africa's infrastructure needs, with transport taking the largest share (35–45%), followed by energy (25–35%). This reflects the interlinked nature of industrial development and continental integration, where efficient transport and reliable energy supply are essential for driving industrial and trade growth.

The ICT sector, despite its smaller share, plays a pivotal role in digital transformation and productivity gains, particularly with the expansion of digital services. Analytically, these values suggest that any successful financing strategy must align with sectoral priorities, and that deploying innovative financing instruments, such as green bonds or blended finance, could yield multiplier effects when targeted at sectors with strong linkages to inclusive growth.

3.4 Algeria: Infrastructure as a Lever for Economic Diversification

Algeria has significantly increased its infrastructure investments over the past two decades, primarily financed through hydrocarbon revenues. The country has developed major transport corridors, new ports (e.g., Port of El Hamdania), urban expressways, and industrial zones.

Recent efforts aim to diversify financing sources away from public oil-dependent budgets:

- In 2021, Algeria launched a National Infrastructure Investment Strategy aligned with the objectives of the African Union's Agenda 2063.
- In 2023, the government announced pilot projects in PPP frameworks, including highways and logistics parks.
- There is growing interest in developing green infrastructure, particularly in the southern regions, including renewable energy transmission networks and smart irrigation systems (Ministry of Energy, Algeria, 2023).

Figure N°01: Gross Capital Formation as a Percentage of GDP in Algeria (2012–2023)



Source: CEIC Data – Algeria Investment: Percentage of Nominal GDP- 2023.

<https://www.ceicdata.com/en/indicator/algeria/investment--nominal-gdp>

The chart indicates that Gross Capital Formation in Algeria reached approximately 37.7% of GDP in 2023, representing a notable increase compared to the recent historical average of around 32.6%. This elevated level reflects the government's commitment to intensifying investments, particularly in strategic infrastructure projects such as transportation networks, energy facilities, and digital connectivity.

□ **From our research perspective:**

- The sustained high investment ratio signals a proactive public policy orientation towards infrastructure expansion, largely financed through fiscal revenues from hydrocarbons.
- While this trend is positive for economic modernization and capacity building, it raises questions about long-term fiscal sustainability, especially in the face of fluctuating oil prices and potential external shocks.
- Without diversified financing instruments, such as Public–Private Partnerships (PPPs), infrastructure bonds, and green finance mechanisms, reliance on state-led funding could limit efficiency, increase fiscal vulnerability, and delay the continent's broader integration goals.

According to the World Bank Spring 2024 Algeria Economic Update (World Bank, 2024), Algeria's GDP grew by 4.1% in 2023, supported by both hydrocarbon and non-hydrocarbon sectors, strong private consumption, and increased investment. Natural gas output reached record highs, offsetting reductions in crude oil under OPEC quotas.

Despite lower hydrocarbon prices and a narrower trade surplus, foreign reserves increased to cover 16.1 months of imports. Inflation eased to 5.0% in early 2024, helped by currency strength and lower food prices (World Bank, 2024).

The report highlights the importance of data-driven policymaking, advocating for alternative sources such as satellite and shipping data to complement official statistics.

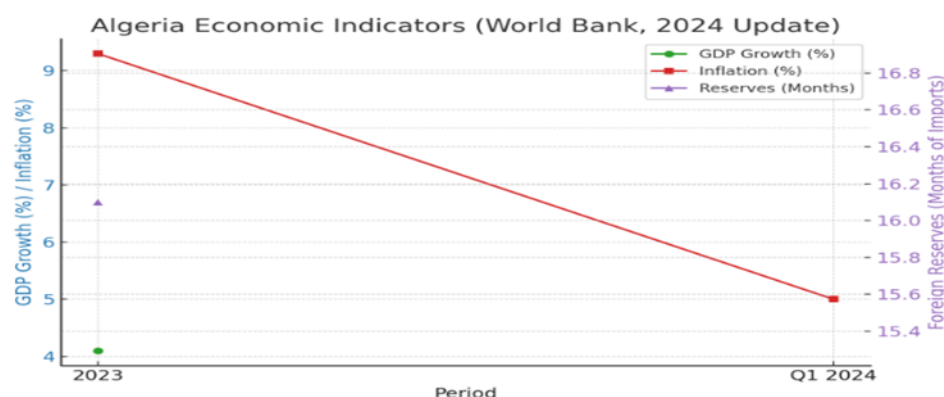
Looking ahead, growth may slow in 2024 before rebounding in 2025, but fiscal sustainability faces risks from high public spending and import growth. Recent reforms—including the 2022 Investment Law, 2023 Banking and Monetary Law, and AfCFTA membership—aim to boost private sector investment, diversify the economy, and improve infrastructure financing beyond reliance on public capital (World Bank, 2024).

