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Industrialisation and Sustainable Development in Africa: Empirical Evidence from Panel Data (2000–2023)

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Abstract

This study examined the effect of industrialisation on sustainable development in Africa over the period 2000–2023. Using panel data from 42 African countries, the study employs the Driscoll–Kraay (DK) estimation technique to account for cross-sectional dependence, heteroskedasticity, and serial correlation. The Fully Modified Ordinary Least Squares (FMOLS) method is applied as a robustness check. At the same time, the System Generalised Method of Moments (GMM) is used to validate the dynamic persistence of sustainable development outcomes. Sustainable development is assessed using a multidimensional index that captures economic sustainability, social sustainability (life expectancy, expected years of schooling, mean years of schooling), and environmental sustainability (carbon emissions and material footprint). The results consistently reveal that industrialisation exerts a positive and statistically significant effect on sustainable development in Africa (coefficient ≈ 0.017, $p < 0.05$), confirming that industrial expansion strengthens the economic, social, and environmental dimensions of sustainable development. Industrialisation reduces carbon dioxide emissions and material footprint in the long run, while significantly improving life expectancy and educational outcomes. Population growth and remittances show mixed effects, while foreign direct investment and inflation generally undermine sustainable development outcomes. These findings underscore industrialisation as a structurally transformative pathway to sustainable development in Africa, particularly when aligned with clean energy transitions and robust institutional frameworks.

Keywords: *Industrialisation; Sustainable Development; Panel Data; Africa; Driscoll–Kraay; FMOLS; System GMM*
Subjects Development Economics; Environmental Economics; African Studies; Panel Econometrics.

I. INTRODUCTION

One of the main defining challenges of the twenty-first century is Africa's pursuit of sustainable development of the continent is home to the world's fastest-growing population, an abundant endowment of natural resources, and yet some of the most persistent developmental deficits globally. According to the 2024 Africa Sustainable Development Report, fewer than three of 32 evaluated Sustainable Development Goal (SDG) targets are on track, and the continent faces an annual financing gap of approximately US$200 billion for SDG implementation (UNDP, 2024; AfDB, 2024). Against this backdrop, industrialisation has emerged as a critical structural pathway through which African economies can diversify, generate employment, raise productivity, and accelerate progress toward sustainable development.

Sustainable development, according to the definition of the United Nations, is a way of life that satisfies the needs of today while not threatening the ability of future generations to satisfy their own needs. It is based on three mutually dependent branches: economic development, social inclusion and protection of the environment (United Nations, 2023). Sustainable development is about facilitating the development of people, communities and cultures that would allow everyone to have a decent and fair quality of life, healthcare, and education worldwide. The United Nations (UN), in turn, adopted the Sustainable Development Goals (SDGs) after many countries failed to achieve the Millennium Development Goals in 2015. The SDGs consist of 17 goals and 169 targets, which all 191 UN member states have committed to achieving by 2030. The SDGs also provide the global development framework with targets to be achieved by 2030, while 2050 is

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commonly used as a long-term sustainability horizon for assessing whether current development pathways are consistent with further environmental, economic and social objectives. The SDGs are an appeal to all nations, rich or poor, to promote prosperity while protecting the environment, according to the UN. The objectives relate to environmental, economic and social issues. The SDGs are a call to all countries, whether rich or poor, to foster economic growth while saving the environment, says the UN. SD means fulfilling the needs and desires of the current generation without harming the potential of the future generation to fulfil their needs (UN Brundtland Commission, 1987). The UN knows that ending poverty should be done alongside efforts that lead to economic growth and at the same time satisfy a variety of social needs such as jobs, social safety nets, health care, education, and climate change mitigation.

According to the SD report by Sachs et al. (2023), developed countries top the list with a sustainable development index (SDI) of over 80%. On the contrary, developing countries, especially those in Africa, are at the bottom with an index between 39% and 60%. The implication is that there is still a big gap for African countries in the achievement of the SDGs. Development-wise, it is highly important for Africa to focus on sustainable development as the continent is not only faced with the problem of poverty but also is very vulnerable to climate change. The IPCC (2022) warns that the economic consequence of no action on climate change could be a 3% reduction in Africa's GDP every year till 2050. Besides, the population of Africa is expected to double by 2050 which will put a lot of stress on its infrastructure, education, healthcare, and employment systems (AfDB, 2021).

