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Role of Cross-Border Energy, Transport, and ICT Infrastructure on Economic Integration among West African States

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Abstract

Background: Cross-border infrastructure is one of the major constraints on regional economic integration in West Africa. This study focuses on energy, transport, and Information and Communication Technology (ICT) infrastructure in the 15 member countries of the ECOWAS region and assesses their potential to promote regional economic integration.
Methods: Data on the physical development of various types of infrastructure were derived from the African Infrastructure Development Index (AIDI) for the 2020–2025 period. The secondary data used in the study were largely drawn from the African Development Bank and other relevant studies. The methodology used in the study is descriptive and comparative.
Results: The study established that there are significant disparities in the levels of development of various types of infrastructure across the ECOWAS region. While ICT infrastructure is growing rapidly, the development of energy infrastructure, particularly electricity infrastructure, remains slow in most countries. There is a positive correlation between infrastructure quality and integration outcomes; however, institutional factors are preventing goods and services from moving smoothly across borders, thereby limiting the ability of physical connectivity to translate into trade benefits.
Conclusion: Thus, there is a need for focused investment and coherent policies in energy, transport, and ICT infrastructure to achieve significant progress in regional integration within ECOWAS.

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INTRODUCTION

In this study, economic integration is operationalized descriptively through observable regional connectivity outcomes, particularly intra-regional trade facilitation, cross-border movement of goods and services, and infrastructure conditions that lower transaction and coordination costs. Because the study does not estimate causal or correlational models, the analysis is limited to comparative patterns and plausible linkages supported by the AIDI indicators and relevant regional evidence.

For decades, integration into the regional market of West Africa has been one of the priorities of ECOWAS policies since the establishment of the community in 1975. However, although the community has existed for more than forty years, intra-regional trade within ECOWAS remains very low. Intra-regional trade in ECOWAS as a percentage of the total trade of member countries is estimated at about 10%–12%, whereas it is greater than 20%–25% in Southeast Asia and the European Union (Andoh et al., 2024; Kostyunina, 2025). This is mainly due

to weak institutions, policy fragmentation at the national level, and, above all, the lack of cross-border infrastructure (Chuku et al., 2022; Dike et al., 2026).

Energy, transport, and ICT infrastructure are interrelated and perform different functions in supporting trade and business across borders. The first function is that of transport networks, which determine the effective cost of moving goods across borders. The second function is that of energy infrastructure, which provides a stable and affordable supply of electricity to industrial and commercial sectors. Electricity is essential for industrial development and for conducting business in many parts of West Africa. The third function is that of ICT, which supports trade-related functions such as documentation, financial transactions, and customs clearance. These three sectors have interdependent and potentially simultaneous effects on ECOWAS integration (Usman et al., 2024).

There are very few studies that analyze all three infrastructure sectors (energy/electricity, transport, and ICT) within the ECOWAS framework. This study utilizes country-level data that have been systematically collected and published over time. The African Infrastructure Development Index (AIDI) measures infrastructure development across all 54 African countries on an annual basis (Ajagun et al., 2024). The AIDI 2025 dataset for all 15 ECOWAS countries contains five sub-indices (transport, electricity, information and communication technology, water, and sanitation) covering 2003 to 2025. The AIDI 2025 dataset was published by the African Development Bank and is the main data source for this study.

The study has two main objectives. The first objective is to analyze the cross-border development of energy, transport, and ICT infrastructure in ECOWAS member countries over time using the AIDI 2025 data. The second objective is to determine the extent to which the indicators analyzed in the study contribute to the economic integration of the subregion. The analysis covers the latest available data from 2020 to 2025. The paper is organized into six sections. Section 2 reviews the latest studies on the subject published between 2020 and 2026. Section 3 presents the theoretical background. Section 4 explains the methodology used in the study. Section 5 analyzes and discusses the results of the study. Finally, Section 6 presents the conclusions and recommendations.

Regional economic integration is not linear in developing regions. In West Africa, member countries of economic integration schemes have not engaged in significant trade deepening despite their formal commitment to integration. This is largely the result of a substantial disconnect between physical connectivity and treaty obligations (Bassey et al., 2024; Gammadigbe, 2021). Trade creation occurs with tariff reductions, while trade costs can also decline substantially as a result of improvements in hard and soft infrastructure, including roads, electricity, and the digital environment. Earlier work by Tandrayen-Ragoobur et al. (2022) utilized an augmented gravity model to analyze trade flows among 51 countries in Africa. The results of the study reveal that hard and soft infrastructure indicators have significant effects on trade between two countries. The marginal effect of the electricity composite index was the largest among all variables used in the study.

Distinguishing between hard and soft infrastructure elements in trade and development is well established in the literature (Kuteyi & Winkler, 2022). While both types of infrastructure are underperforming in West Africa, notable progress in one form of infrastructure is unlikely to yield optimal results if corresponding progress in the other form is not achieved (Fisher & Oludemi, 2022).

In West Africa, electricity access and power generation remain below global averages. Moreover, electricity generation is not yet sufficient to meet demand and sustain economic activities. The ECOWAS vision for the interconnection of power systems across the region through cross-border electricity transmission, as embodied in the West African Power Pool (WAPP), has yet to be fully implemented, as the level of implementation remains limited. Moreover, losses in the interconnected network are high (Ojomo, 2023). Energy trade contributes to long-run economic growth in West African countries, whereas inefficient energy consumption does not support growth. It has been noted that introducing regionally integrated energy systems can enhance economic development in Sub-Saharan Africa, but this requires the commitment of governments, development finance institutions, and the private sector (Ajagun et al., 2024).