Table N°04: Algeria Economic Update 2024 Statistics

Indicator	Value	Year / Period	Notes
GDP growth rate	4.1%	2023	Driven by the hydrocarbon & non-hydrocarbon sectors
Inflation rate	9.3%	2023	Consumer price inflation
Inflation rate	5.0%	Q1 2024	Decrease due to strong dinar & lower food/import prices
Foreign reserves coverage	16.1 months of imports	End of 2023	Despite a reduced trade balance
Natural gas production	Record-high	2023	Compensated for crude oil decline
Public investment trend	Constrained	2023–2024	Due to higher current expenditure
Main investment drivers	Private consumption & investment growth	2023	Led to import growth
Trade balance trend	Shrinking	2023	Caused by lower hydrocarbon prices & higher imports
Policy reforms	2022–2023	Multiple	Investment Law 2022, Banking & Monetary Law 2023, Land Law 2023, SOE bank reforms
Economic outlook	Temporary slowdown in 2024, robust recovery in 2025	Projection	Risks from commodity prices & climate

Source: <https://www.worldbank.org/en/country/algeria/publication/algeria-economic-update-spring-2024>.

Figure N°02: Algeria Economic Indicator Statistics



Source: <https://www.worldbank.org/en/country/algeria/publication/algeria-economic-update-spring-2024>.

3.5 Regional Disparities and the Need for Continental Platforms

While countries like Rwanda and South Africa have made progress in implementing innovative models, most African nations still lack access to scalable, long-term financing. There is an urgent need to:

- ☐ Create regional infrastructure funds backed by African development banks and sovereign wealth funds.
- ☐ Standardize regulations to facilitate regional project pipelines.
- ☐ Develop risk mitigation mechanisms (e.g., guarantees, first-loss instruments) to encourage private-sector participation.

Despite notable progress in countries like Rwanda and South Africa, where innovative infrastructure financing models and public-private partnerships (PPPs) have started to yield measurable results, most African nations still face significant barriers to accessing scalable, long-term infrastructure financing. These disparities stem from structural challenges, including fragmented regulatory frameworks, limited creditworthiness of national governments, and underdeveloped domestic capital markets, which together hinder the mobilization of sustainable investment flows.

Addressing these gaps involves creating regional infrastructure funds funded by African development banks, sovereign wealth funds, and multilateral partners. This would allow pooling resources to finance cross-border projects with high development impact. Equally important is harmonizing regulations across countries to establish standard procurement rules, transparent approval processes, and unified environmental and social safeguards. These measures would speed up the development of viable regional project pipelines.

Furthermore, expanding risk mitigation tools, such as partial credit guarantees, political risk insurance, and first-loss mechanisms, can significantly enhance the bankability of infrastructure projects, thereby attracting a broader range of private sector investors. These tools not only lower perceived risks for institutional investors but also support blended finance structures that mix concessional and commercial funding.

In this context, continental platforms like the Program for Infrastructure Development in Africa (PIDA) can act as catalysts, coordinating investment priorities, fostering knowledge exchange, and ensuring projects align with Africa's broader integration and industrialization goals. Without such coordinated, data-driven approaches, the continent risks widening its infrastructure gap, undermining regional competitiveness, and hindering the achievement of the African Union's Agenda 2063 objectives.