Industrialisation contributes to sustainable development through multiple channels: it diversifies economies away from raw commodity dependence, creates decent jobs, fosters technological advancement, and generates government revenue for public investment in social services and infrastructure (Opoku & Yan, 2019; UNIDO, 2020). Despite this, Africa's manufacturing sector contributes approximately 10.4% to GDP and accounts for only about 2% of global manufacturing value added (UNIDO, 2025), falling well short of the 25% benchmark recommended by the United Nations Industrial Development Organisation (UNIDO) for developing countries aiming to reach middle-income levels.

Notwithstanding the extensive body of research on industrialisation and economic growth in Africa (Ibbih & Gaiya, 2013; Opoku & Yan, 2019; Ibitoye et al., 2022), the empirical literature examining the direct effects of industrialisation on multidimensional sustainable development outcomes remains fragmented. Most existing studies assess industrialisation solely through its impact on GDP growth, thereby neglecting its broader implications for environmental sustainability and social outcomes such as education and life expectancy. Furthermore, the evidence base for a comprehensive Africa-wide panel analysis spanning the post-SDG era (2000–2023) is limited.

This paper addresses these gaps by looking at the effect of industrialisation on a multidimensional Sustainable Development Index (SDI) across 42 African countries over the period 2000–2023. The study decomposes sustainable development into economic sustainability, social sustainability (life expectancy, expected years of schooling, mean years of schooling), and environmental sustainability (carbon dioxide emissions and material footprint). The analysis employs the Driscoll–Kraay (DK) estimator to account for cross-sectional dependence, heteroskedasticity, and serial correlation inherent in African panel data, with FMOLS and System GMM used for robustness validation.

The remainder of this paper is structured as follows. Section 2 provides a stylised overview of industrialisation and sustainable development trends in Africa. Section 3 reviews the theoretical and empirical literature. Section 4 presents the data and methodology. Section 5 reports and discusses the empirical results. Section 6 concludes with policy recommendations.

II. OVERVIEW OF INDUSTRIALISATION AND SUSTAINABLE DEVELOPMENT IN AFRICA

The path Africa has taken towards industrialisation in the last twenty years has been marked by little progress and big structural problems. Manufactured production was about USD 125 billion in 2000 and grew to about USD 235 billion in 2023, although it reached the highest level in the mid-2010s and after that suffered a small decline of around 3% in 2023 (AFDB, 2024). A lot more serious is the continuous drop of the manufacturing value added as a share of GDP, which went down from 12% to around 10% during the same time, showing that several countries have been prematurely experiencing de-industrialisation (UNIDO 2023)

According to the SDG Index, progress in sustainable development has been limited. The SDG index score for Africa was about 50% in 2000 and has slightly risen to 53% in 2022, which is still quite low due to the persistent structural challenges the continent is facing in terms of sustainable development (SDSN, 2023). From the environmental perspective, per capita carbon emissions, though very low in Africa compared to the world, have been slowly rising over time. This is a sign of increased energy usage without the appropriate move towards the green transition (IEA 2023). Socially, indicators reveal some level of improvement in life expectancy, education and healthcare access; however, there are still notable differences between countries and sub-regions.

From the stylised facts, it appears that there may be a structural disconnection between industrial expansion

and sustainable development outcomes in Africa. Industrial growth does not always lead to better results in the SDG index, and the gap between industrial output and sustainability performance is an indication of the need for more effective policy frameworks that connect industrialisation strategies with sustainable development objectives. Such development serves as the impetus for the empirical study of this paper.