Owolabi et al. (2021) examined the impact of energy and ICT access on trade and financial

development for a sample of West African countries. Their findings reveal that electricity access and ICT access have positive and significant effects on financial development and trade, respectively. The study further underscored the importance of the interdependence of energy and ICT systems for integration policy.

Transport infrastructure, measured through road density, rail connectivity, port efficiency, and logistics performance, is a major determinant of trade costs in both landlocked and coastal ECOWAS states. The inclusion of rail connections between trading country pairs can increase trade, while improvements in road density can also contribute significantly to trade performance in the ECOWAS subregion. This result is consistent with Chuku et al. (2022), who found that the transport sector is the second-strongest infrastructure multiplier for economic activity across Africa after ICT.

Dike et al. (2026) analyzed AfCFTA cross-border logistics in West Africa using data from UNCTAD, the African Development Bank, UNECA, and the World Bank covering 2018 to 2024. Intra-African trade grew from 15% to 22.3% over that period, but road and rail deficiencies, port congestion, and institutional inefficiencies continued to limit further gains. They specifically identified the Abidjan–Lagos Corridor and the Northern Corridor as areas where targeted investment has measurable potential. Shi et al. (2022) applied an intermodal hub-location model to ECOWAS and found that optimizing transport hub placement could materially reduce intra-regional freight costs. Port efficiency across major ECOWAS ports also varies considerably, with Ghana and Senegal outperforming Nigeria and Côte d'Ivoire on several operational metrics (Diaby et al., 2025).

Political instability compounds transport infrastructure deficiencies in several ECOWAS states. Charles et al. (2025) noted that while Chinese Belt and Road transport projects enhanced physical connectivity in parts of the subregion, their contribution to deeper regional integration was uneven, partly because ECOWAS oversight of these projects has been limited and implementation has been fragmented.

Among all forms of infrastructure in ECOWAS, information and communication technology (ICT) is currently the fastest-growing infrastructure category, with the largest multiplier effects across a broader range of outcomes than the other infrastructure categories combined. Yao (2025) pointed out that ICT infrastructure in ECOWAS has not only direct effects but also indirect effects on outcomes through several channels, including trade and financial inclusion. For instance, Abendin and Duan (2021) argued and showed empirically how the digital economy can have positive effects on trade and, thereby, on economic growth across 53 African countries. In West Africa, Koroma et al. (2025) assessed digital trade barriers and found that three main constraints to digital economic integration are (1) infrastructural deficiencies, (2) security risks, and (3) regulatory fragmentation. Kalinichenko (2023) analyzed ECOWAS Vision 2050 and found that the ECOWAS strategy for creating a unified digital market is to be realized through significant regulatory changes in the region. According to the ECOWAS plan, Cabo Verde is to be designated as a regional technology hub, with its market interconnected with Guinea-Bissau, Sierra Leone, Liberia, and Guinea through an undersea fiber-optic cable network. Yet, to translate the ECOWAS plan into measurable integration benefits, significant changes in the regulatory environment across ECOWAS are required.

Koroma et al. (2025) examined digital trade barriers in West Africa and identified three key critical factors: infrastructure, security, and regulation. Kalinichenko (2023) analyzed the ECOWAS Vision 2050 goals concerning a single digital market, with Cabo Verde serving as a regional technology hub. The market would be interconnected by undersea cables with Guinea-Bissau, Sierra Leone, Liberia, and Guinea, among others. Kalinichenko (2023) maintained that achieving such gains would require a significant degree of regulatory harmonization. The scores of the ICT indicator for the 15 ECOWAS member countries covered in the AIDI report African Development Bank (2025) increased between 2020 and 2025. However, the scores for most of the Sahelian countries, including Niger and Mali, were very low and even declined in some cases.

It is also important to highlight the link between ICT development and trade facilitation, specifically with respect to customs digitalization. While Soro (2025) examines the experience of Côte d'Ivoire in computerizing its customs clearance processes, the study notes that this experience not only enables the country to control fraudulent practices in customs valuation but

also improves the administrative performance of the sector. The lessons from such an experience could be very useful for ECOWAS in its efforts to digitize trade.

Most studies that assess individual infrastructure sectors or the African continent as a whole are reviewed in this literature study. However, studies that specifically assess ECOWAS member countries are lacking. None of the studies reviewed assesses all 15 ECOWAS countries, and most do not make use of the latest available data. The use of the African Infrastructure Development Index (AIDI) 2025 for all 15 ECOWAS countries over time, using the same set of indicators and a composite score for the three transport, energy/electricity, and ICT sectors, provides a unique opportunity for a comprehensive assessment of the infrastructure of individual countries, as well as its interlinkages and relationships with other indicators of integration.

New regionalism theory, or the new regionalism approach, has been conceptualized by several authors, including Hettne and Söderbaum. New regional integration is driven by market forces, various actors, and the interdependence of structures within a region (Rasheed, 2023). In ECOWAS integration, for instance, more than a mere agreement between member states is required. ECOWAS integration requires economic actors (i.e., firms, households, and governments) to be physically connected to one another and to conduct transactions among themselves within the region at minimal cost. The physical connectivity required for regional integration forms part of regionalism. This physical connectivity, therefore, needs to be accompanied by institutional harmonization within the region for effective integration to take place (Fisher & Oludemi, 2022).

Gravity-model scholarship is used here only as a conceptual reference for understanding the relationship between two countries' trade and the economic "mass" (GDP) and "friction" (distance, trade barriers between countries, etc.) between them. The augmented gravity model includes additional indicators of countries' infrastructure, such as road density, the reliability of electricity supply in a country, and internet use among the population. Various studies apply the gravity model to the analysis of trade in West Africa. These studies reveal that the quality of transport infrastructure in a country plays a crucial role in its trade with other countries. The lack of a railway and poor road connections between two countries constitute major obstacles to trade, which can even be quantified. These findings provide conceptual context for Objective 2, *i.e.*, an analysis of the relationships between the sub-indices used to measure infrastructure development in a country and other indicators of integration.