4. Global Leading Practices and Lessons Learned

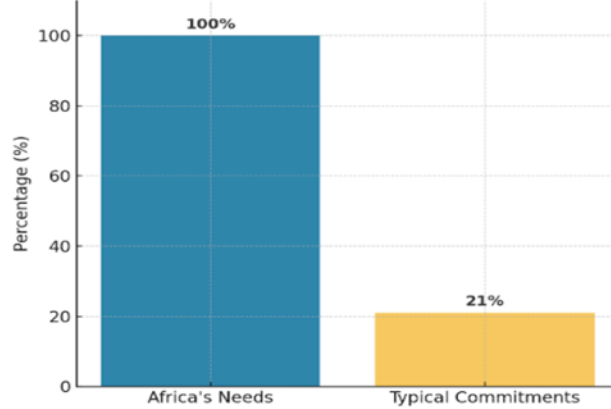
4.1. Global Evidence-Based Practices and Strategically Inferred Lessons

In recent decades, the world has witnessed the emergence of several pioneering experiences in the development and financing of sustainable infrastructure, which can serve as an important reference for African countries, including Algeria, given the growing need for innovative models that combine economic efficiency with environmental and social sustainability (UNCTAD, 2021; World Bank, 2020).

According to the latest estimates from the African Development Bank, Africa's annual infrastructure financing needs range between 130 and 170 billion USD, while actual funding commitments cover only 21% of these requirements. (African Development Bank, 2022) This substantial financing gap poses a strategic barrier to implementing critical

projects, including regional transport networks, energy, water, and telecommunications systems, thereby limiting the continent's ability to achieve productive transformation and the desired industrial growth. Given this context, there is an urgent need to adopt innovative financing mechanisms that enhance private sector participation, expand green financing, and establish regional infrastructure funds capable of attracting long-term capital. See figure N°03.

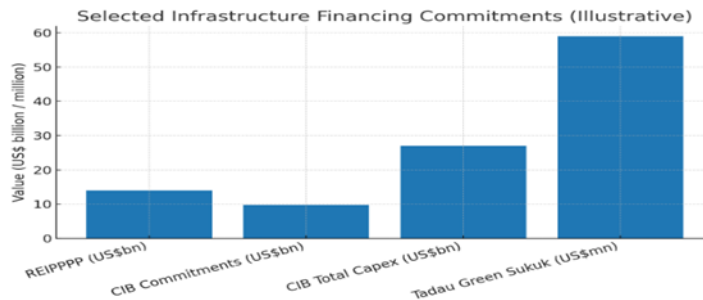
Coverage of Africa's Climate Investment Needs vs. Typical Commitments



Source: African Development Bank, 2022

Quantitative evidence reinforces the effectiveness of innovative financing models in mobilizing capital and enhancing project bankability. At the continental level, AfDB/NEPAD estimates indicate that Africa's annual infrastructure needs range between 130–170 billion USD; with a financing gap of approximately 68–108 billion USD per year (AfDB/NEPAD, 2023). In the energy sector, South Africa's REIPPPP has demonstrated the ability of competitive procurement and long-term contracts to attract private capital, mobilizing roughly 14 billion USD for about 6.4 GW of renewable capacity (REIPPPP, 2022).

Institutional instruments also demonstrate significant leverage effects. For example, the Canada Infrastructure Bank (CIB) reported investment commitments totaling 9.7 billion USD as of 31 March 2023. This helped to mobilize projects worth approximately 27 billion USD, demonstrating how development/infrastructure banks can leverage public capital through private participation (CIB, 2023). Moreover, innovative Islamic finance instruments have practical precedents: Malaysia's Tadau Energy Green Sukuk raised MYR 250000000 (~59 million USD) for a solar project, indicating the potential to attract Sharia-compliant and green investors (Tadau, 2017). Figure N°04: Comparative Infrastructure Financing Models (Key Statistics)



Source: AfDB/NEPAD (2023); REIPPPP (2022); Canada Infrastructure Bank (CIB) (2023); Tadau Energy (2017).

Together, these figures suggest that combining competitive procurement, infrastructure banks, and green/sukuk issuances, backed by sound governance and project preparation, can materially contribute to closing Africa's infrastructure financing gap

Table N°05: Gap between Africa's Infrastructure Needs and Typical Commitments (Billion USD)

Year	Africa's Needs (Billion USD)	Typical Commitments (Billion USD)	Financing Gap (Billion USD)
2015	60	20	40

2016	62	22	40
2017	65	23	42
2018	68	24	44
2019	72	25	47
2020	75	26	49
2021	78	28	50
2022	82	30	52
2023	85	32	53

Source: African Development Bank (2022) – African Infrastructure Report.