III. LITERATURE REVIEW

- *Theoretical Framework*

The theoretical foundation of this study draws primarily from the structuralist model of economic development, originally proposed by Prebisch (1950) and formalised by Szirmai (2012). The structuralist approach posits that sustainable development requires fundamental shifts in economic structures, particularly the movement of labour and capital from low-productivity agricultural activities to higher-productivity industrial sectors. This structural transformation generates multiplier effects across the economy, improving incomes, strengthening technological capabilities, and creating the fiscal space for social investment.

Complementing this framework, modernisation theory (Rostow, 1959) argues that industrialisation and economic growth drive broader social and political progress. The dependency theory (Prebisch, 1950; Frank, 1967) highlights the structural constraints imposed by global economic relations on developing countries' industrialisation pathways, emphasising the need for domestic industrial policy. The green economy theory (Pearce et al., 1989) provides the normative basis for examining the environmental dimension of sustainable development, arguing that economic growth must be decoupled from resource exploitation and environmental degradation.

The theoretical linkages between industrialisation and sustainable development operate through three principal channels. First, industrialisation promotes economic sustainability by diversifying output, increasing productivity, and generating employment that raises household incomes and government revenues. Second, industrial development supports social sustainability by creating demand for skilled labour, thereby incentivising educational investment, and by generating the fiscal revenues needed to fund healthcare and social protection systems. Third, when accompanied by technological upgrading and clean energy transitions, industrialisation can contribute to environmental sustainability by reducing the carbon intensity of production and improving resource efficiency.

- *Empirical Literature*

The empirical literature on industrialisation and sustainable development in Africa presents broadly supportive but nuanced evidence. Opoku and Yan (2019), examined 37 African countries from 1980 to 2014 using the GMM estimator, found that industrialisation positively impacts economic growth, with trade openness amplifying this effect. Their concluded that boosting industrialisation and trade openness could significantly foster Africa's economic development, consistent with structural transformation theory.

Considering, manufacturing in developing countries remains a critical driver of economic development, Haraguchi et al. (2017), argued that the apparent decline in manufacturing's role reflects a concentration of industrial activities among a small group of populous countries rather than any diminution of manufacturing's developmental potential. Their study recommended that developing countries pursue targeted industrial policies to enhance manufacturing capabilities.

Examining the interaction between industrialisation and Nigeria's economic growth, Ibitoye et al. (2022) used the Error Correction Model (ECM) and found a striking positive aggregate effect of industrial output on real GDP. While Ibbih and Gaiya (2013), analysed all African countries from 1970 to 2008, they confirmed that industrial development drives economic growth. However, the industrial sector in most African countries remains dominated by mining and utilities rather than manufacturing, limiting its developmental impact.

Focusing on the environmental dimension, Aquilas and Mbella (2024), employed the Generalised Least Squares (GLS) method, found that governance plays a positive role in promoting industrial development while capital flight exerts a negative influence. Their results indicated that improved governance supports industrial progress but does not automatically neutralise the environmental costs of industrialisation. While Kurt et al. (2020) found that manufacturing value added has a significant negative impact on environmental sustainability in Africa, they indicated that industrial activities tend to degrade environmental conditions, particularly in the absence of renewable energy transitions.

In another perspective Azolibe and Jisike (2020), examined 17 Sub-Saharan African countries from 2003 to 2018, found a strong link between telecommunications infrastructure and industrial productivity, though electricity, transport, water supply, and sanitation infrastructure showed no significant association with industrial productivity. while Mugambiwa (2023) argued that sustainable industrialisation in South Africa requires expanding access to education, promoting a fairer labour market, and ensuring the efficient use of natural resources.

Using GMM analysis for 45 Asian countries from 1995 to 2021, Bahodurov et al. (2025), demonstrated industrialisation combined with trade openness significantly drives economic growth. While Utouh and Kitole (2024) found that FDI plays a crucial role in advancing industrial development in Tanzania, both in the short and long term. These findings collectively

suggest that industrialisation is a key driver of development outcomes, but its effects are conditioned by the quality of infrastructure, governance, and policy frameworks.

Despite this growing body of evidence, significant gaps remain. Most studies assess industrialisation solely through GDP growth, neglecting its broader implications for environmental and social sustainability. Studies employing multidimensional sustainable development frameworks for Africa remain scarce, particularly those covering the post-SDG period (2015–2023) with comprehensive panel data.