This work is anchored in the infrastructure-led growth framework, which is based on endogenous growth theory. In this paradigm, public infrastructure functions as a productive input that generates positive externalities and other effects beyond production. Of particular importance are energy, transport, and information and communication technology (ICT) productive assets. They enhance total factor productivity in the economy (Ekeocha et al., 2021). To examine the relationship between infrastructure and growth within the context of the ECOWAS region, Usman et al. (2024) developed a framework for infrastructure-led growth within the region. The results revealed that an increase in infrastructure investment led to an increase of 0.01% in GDP per capita for each ECOWAS member country. In the long run, a 1% increase in the AIDI composite index resulted in a 0.292% increase in GDP. A similar result was obtained for a 1% increase in the electricity composite index, which led to a 0.987% increase in GDP in the long run. This represents a strong relationship and, as evident from the results, energy is very important for fostering economic activity.

Three frameworks are used in the analysis. New regionalism theory is primarily applied to ECOWAS as a regionalism initiative. Here, more than the mere implementation of the obligations stemming from a regional agreement is relevant. Rather, the creation of physical and virtual connections is examined. The gravity model then forms the basis for an analysis of the relationship between infrastructure quality and trade (*cf.* Objective 2). The infrastructure-led growth theory is used to analyze the three infrastructure sectors—energy, transport, and ICT—from a productivity/GDP-growth perspective, *i.e.*, from the perspective of economic integration. Thus, the three infrastructure sectors are analyzed as interdependent factors of growth rather than as mere sectors of development.

METHOD

The study was descriptive and comparative. AIDI values were interpreted as standardized indicators of infrastructure development and were compared across the historical 15-country ECOWAS sample for 2020–2025. No regression, gravity model, or correlation coefficient was estimated. Consequently, all statements concerning integration were framed as descriptive associations rather than statistically tested causal effects. AIDI sub-indices were interpreted according to their official sectoral construction for transport, electricity, and ICT, and source values were cross-checked against the African Development Bank dataset before comparison.

The study adopted a secondary quantitative approach to data collection, with descriptive and comparative analyses of the findings. The data for the study were derived from the African Infrastructure Development Index (AIDI). The AIDI systematically and annually tracks and reports infrastructure development performance across all 15 member states of the Economic Community of West African States (ECOWAS). The dataset was too extensive to be replicated through primary data collection. The analysis was cross-sectional but conducted within a longitudinal framework. Hence, trends from 2020 to 2025 were tracked and analyzed, and countries were compared on the basis of data for 2025.

The primary dataset for this study consisted of information provided by the African Development Bank for the African Infrastructure Development Index (AIDI) 2025 for all 15 ECOWAS countries. The AIDI comprised four sub-indices covering four different types of infrastructure: Transport, Electricity, Information and Communications Technology (ICT), and Water Supply and Sanitation. For the purpose of this study, the three sub-indices corresponding to the infrastructure dimensions identified in the title of the study—transport, electricity, and ICT—were analyzed for the years 2020–2025. AIDI scores were normalized to values between 0 and 100 for all years. In addition to the primary dataset of AIDI scores for the 15 ECOWAS countries, this study also referred to a secondary literature dataset comprising 168 peer-reviewed publications on African infrastructure development published between 2020 and 2025. These secondary literature publications were used to support the analysis of the primary data and to contextualize trends in AIDI scores for the ECOWAS countries.

Economic integration among ECOWAS countries was analyzed and represented here using the AIDI composite scores and the scores of the individual infrastructure components for each ECOWAS country. In the discussion section, intra-ECOWAS trade intensities previously estimated by other authors in the literature were also presented. The three independent variables in this analysis were the three infrastructure components: the Transport Composite Index (TCI), the Electricity Composite Index (ECI), and the Information and Communication Technologies Composite Index (ICI), all taken from the AIDI 2025 dataset. The analysis was purely descriptive and did not include any form of regression analysis.

The analysis was carried out in two steps. First, a trend analysis of the three individual indicators was conducted for the 15 ECOWAS countries between 2020 and 2025. This allowed development over time to be monitored and individual cases to be identified. Subsequently, a cross-country comparison was conducted on the basis of data from 2025. For this purpose, a summary table was created presenting the three individual indicators alongside the AIDI composite score for all countries. All values in the tables and figures were based on data from the AIDI 2025 dataset (African Development Bank, 2025).

This study used publicly available secondary data and published academic literature. No primary human subjects were involved. All data sources were fully attributed in the reference section.

RESULTS AND DISCUSSION

Results

The theoretical interpretation combines new regionalism and infrastructure-led growth without treating either framework as an estimated model. New regionalism explains why physical connectivity must operate together with institutional coordination, while infrastructure-led growth explains how energy, transport, and ICT can reduce production and transaction constraints. The comparative evidence therefore supports a conditional proposition: infrastructure is an enabling component of integration, but its regional effects depend on

harmonized rules, border institutions, and interoperable networks.

Status of Infrastructure Development Across ECOWAS Member States (Objective 1)

Overall AIDI composite scores for all 15 ECOWAS member states from 2020 to 2025 are presented in Table 1. The figures are sourced from the AIDI 2025 dataset (African Development Bank, 2025).