The data in Table N° 05 illustrates a persistent and widening financing gap between Africa's infrastructure needs and the typical commitments made by funding bodies between 2015 and 2023. While total infrastructure needs have grown steadily from 60 billion USD in 2015 to 85 billion USD in 2023, actual commitments have lagged significantly, rising only from 20 billion USD to 32 billion USD over the same period. This has resulted in a financing gap expanding from 40 billion USD in 2015 to 53 billion USD in 2023. Such trends underscore structural constraints in mobilizing sufficient capital, with implications for delayed project implementation, reduced regional integration, and slower progress toward industrial transformation. Bridging this gap will require innovative financing instruments, deeper private sector engagement, and enhanced regional cooperation to pool resources and share risks (African Development Bank, 2022).

4.2. Evidence-Based International Best Practices

In this research area, we review pioneering international experiences in infrastructure development and sustainability. Our aim is to apply these experiences to African countries to help them achieve sustainable development.

The comparative analysis of these three countries, Singapore, Canada, and China, reveals three critical lessons for Africa's infrastructure financing challenges:

a. The Singaporean experience

Has relied on an integrated Public-Private Partnership (PPP) model, supported by a strict system for assessing and distributing risks among stakeholders, which has contributed to accelerating project completion and reducing long-term operating costs (Asian Development Bank, 2019). It has also integrated urban planning with green economy strategies through large investments in public transportation and smart infrastructure (OECD, 2022). Singapore's success with PPPs highlights the importance of risk allocation frameworks and integrating urban planning. By incorporating green economy principles into infrastructure design, such as smart public transport systems, Singapore has achieved cost efficiency and sustainability. (OECD, 2022).

- ☐ For Africa, this highlights the need for:
- ☐ Strong regulatory institutions to assess and mitigate project risks (e.g., via AU-backed PPP guidelines).
- ☐ Cross-sectoral synergies, such as linking transport corridors with renewable energy grids to attract climate finance.

b. Blended Finance and Strategic Prioritization (Canada Model)

The establishment of the Canada Infrastructure Bank is emblematic of the Canadian experience. Funded partly by the government and partly by the private sector, the Bank provides long-term financing for strategic projects, particularly those relating to renewable energy and regional connectivity (Canada Infrastructure Bank, 2023).

This mechanism has helped to reduce financial risks and attract foreign direct investment (Government of Canada, 2022). The Canada Infrastructure Bank demonstrates how blended capital (public/private) can reduce project risk and encourage foreign direct investment, particularly in renewable energy (Government of Canada, 2022). Africa can adapt this model by:

- ☐ This could involve establishing national infrastructure banks or expanding the role of the African Development Bank (AfDB) to provide long-term, low-interest loans for priority projects.
- ☐ Creating special economic zones (SEZs) with tax incentives to attract private investment to industrial clusters (e.g., Rwanda's Kigali Innovation City).

c. Scalable Multilateral Financing (China's Belt and Road Initiative - BRI)

The Chinese experience has adopted a proactive approach to infrastructure through the Belt and Road Initiative, which combines government financing with international financial institutions, enabling the implementation of major projects in transport, energy, and ports (World Bank, 2019; OECD, 2021). The main lesson from this experience is the ability to align local and foreign financing to achieve a broad economic impact. While BRI's debt sustainability concerns warrant caution (World Bank, 2019), its -multi-stakeholder financing- approach offers insights:

- Leveraging continental platforms like the African Continental Free Trade Area (AfCFTA) to pool resources for Tran's boundary projects (e.g., Lagos-Abidjan highway).

- Localizing green finance instruments, such as issuing developmental Sukuk for solar energy projects, as seen in Algeria and Nigeria.

- Algeria's developmental state financing model for infrastructure

Primarily a rentier-state financing model transitioning towards a developmental state framework.

- Key Mechanisms

The country relies heavily on hydrocarbon revenues to finance infrastructure development through centralized public treasury allocations. Recently, there has been increasing exploration of Public-Private Partnerships (PPPs), Build-Operate-Transfer (BOT)/Build-Own-Operate-Transfer (BOOT) contracts, and multilateral development bank financing to supplement shrinking oil revenues. Large-scale investments focus on transport infrastructure (roads, ports, and railways), water resource management (dams, desalination), housing, and urban development. However, declining hydrocarbon income has led to reduced state transfers to local municipalities, constraining decentralized development initiatives (Chikh-Amnache & Mekhzoumi, 2023; Bennamane, 2021).