IV. DATA AND METHODOLOGY

➢ *Model Specification*

Following the theoretical framework and studies by Oreiro and Paula (2022), Yajin et al. (2023), and Akosah et al. (2024), the empirical model for this study is specified as:

$$SDI_{it} = \beta 0 + \beta 1 IND_{it} + \beta 2 POP_{it} + \beta 3 REM_{it} + \beta 4 FDI_{it} + \beta 5 INF_{it} + \varepsilon_{it} \quad (1)$$

Where SDI represents the Sustainable Development Index (and its component indicators); IND denotes industrialisation measured by industrial value added as a percentage of GDP; POP is population growth; REM represents personal remittances as a percentage of GDP; FDI is foreign direct investment net inflows; INF is the inflation rate; and ε is the error term. The subscripts i and t represent country and time period, respectively.

The control variables, population growth, remittances, FDI, and inflation are included because prior studies have demonstrated their significant associations with sustainable development outcomes in Africa (Bibi & Rashid, 2014; Akanbi et al., 2024; Osinubi et al., 2025).

➢ *Estimation Strategy*

The study employs the Driscoll–Kraay (DK) estimator (Driscoll & Kraay, 1998) as the primary estimation technique. The DK estimator is particularly appropriate for this analysis because it produces robust standard errors under conditions of cross-sectional dependence, heteroskedasticity, and serial correlation, all of which are prevalent in African panel data as confirmed by the preliminary diagnostic tests. The DK estimator is non-parametric and robust for both balanced and unbalanced panels, making it well-suited to the study's dataset.

The Fully Modified Ordinary Least Squares (FMOLS) method, originally developed by Phillips and Hansen (1990), is applied as a complementary estimator to ensure the robustness of the long-run relationships. FMOLS produces asymptotically unbiased estimates by correcting for long-run correlations between cointegrating equations and stochastic regressors through semi-parametric adjustments, making it appropriate for non-stationary panel series that are cointegrated.

The System Generalised Method of Moments (System GMM) estimator is further employed as a dynamic robustness check. The System GMM controls for endogeneity and unobserved country-specific heterogeneity by instrumenting endogenous regressors with their lagged values, while the inclusion of the lagged dependent variable captures the path-dependent nature of sustainable development outcomes.

➢ *Preliminary Diagnostic Tests*

Before the main estimation, a series of preliminary diagnostic tests are conducted to ensure the validity of the econometric approach. The Pesaran and Yamagata (2008) slope homogeneity test is employed to determine whether the coefficients of the slope parameters are constant across countries. The Pesaran (2007) CD test examines the presence of cross-sectional dependence in the panel. Unit root tests, specifically the CADF and CIPS tests developed by Pesaran (2007), are conducted to assess the stationarity properties of the series, accounting for cross-sectional dependence. The Westerlund (2007) panel cointegration test is applied to examine long-run relationships among the variables.

➢ *Data Sources and Variable Measurement*

The Sustainable Development Index (SDI) is constructed by Hickel (2020) as a composite measure that evaluates countries' sustainable development performance relative to their ecological impact. The index is computed as the ratio of human development achievement, proxied by a transformed version of the UNDP's Human Development Index (HDI), which captures life expectancy, educational attainment, and income, to ecological overshoot, measured by the extent to which a country's material footprint and carbon emissions exceed globally sustainable per-capita thresholds. The SDI therefore takes higher values when a country achieves greater human development outcomes at lower ecological cost, and lower values when high human development is accompanied by disproportionate resource consumption or carbon emissions. The index is bounded between 0 and 1, with higher values indicating superior sustainable development performance. In this study, the overall SDI is used as the primary dependent variable, while its component indicators, ECS (economic sustainability), LXP (life expectancy), EYS (expected years of schooling), MYS (mean years of schooling), CO_2 (carbon emissions per capita, in logarithm), and MFT (material footprint per capita) ,are examined individually in separate model specifications to capture the distinct economic, social, and environmental dimensions of sustainable development across 42 African countries.