Table 1

AIDI Composite Scores for ECOWAS Member States, 2020–2025

Country	2020	2021	2022	2023	2024	2025
Benin	56.0	52.6	53.1	53.6	55.1	55.1
Burkina Faso	64.9	61.4	62.6	63.8	64.9	66.0
Cabo Verde	88.9	89.7	90.6	91.4	93.6	93.7
Côte d'Ivoire	63.9	64.9	65.7	66.1	69.6	70.2
Gambia	76.5	76.1	75.9	75.7	76.8	76.8
Ghana	79.1	80.0	81.0	82.0	83.6	84.5
Guinea	63.7	65.0	66.6	68.2	69.2	70.8
Guinea-Bissau	50.5	52.1	53.6	55.1	58.8	59.0
Liberia	61.4	64.0	65.2	65.5	66.5	67.7
Mali	68.8	69.8	71.8	73.7	75.4	77.2
Niger	37.6	39.0	40.4	41.8	43.3	44.7
Nigeria	65.5	66.9	68.2	69.5	70.7	71.9
Senegal	74.9	76.3	77.8	79.1	80.6	81.9
Sierra Leone	53.3	54.7	56.1	57.5	59.1	60.6
Togo	53.8	55.3	56.8	57.1	58.8	59.9

Note. Source: African Development Bank, AIDI 2025 dataset.
All scores are on a 0–100 normalized scale.

Cabo Verde consistently records the highest AIDI composite score in the subregion, reaching 93.7 in 2025, followed by Ghana (84.5), Senegal (81.9), Mali (77.2), and The Gambia (76.8). Niger records the lowest score at 44.7, followed by Benin (55.1) and Guinea-Bissau (59.0). The 49-point gap between the highest- and lowest-scoring ECOWAS states illustrates the scale of within-bloc infrastructure disparities. Most member states recorded improvements between 2020 and 2025, although the pace varied considerably, and Benin and The Gambia recorded lower scores in 2025 than in 2020.

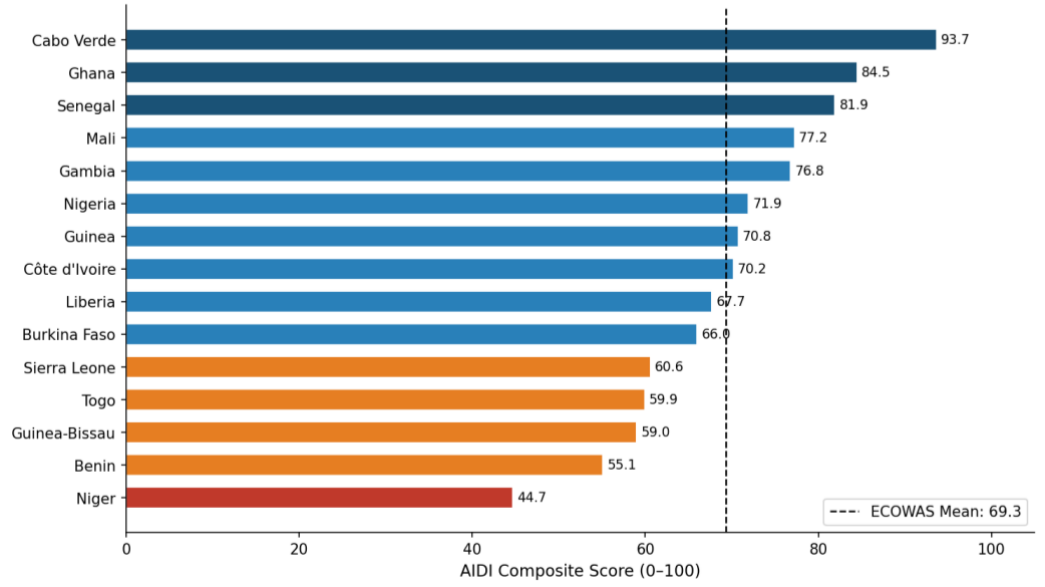

Figure 1. AIDI Composite Scores for ECOWAS Member States, 2025.
Source: Research Survey, 2026. Data: African Development Bank, AIDI 2025.

Table 2

Transport Composite Index, Selected ECOWAS Member States, 2020–2025

Country	2020	2021	2022	2023	2024	2025
Cabo Verde	25.66	25.53	25.44	25.41	26.09	26.01
Ghana	11.52	11.44	11.35	11.33	11.34	11.31
Burkina Faso	11.02	10.97	10.84	10.80	10.77	10.89
Nigeria	5.66	5.61	5.57	5.56	5.43	5.40
Togo	5.89	6.50	6.44	6.42	6.34	6.33
Gambia	7.93	7.92	8.02	8.61	8.42	8.36
Senegal	3.65	3.59	3.60	3.60	3.52	3.94
Niger	1.83	1.79	1.79	1.79	1.68	1.89
Mali	2.40	2.35	2.36	2.36	2.13	2.42
Liberia	2.92	2.90	2.88	2.87	2.82	2.81

Note. Source: African Development Bank, AIDI 2025 dataset.

Transport index values reflect persistent stagnation across most ECOWAS states. Cabo Verde leads with a score of 26.0 in 2025, but its geography as an island nation limits its relevance as a cross-border land transport benchmark. On the mainland, Ghana (11.3) and Burkina Faso (10.9) lead, while Niger (1.9), Mali (2.4), and Liberia (2.8) remain near the bottom of the distribution. Several states show slight declines between 2020 and 2025, including Nigeria (5.66 to 5.40) and Ghana (11.52 to 11.31), suggesting that maintenance deficits may be offsetting the effects of new investment.