- State role

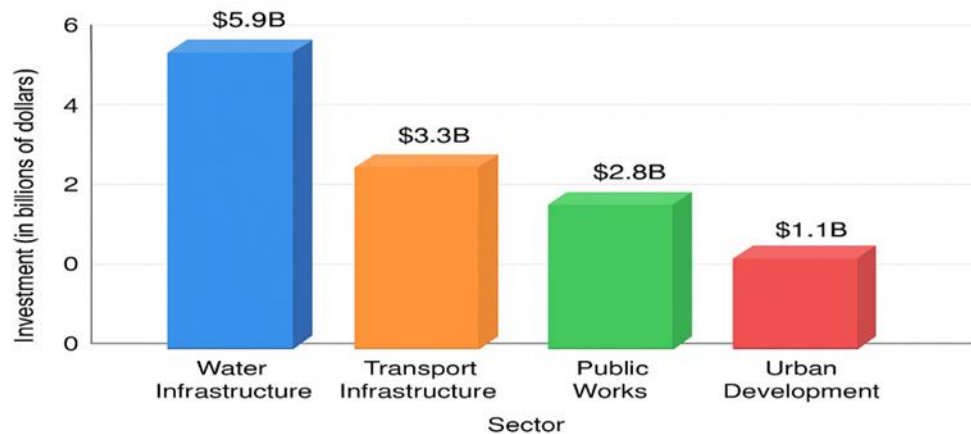
The Algerian state plays a dominant role as financier, planner, and regulator of infrastructure projects, steering strategic investments via ministries and national agencies. It works towards transitioning from a rentier model reliant on oil rents to a more diversified, development-oriented state. However, the state's role remains strongly interventionist with limited market participation, though efforts to introduce PPPs and attract foreign direct investment are emerging (Asjp, 2021; World Bank, 2025).

- Outcomes

Algeria has achieved substantial public infrastructure expansion, including major highway projects, modernization of ports (e.g., El Hamdania port), and large water storage capacity development. Yet sustainability challenges persist due to the heavy reliance on volatile oil revenues and limited private sector involvement. Infrastructure growth has been uneven, with urban areas benefiting more and rural/remote regions lagging, partially driven by declining municipal funding levels (Oxford Business Group, 2018; Bennamane, 2021).

We summarize that this overview aligns Algeria with a rentier state gradually evolving toward a developmental state financing, with a strong centralized public role, emerging PPP mechanisms, and mixed outcomes related to fiscal constraints and diversification challenges. See Figure N°07 Algeria infrastructure investment by sector 2025.

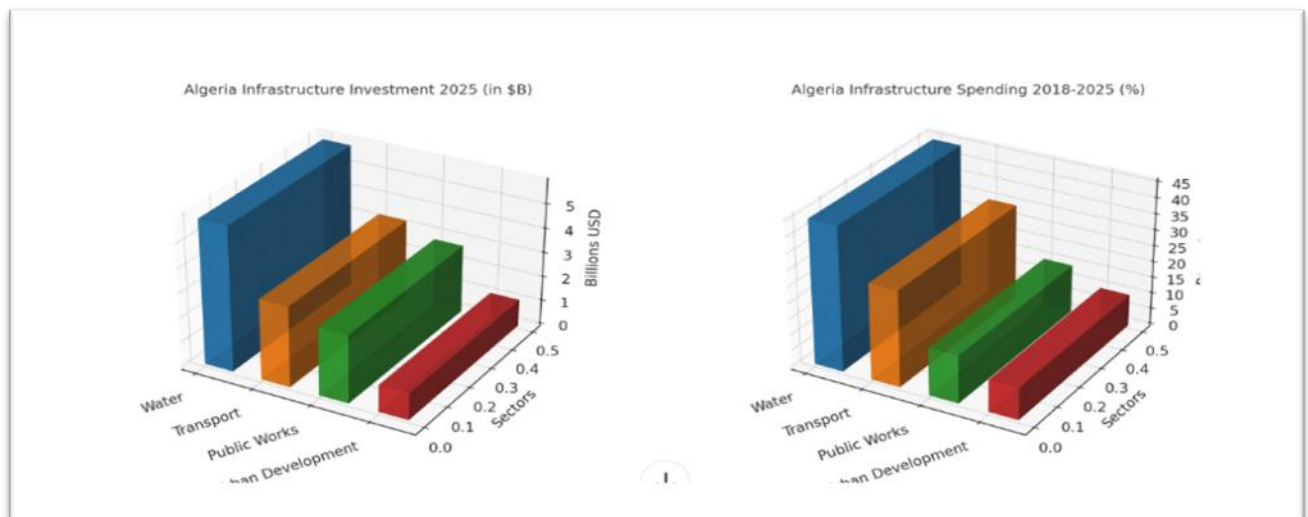
Algeria's Infrastructure Investment by Sector in 2025



Source: African Development Bank (2022) African Infrastructure Report: Challenges and Opportunities. Abidjan: AfDB.