Table 1 List of Countries Used in the Study

1.	Angola	15. Gabon	29. Namibia
2.	Algeria	16. Gambia	30. Niger
3.	Benin	17. Ghana	31. Nigeria
4.	Burkina Faso	18. Guinea	32. Rwanda
5.	Burundi	19. Kenya	33. São Tomé and Príncipe
6.	Cameroon	20. Lesotho	34. Senegal
7.	Chad	21. Libya	35. Sierra Leone
8.	Congo, Democratic Republic of the	22. Madagascar	36. South Africa
9.	Congo, Republic of the	23. Malawi	37. Tanzania
10.	Côte d'ivoire (Ivory Coast)	24. Mali	38. Togo
11.	Dijibouti	25. Mauritania	39. Tunisia
12.	Egypt	26. Mauritius	40. Uganda
13.	Eswatini (Swaziland)	27. Morocco	41. Zambia
14.	Ethiopia	28. Mozambique	42. Zimbabwe

Table 2 Variable Descriptions, Measurements, and Sources.

Variable	Category	Symbol	Measurement	Source
Sustainable Development Index	Dependent	SDI	SDG Index Score (0–1)	SDI Database
Economic Sustainability		ECS	GNI per capita (Constant 2017 PPP)	
Life Expectancy		LXP	Life expectancy at birth (years)	
Expected Years of Schooling		EYS	Expected years of schooling	
Mean Years of Schooling		MYS	Mean years of schooling	
Carbon Emissions		CO_2	CO_2 emissions per capita	
Material Footprint		MFT	Material footprint per capita	
Industrialisation	Independent	IND	Industrial value added (% of GDP)	WDI
Population Growth	Control	POP	Population growth (annual %)	
Remittances		REM	Personal remittances received (% of GDP)	
Foreign Direct Investment		FDI	FDI net inflows (% of GDP)	
Inflation		INF	Producer Price Index (PPI)	

Source: Authors' Compilation (2026). WDI = World Development Indicators; SDI = Sustainable Development Index. 2026

V. RESULTS AND DISCUSSION

➢ *Preliminary Diagnostics*

Table 3 presents the descriptive statistics for all variables. The SDI has a mean value of 0.512 and a standard deviation of 0.182, indicating moderate variation in sustainable development performance across African countries. Life expectancy averages 60.31 years, ranging from 43.18 to 76.51, while expected years of schooling average approximately 10 years and mean years of schooling average 4.93 years, reflecting significant disparities in human capital accumulation across the continent. The industrialisation variable (IND) averages 11.43% with a standard deviation of 1.42, consistent with Africa's relatively low level of industrial development. The wide range of the real interest rate (−81.13% to 52.44%) reflects episodes of severe macroeconomic instability in some African countries during the study period.

Table 3 Descriptive Statistics.

Variable	Observations	Mean	Std. Dev.	Min	Max
SDI	1,008	0.512	0.182	0.000	1.490
LXP	1,008	60.305	7.225	43.18	76.51
EYS	1,008	9.996	2.547	2.90	16.00
MYS	1,008	4.932	2.217	1.10	22.00
ECS	1,008	8.116	1.017	6.425	11.472
CO_2	1,008	−0.628	1.875	−4.605	3.604
MFT	1,008	4.516	5.422	0.22	32.21
IND	1,008	11.428	1.415	5.72	13.88
POP	1,008	7.065	0.612	5.16	8.36
REM	1,008	3.972	7.014	0.00	53.83
FDI	1,008	3.559	5.535	−26.153	46.28
INF	1,008	1.564	1.157	−3.219	6.323

Source: Authors' Computations (2026).

➢ *Correlation Analysis*

Table 4 reports the pairwise correlation matrix. SDI is most closely associated with human-capital and social-welfare indicators; mean years of schooling, expected years of schooling, life expectancy, and economic sustainability; underscoring the structural basis of education, health, nd socio-economic resilience in driving sustainable development. Money supply correlates positively with SDI, while inflation and the real interest rate correlate negatively with it. SDI and CO_2 emissions are both positively correlated with material footprint, pointing to a development environment trade-off and the continued reliance of growth on resource- and carbon-intensive production. Importantly, none of the pairwise correlations among explanatory variables exceeds the conventional 0.70 threshold (the highest, between MYS and EYS, is 0.692), indicating that multicollinearity is not a serious concern for the subsequent econometric estimation.