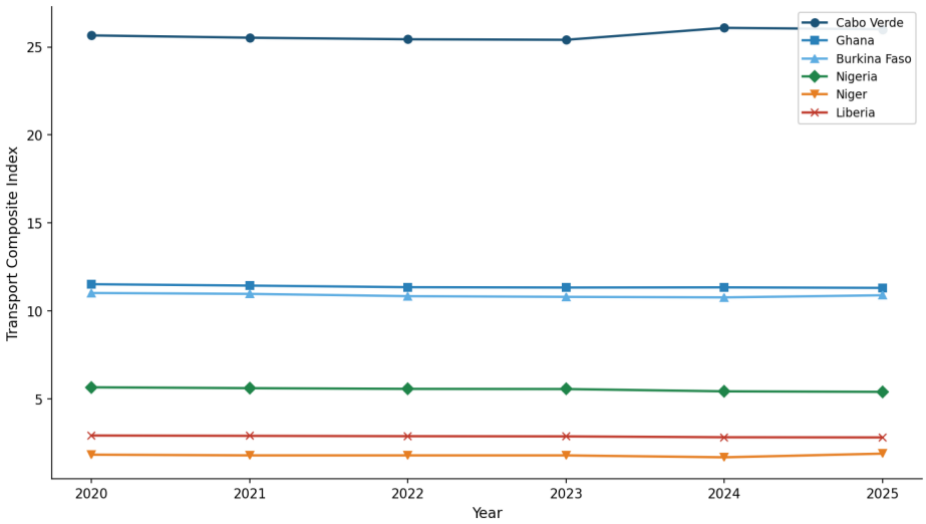

Figure 2. Transport Composite Index Trends, Selected ECOWAS States, 2020–2025. Source: *Research Survey,* 2026. Data: African Development Bank, AIDI 2025.

Table 3

Electricity Composite Index, All ECOWAS Member States, 2020–2025

Country	2020	2021	2022	2023	2024	2025
Benin	0.46	0.44	0.55	1.11	1.36	1.36
Burkina Faso	0.87	0.78	0.66	0.49	0.71	0.52
Cabo Verde	15.18	15.36	12.75	11.94	12.46	13.13
Côte d'Ivoire	6.52	6.38	6.60	6.80	6.77	7.03
Gambia	2.42	2.40	2.47	2.22	2.43	3.09
Ghana	7.74	8.18	9.57	10.40	11.15	11.16
Guinea	1.83	2.51	2.40	2.95	4.16	3.60
Guinea-Bissau	1.47	1.54	0.64	0.62	0.61	0.62
Liberia	0.89	0.87	0.85	0.83	0.81	1.15
Mali	2.27	2.28	1.74	1.83	1.70	2.23
Niger	0.29	0.23	0.27	0.28	0.27	0.35

Nigeria	2.72	2.72	2.60	2.58	2.52	2.77
Senegal	4.82	4.80	4.68	4.96	4.83	5.13
Sierra Leone	0.85	0.89	0.88	0.91	0.89	0.47
Togo	0.57	0.71	0.88	0.99	1.33	1.62

Note. Source: African Development Bank, AIDI 2025 dataset.

Electricity sub-index values are low across much of the region, and several countries experienced declines over the period. Ghana improved from 7.74 in 2020 to 11.16 in 2025, representing the largest absolute gain in the subregion. Côte d'Ivoire increased from 6.52 to 7.03. By contrast, Burkina Faso declined from 0.87 to 0.52, Sierra Leone from 0.85 to 0.47, and Cabo Verde from 15.18 to 13.13. The decline in Cabo Verde was reportedly driven largely by an adjustment in the renewable-energy component. Nine of the 15 ECOWAS member states recorded electricity composite scores below 2.0 in 2025, reflecting generation and distribution deficits that are well documented in the energy literature (Atiku et al., 2021).

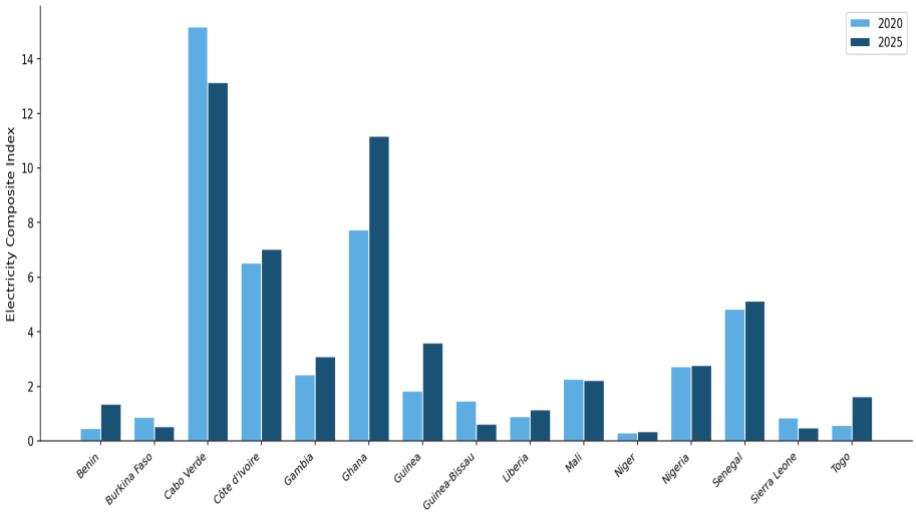

Figure 3. Electricity Composite Index by ECOWAS Member State, 2020 and 2025. Source: Research Survey, 2026. Data: African Development Bank, AIDI 2025.