The chart illustrates the development trends of Algeria's infrastructure by 2025, highlighting increased investments in transportation, energy, and telecommunications. It shows the expansion of road and railway networks, as well as renewable energy projects aimed at supporting economic growth and reducing dependence on fossil fuels. The graph also emphasizes the advancement of digital infrastructure, particularly in telecommunications and information technology, reflecting Algeria's commitment to digital transformation and sustainable development.

Figure N°08: Distribution of public spending on infrastructure between 2018 and 2025 (in percentages).



Source: Algerian Renewable Energy and Energy Efficiency Program: 2011–2030 Outlook. Algiers: National Electricity and Gas Company (Sonelgaz). Available at: www.sonalgaz.dz

The distribution shows a water-sector emphasis (45%), indicating that public investment priorities have focused on water security—e.g., dams, desalination, network rehabilitation, and drought-resilience. Transport (30%) is the second pillar, consistent with goals to improve connectivity and logistics (roads, rail, ports, airports) that underpin industrial growth and regional integration. Public works (15%) likely reflects maintenance and basic services (drainage, public facilities), while urban development (10%) suggests a comparatively smaller allocation to city upgrading, housing, and smart-city infrastructure over this period.

Implications:

The concentration of investment in water and transport infrastructure (75% combined) suggests a strategy to reduce climate and logistics bottlenecks, which is reasonable given Algeria's geography and growth objectives.

□ The lower urban share (10%) may imply a reliance on local budgets/PPP for city projects, or a deliberate sequencing of projects (core networks first, urban densification later).

□ To support industrial diversification and productivity, it is key to maintain high transport investment, but gradually raising urban development (last-mile services, transit-oriented development and digital infrastructure) can amplify returns.

□ Since these are shares, they reflect allocation priorities rather than absolute spending levels. Efficiency will depend on project selection, delivery and O&M quality.

In summary: The pattern prioritises climate-resilient water systems and transport that enables trade, with room to rebalance towards urban systems that convert network access into firm productivity, jobs, and inclusive growth.

5. Theoretical Framework of State-Led Development Financing

The analysis of African experiences in mobilizing development finance draws on Developmental State Theory (Evans, 1995), which emphasizes the “embedded autonomy” model whereby state institutions, such as the Rwanda Development Board (RDB), establish strategic partnerships with private sector actors to channel capital towards high-impact sectors. The Kigali International Financial Centre (KIFC) exemplifies this, where 78% of green bond proceeds were allocated to nationally prioritized projects (MINECOFIN, 2023). Similarly, New Structural Economics (Lin, 2012) illustrates how South Africa's Renewable Energy Independent Power Producer Procurement Program (REIPPP) leverages the country's comparative advantages, namely, its abundant solar and wind resources, to attract foreign direct investment (FDI) into the renewable energy sector. This policy approach increased the share of renewable energy in the national energy mix from 2% in 2011 to 11% in 2023 (Eskom, 2023).

Table N°06: Comparative Framework of Developmental State Financing Models in Africa

Country	Model of Financing	Key Mechanisms	State Role	Outcomes
Rwanda	state-led financing inspired by Developmental State Theory	Centralized investment planning; coordination with donors	Strong regulatory role; active investment in infrastructure	Rapid growth in ICT, energy, and infrastructure
South Africa	Mixed financing (state + market mechanisms)	Public-Private Partnerships (PPP); capital markets development	Enabler and regulator of financial markets	Moderate growth; stronger private sector role
Ethiopia	State-driven financing with emphasis on industrial policy	Large-scale public investments; dominance of state-owned enterprises	Control of key sectors (energy, telecom, banking)	Fast industrialization; infrastructure-led growth
Algeria	The transition from rentier-state financing to developmental state financing.	Reliance on hydrocarbon revenues; centralized public treasury funding; emerging Public-Private Partnerships (PPP) and Build-Operate-Transfer (BOT/BOOT) contracts; multilateral bank financing	Dominant financier, planner, and regulator; strong interventionism with nascent private sector role	Substantial public infrastructure expansion (transport, water, urban); uneven regional development; fiscal constraints due to oil dependency

Source: Compiled by the author based on Evans (1995); Mkandawire (2001); UNECA (2016); World Bank (2020).

Africa's infrastructure financing should be viewed not merely as an economic necessity, but as a strategic lever for achieving resilience, solidarity, and prosperity across the continent. Building on shared experiences and collective action, the continent can transform its financing challenges into opportunities for industrial growth, sustainable development, and strengthened regional integration.

6. Conclusion

This study provides a comprehensive and critical analysis of one of the most pivotal challenges hindering Africa's development: the significant infrastructure-financing gap. Moving beyond a mere diagnosis of this fiscal shortfall, it examines its intrinsic link to two foundational yet interdependent strategic imperatives: industrial productive transformation and meaningful continental integration. The evidence-based analysis in this paper definitively confirms that the traditional financing paradigm, which relies heavily on constrained public budgets and the accumulation of external debt, is insufficient to bridge the estimated annual deficit of \$68–\$108 billion. This paradigm also constitutes an increasingly significant burden on national fiscal stability, thereby exacerbating macroeconomic vulnerabilities across the continent. This untenable situation necessitates an urgent paradigm shift towards innovative, sustainable, and diversified financing mechanisms capable of mobilizing capital on the scale and at the pace required for Africa's transformative growth.

a. General Summary and Key Findings

This research paper has reached several key findings, which can be summarized as follows:

- **The Need for an Integrated Model:** The study demonstrated that addressing the financing gap requires adopting an integrated model that combines mobilizing domestic resources, attracting domestic and foreign private investment, and leveraging innovative financial mechanisms, all within a unified regional vision.
- **Success of Comparative Models:** International (e.g., Singapore, Canada, China) and regional case studies (e.g., Rwanda, Ethiopia, Algeria, South Africa) showed that the success of any financing mechanism is contingent upon a clear and stable legislative and regulatory framework, sound governance, and transparency, which build investor confidence and mitigate risks associated with long-term projects.
- **The Vital Link between Financing and the Continental Agenda:** Infrastructure investments cannot be separated from the goals of the African Union's Agenda 2063. Cross-border projects (in transport, energy, and digital connectivity) are the arteries for economic and trade integration and are a prerequisite for creating regional value chains and boosting local industrialization.

b. Strategic Recommendations

Based on these findings, this paper offers a set of recommendations for policymakers at the national and continental levels:

- **Enhancing Public-Private Partnerships (PPPs):** We recommend establishing specialized PPP units in each country to facilitate project preparation and implementation, and developing standard contract models that fairly allocate risks between parties.
- **Leveraging Sovereign Wealth Funds and Islamic Finance:** Resource-rich African countries should be encouraged to use their revenues to establish or strengthen sovereign wealth funds that invest a portion of their assets in long-term developmental local and regional infrastructure projects. Developmental Sukuk can also be an effective tool for attracting Islamic capital.
- **Green Finance as a Strategic Opportunity:**** The continent should embrace green finance (e.g., issuing "green bonds") to fund climate-resilient and low-carbon infrastructure projects, particularly in renewable energy and sustainable transport, thereby attracting investments with a positive impact.
- **Establishing Joint Continental Financing Platforms:**** We urge the strengthening of continental financial institutions like the African Development Bank (AfDB) and the African Monetary Agency (AMA) to create joint financing platforms dedicated to pooling resources and providing guarantees for cross-border projects, thereby lowering borrowing costs and attracting international investors.

c. Future Prospects

This study opens the door for several future research and action pathways:

- Deepening Risk Management Mechanisms:** There is a critical need to develop innovative tools for insuring and guaranteeing political and operational risks specific to major projects in Africa.
- Digital Transformation of Finance:** Exploring the potential of Financial Technology (FinTech) and blockchain to enhance transparency, reduce transaction costs, and finance small and medium-sized projects through crowdfunding platforms.
- Measuring Developmental Impact:** Developing new indicators and analytical frameworks to measure the comprehensive developmental return (economic, social, environmental) of infrastructure investments, moving beyond mere financial return metrics.

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