Table 4

ICT Composite Index, All ECOWAS Member States, 2020–2025

Country	2020	2021	2022	2023	2024	2025
Cabo Verde	21.91	22.48	23.63	23.19	24.97	26.16
Ghana	17.73	20.03	20.78	21.05	24.59	24.24
Côte d'Ivoire	18.52	18.38	20.07	21.26	22.50	23.00
Senegal	13.93	15.51	16.83	19.81	21.61	21.92
Nigeria	11.47	14.03	15.45	16.95	16.28	17.32
Mali	12.03	13.88	15.35	16.76	15.81	16.27
Guinea-Bissau	8.61	9.11	11.24	13.72	14.74	16.45
Gambia	13.97	15.41	14.35	14.97	15.10	18.37
Guinea	9.46	11.61	12.91	14.82	14.60	14.69
Burkina Faso	8.69	9.53	10.53	12.50	13.34	13.29
Togo	9.13	9.68	11.12	13.05	13.53	14.07
Sierra Leone	9.07	9.39	10.41	10.88	11.85	13.63
Benin	9.82	10.44	11.72	12.53	14.55	14.55
Liberia	7.33	7.97	9.17	7.85	7.78	8.06
Niger	4.99	5.14	6.54	7.92	7.78	7.88

Note. Source: African Development Bank, AIDI 2025 dataset.

ICT is the one infrastructure dimension in the present analysis where broad-based improvement is unambiguous. Every ECOWAS member state recorded a higher ICT composite

score in 2025 than in 2020. Cabo Verde led with 26.2, followed by Ghana (24.2), Côte d'Ivoire (23.0), and Senegal (21.9). Even the lowest-performing countries, Niger (7.9) and Liberia (8.1), recorded gains of approximately three points over the five-year period. The Gambia recorded a particularly sharp increase, from 14.0 in 2020 to 18.4 in 2025. This growth pattern broadly corroborates Yao (2025), who documented direct and indirect ICT growth effects in ECOWAS, and Koroma et al. (2025), who nonetheless cautioned that regulatory fragmentation continues to constrain the translation of improved ICT infrastructure into digital trade gains.

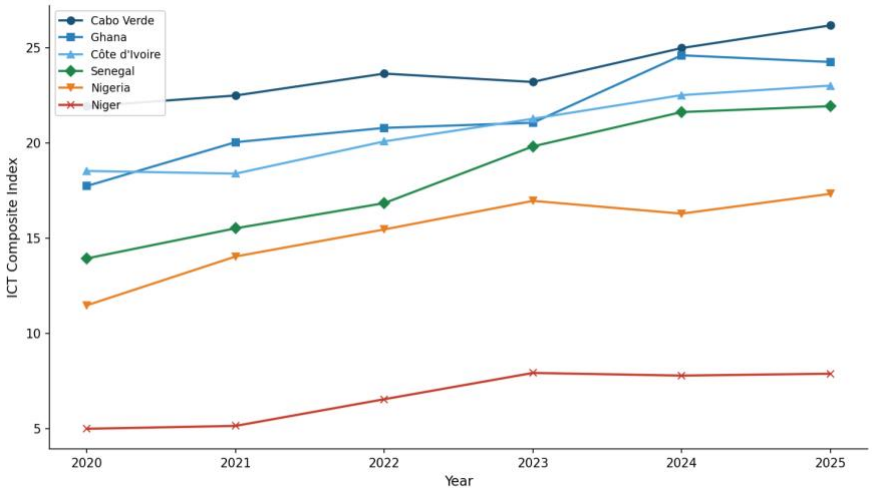

Figure 4. ICT Composite Index Trends, Selected ECOWAS States, 2020–2025.
Source: Research Survey, 2026. Data: African Development Bank, AIDI 2025.

Contribution of Cross-Border Infrastructure to Economic Integration (Objective 2)

Table 5 presents the 2025 sub-index scores for the three infrastructure dimensions analyzed in this study alongside the overall AIDI composite score, ranked by AIDI.

Table 5
AIDI Sub-Index Scores by Infrastructure Dimension and Overall Composite Score, ECOWAS Member States, 2025

Country	Transport	Electricity	ICT	AIDI 2025
Cabo Verde	26.01	13.13	26.16	93.69
Ghana	11.31	11.16	24.24	84.50
Senegal	3.94	5.13	21.92	81.93
Mali	2.42	2.23	16.27	77.24
Gambia	8.36	3.09	18.37	76.78
Nigeria	5.40	2.77	17.32	71.92
Guinea	4.83	3.60	14.69	70.75
Côte d'Ivoire	6.14	7.03	23.00	70.17
Liberia	2.81	1.15	8.06	67.70
Burkina Faso	10.89	0.52	13.29	66.00
Togo	6.33	1.62	14.07	59.93
Guinea-Bissau	3.28	0.62	16.45	59.00
Sierra Leone	4.12	0.47	13.63	60.59
Benin	5.01	1.36	14.55	55.12
Niger	1.89	0.35	7.88	44.66

Note. Source: Research Survey, 2026. Data: African Development Bank, AIDI 2025 dataset. All values on a 0–100 scale.

Discussion

Countries with higher AIDI composite scores tend to register better performance across the three sub-indices examined, although the relationship is not perfectly monotonic. Ghana performs relatively well across transport, electricity, and ICT and ranks second overall. Senegal's

strong ICT and moderate electricity scores contribute to its third-place AIDI ranking. By contrast, Burkina Faso has a relatively high transport index (10.89) but very low electricity score (0.52), which constrains its overall infrastructure profile despite its middle-range AIDI composite score of 66.0. This pattern suggests that no single infrastructure sector is sufficient on its own and that integration gains are most likely where multiple sectors reach adequate levels simultaneously.

The infrastructure–trade nexus in ECOWAS is well documented. Andoh et al. (2024) used data from 2000, 2010, and 2020 and found that transport infrastructure improvements and reductions in administrative barriers are the two policy levers most likely to increase intra-ECOWAS trade, which has changed little in proportional terms over the decades. Gammadigbe (2021) reached a similar conclusion using a gravity model covering 1996 to 2018, finding that political stability is the key institutional variable but that transport infrastructure and reductions in trade costs are indispensable complements to any institutional reform agenda.

On the energy side, Ojomo (2023) observed that the West African Power Pool (WAPP) represents an unusual model of regional governance in which energy infrastructure itself has shaped and modified the institutional rules governing its operation. Yet WAPP remains incomplete. Kourouma and Camara (2026) documented that technical and commercial losses in the West African interconnected electricity network remain a major operational and financial challenge, reducing the economic value of cross-border energy trade even where the physical infrastructure exists. Idu et al. (2025) found that intra-African energy trade has genuine poverty-alleviation potential, but that translating this potential into practice in West Africa requires addressing both investment gaps and market-governance deficiencies.

The ICT contribution to integration operates through several channels. The most direct is digital trade facilitation. Soro (2025) showed that customs digitization in Côte d'Ivoire reduced fraud and improved administrative efficiency, an effect that, if replicated at the ECOWAS level, could substantially reduce nontariff trade barriers. Abendin and Duan (2021) demonstrated across 53 African countries that trade's positive effect on economic growth is conditional on digital economy development, meaning that ICT infrastructure is not merely a facilitator of trade but also a necessary precondition for trade gains to materialize. Yao (2025) found indirect effects of ICT through financial inclusion channels that are relevant given ECOWAS's ongoing mobile-money integration efforts.

The complementarity among the three infrastructure sectors is a recurring theme. Owolabi et al. (2021) found that electricity access and ICT jointly determine financial development outcomes in West Africa. Transport efficiency depends on energy supply for fuel, cold-chain logistics, and port operations. Digitization of customs requires electricity and internet connectivity simultaneously. These interdependencies mean that investment in one sector without parallel investment in others produces weaker integration dividends than coordinated, multisector approaches (Akomolehin et al., 2025; Chuku et al., 2022).

Institutional and governance constraints nevertheless constitute a binding limitation. Koroma et al. (2025) found that regulatory fragmentation is as damaging to digital trade as physical infrastructure deficits. Charles et al. (2025) showed that Belt and Road Initiative (BRI) transport projects in West Africa failed to deepen integration partly because ECOWAS lacks a unified oversight protocol for externally financed infrastructure. Akinleye (2026) made a similar point about Programme for Infrastructure Development in Africa (PIDA) and New Partnership for Africa's Development (NEPAD) investments: persistent challenges in project bankability, limited private-sector participation, and absent policy-harmonization mechanisms reduce the trade dividend of physical connectivity.

CONCLUSION

Infrastructure development across ECOWAS during 2020–2025 reveals substantial disparities among countries and sectors, with ICT showing the most consistent improvement, while energy and transport development remain constrained by uneven progress and institutional challenges. The findings indicate that infrastructure connectivity contributes to regional economic integration, but its impact is limited by regulatory fragmentation, governance weaknesses, and cross-border coordination issues. Therefore, ECOWAS should strengthen integrated infrastructure planning by prioritizing energy interconnections, transport corridor

development, digital infrastructure, and institutional harmonization among member states.

Future policy efforts should focus on completing and maintaining regional energy networks, improving transport infrastructure quality, and harmonizing digital regulations to maximize the benefits of infrastructure investment. However, this study is limited by its descriptive approach, which does not establish causal relationships between infrastructure development and integration outcomes. Further research should employ panel econometric methods, country-specific case studies, and investment optimization models to identify the most effective strategies for improving infrastructure-driven economic integration within the ECOWAS region.

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AUTHOR CONTRIBUTION STATEMENT

Naim Shehu was responsible for the conceptualization of the study, development of the research framework, data collection and analysis, interpretation of findings, and preparation of the original manuscript. The author conducted the literature review, developed the methodology, analyzed the AIDI dataset, and contributed to the revision and final approval of the manuscript.

REFERENCES

Abendin, S., & Duan, P. (2021). International trade and economic growth in Africa: The role of the digital economy. *Cogent Economics & Finance*, *9*(1), 1–20. https://doi.org/10.1080/23322039.2021.1911767

African Development Bank. (2025). *Africa Infrastructure Development Index (AIDI) 2025* [Dataset]. African Development Bank Group.

Ajagun, A. S., Mao, W., Sun, X., Guo, J., Adebisi, B., & Aibinu, A. (2024). The status and potential of regional integrated energy systems in sub-Saharan Africa: An investigation of the feasibility and implications for sustainable energy development. *Energy Strategy Reviews*, *53*, Artikel 101402. https://doi.org/10.1016/j.esr.2024.101402

Akinleye, V. (2026). Unlocking Africa's regional trade potential: Evaluating PIDA and NEPAD infrastructure investments on intra-African trade efficiency and cross-border links. *Research and Innovation*, *2*(2), 1–18. https://doi.org/10.11648/j.ri.20260202.13

Akomolehin, O. F., Olusegun, I. F., & Famo, O. J. (2025). Infrastructure development and labor market efficiency: A sectoral analysis of transport and energy infrastructure in ECOWAS. *International Journal of Innovative Science and Research Technology*, *10*(8), 1–15. https://doi.org/10.38124/ijisrt/25aug1152

Andoh, S., Thorson, J. L., & Gebremariam, Y. (2024). Economic Community of West African States (ECOWAS): A regional integration analysis. *Journal of Leadership, Accountability and Ethics*, *21*(2), 1–15. https://doi.org/10.33423/jlae.v21i2.7063

Atiku, A., Ismail, S., & Ahmad, A. U. (2021). Energy trade amidst sustainable economic growth in regional cooperation of West African states: Fresh evidence from panel CS-ARDL. *International Journal of Energy Economics and Policy*, *11*(3), 1–12. https://doi.org/10.32479/ijeep.11598

Bassey, M., Etefia, V., & Ebong, V. (2024). Economic Community of West African States (ECOWAS) and sub-regional integration in West Africa. *European Journal of Political Science Studies*, *7*(2), 1–20. https://doi.org/10.46827/ejpss.v7i2.1772

Charles, V. P., Aniche, E. T., Jacob, O., & Iwuoha, V. C. (2025). Which way ECOWAS? China's Belt and Road initiatives and regional economic integration in West Africa. *Politikon*, *52*(2), 1–22.

https://doi.org/10.1080/02589346.2025.2595725
Chuku, C., Simpasa, A., & Ekpo, A. (2022). Catalyzing regional integration in Africa: The role of infrastructure. *The World Economy*, *45*(10), 3024–3060. https://doi.org/10.1111/twec.13364
Diaby, Z., Nyakujara, R. T., Zhu, H., & Arif, A. (2025). Comparative analysis of port efficiency in ECOWAS: Case studies of major ports. *Journal of Management Science*, *3*(1), 1–18. https://doi.org/10.54097/wy003r45
Dike, G. S., Eke, E. I., & Olayanju, O. (2026). Transport infrastructure deficits and their implications on AfCFTA cross-border logistics in West Africa. *European Journal of Logistics, Purchasing and Supply Chain Management*, *14*(1), 1–22. https://doi.org/10.37745/ejlpscm.2013/vol14n119
Ekeocha, D. O., Ogbuabor, J., & Orji, A. (2021). Public infrastructural development and economic performance in Africa: New evidence from panel data. *Economic Change and Restructuring*, *55*(3), 1205–1232. https://doi.org/10.1007/s10644-021-09334-8
Fisher, A. O., & Oludemi, S. A. (2022). Reassessing regional integration in the West Africa sub-region: ECOWAS's prospects and challenges. *Budapest International Research and Critics in Linguistics and Education*, *4*(1), 1–12. https://doi.org/10.33258/biohs.v4i1.599
Gammadigbe, V. (2021). Trade integration in West Africa: Does the quality of institutions matter? *Journal of African Trade*, *8*(1), 1–15. https://doi.org/10.2991/jat.k.211201.001
Idu, J. O. O., Abioye, R. F., & Itoh, S. (2025). Harnessing intra-African energy trade for poverty alleviation: Opportunities and barriers in the context of AfCFTA. *International Journal of Multidisciplinary Research and Growth Evaluation*, *6*(5), 394–408. https://doi.org/10.54660/.ijmrge.2025.6.5.394-408
Kalinichenko, L. (2023). ECOWAS: Energy and digital infrastructure as a factor of regional integration and development. *Asia and Africa Today*, *2023*(10), 1–12. https://doi.org/10.31857/s032150750026540-6
Koroma, M., Fofanah, K., Tejan, M. D., & Alimamy, A. (2025). Digital trade barriers: Assessing infrastructure deficiencies, security risks, and regulatory challenges in West Africa. *International Journal of Latest Technology in Engineering, Management & Applied Science*, *14*(6), 1–18. https://doi.org/10.51583/ijltemas.2025.140600053
Kostyunina, G. (2025). The Economic Community of West African States (ECOWAS): Results of 50 years of functioning. *MGIMO Review of International Relations*, *18*(1), 149–161. https://doi.org/10.24833/2073-8420-2025-1-74-149-161
Kourouma, M. L., & Camara, Y. (2026). Technical and commercial losses in the West African interconnected electricity network: Challenges and prospects. *Physical Science International Journal*, *30*(3), 1–15. https://doi.org/10.9734/psij/2026/v30i3940
Kuteyi, D., & Winkler, H. (2022). Logistics challenges in sub-Saharan Africa and opportunities for digitalization. *Sustainability*, *14*(4), Artikel 2399. https://doi.org/10.3390/su14042399
Ojomo, E. (2023). International law and regional electricity infrastructure: The West African Power Pool. *AJIL Unbound*, *117*, 1–8. https://doi.org/10.1017/aju.2022.72
Owolabi, O., Oku, A. O., Alejo, A., Ogunbiyi, T., & Ike, J. I. (2021). Access to electricity, information and communications technology (ICT), and financial development: Evidence from West Africa. *International Journal of Energy Economics and Policy*, *11*(2), 1–10. https://doi.org/10.32479/ijeep.10344
Rasheed, A. (2023). African Union (AU) regional integration agenda and socio-economic development in West African sub-region. *International Journal of Research in Education, Humanities and Commerce*, *4*(3), 1–18. https://doi.org/10.37602/ijrehc.2023.4309
Shi, J., Agyemang, K. O., & Cheng, Z. (2022). Optimizing intermodal transport and hub location problem for ECOWAS in the context of improving intra-regional trade. *Mathematical Problems in Engineering*, *2022*, Artikel 2559663. https://doi.org/10.1155/2022/2559663
Soro, S. J. (2025). The digitalization of procedures and fraud on customs value: The case study of Côte d'Ivoire. *International Journal of Economics, Commerce and Policy*, *3*(1), 1–18. https://doi.org/10.47941/ijecop.3178
Tandrayen-Ragoobur, V., Ongono, P., & Gong, J. (2022). Infrastructure and intra-regional trade in Africa. *The World Economy*, *45*(10), 3061–3095. https://doi.org/10.1111/twec.13358
Usman, F. K., Zakaree, S., Muktar, M., Yakubu, A., & Olure-Bank, A. (2024). Infrastructure and economic growth in ECOWAS member states: The Westerlund co-integration approach. *Jurnal*

Perspektif Pembiayaan dan Pembangunan Daerah, *12*(1), 1–18. https://doi.org/10.22437/ppd.v12i1.28460

Yao, K. A., & Asongu, S. A. (2025). Direct and indirect impacts of ICT infrastructure development in promoting economic growth in ECOWAS. *The Journal of International Trade & Economic Development*, *34*(5), 1–22. https://doi.org/10.1080/08853908.2025.2592936