Table 4 Correlation Analysis

	IND	POP	SDI	MSY	INF	LXP	REM	FDI	RIR	UBP	CO2	MYS	MFT	EYS	ECS
IND	1.000														
POP	0.511	1.000													
SDI	0.172	0.133	1.000												
MSY	-0.213	-0.046	0.240	1.000											
INF	-0.064	0.116	-0.123	-0.107	1.000										
LXP	0.129	-0.021	0.404	0.454	0.091	1.000									
REM	-0.170	-0.047	0.061	0.147	0.041	-0.089	1.000								
FDI	-0.144	-0.214	-0.140	0.037	0.034	0.003	-0.039	1.000							
RIR	0.042	-0.035	-0.117	0.032	-0.055	-0.038	0.050	0.107	1.000						
UBP	-0.133	-0.245	0.388	0.327	-0.074	0.473	-0.092	0.055	-0.130	1.000					
CO2	0.152	0.491	0.252	0.139	0.062	0.278	-0.089	-0.065	-0.144	0.334	1.000				
MYS	-0.095	0.015	0.510	0.315	0.148	0.338	0.038	-0.096	-0.117	0.338	0.315	1.000			
MFT	-0.202	-0.388	0.151	0.251	-0.031	0.014	-0.008	-0.072	-0.038	-0.006	-0.094	0.213	1.000		
EYS	-0.035	-0.053	0.470	0.438	0.082	0.502	0.024	-0.114	-0.014	0.376	0.307	0.692	0.264	1.000	
ECS	-0.079	-0.242	0.546	0.363	-0.057	0.441	-0.031	-0.106	-0.185	0.571	0.330	0.539	0.588	0.578	1.000

Source: Author's Computations

➢ *Slope Homogeneity Test*

The Pesaran and Yamagata (2008) slope homogeneity test was conducted to determine whether the estimated panel regression coefficients are identical across sampled African countries or vary significantly from one country to another. As shown in Table 3, the Δ and adjusted Δ_a (Delta-adjusted) statistics are positive and highly significant at the 1% level ($p = 0.000$) across all seven model specifications corresponding to SDI and its components, with adjusted statistics ranging from 7.847 to 32.973. This provides strong and consistent evidence of slope heterogeneity across African countries, implying that the effects of industrialisation, population growth, remittances, foreign direct investment, and inflation on sustainable development differ substantially from country to country – thereby justifying the use of a heterogeneity-robust estimator such as Driscoll–Kraay.

Table 5 Slope Homogeneity Test

Model	Δ	Δ adj.
f (SDI, IND, POP, REM, FDI, INF)	23.158 (0.00***)	27.515 (0.00***)
f (ECS, IND, POP, REM, FDI, INF)	6.604 (0.00***)	7.847 (0.00***)
f (EYS, IND, POP, REM, FDI, INF)	24.822 (0.00***)	29.492 (0.00***)
f (MYS, IND, POP, REM, FDI, INF)	9.106 (0.00***)	12.879 (0.00***)
f (LXP, IND, POP, REM, FDI, INF)	27.751 (0.00***)	32.973 (0.00***)
f (MFT, IND, POP, REM, FDI, INF)	16.197 (0.00***)	19.245 (0.00***)
f (CO2, IND, POP, REM, FDI, INF)	22.658 (0.00***)	26.922 (0.00***)

*Note: *** Indicates Significance at the 1% Level. Source: Author's Computations*

➢ *Cross-Sectional Dependence Test*

Table 6 reports the results of the Pesaran (2007) cross-sectional dependence (CD) test. The CD statistics for all variables are significant at the 1% level, indicating strong cross-sectional dependence among the African countries in the sample. This confirms the presence of common shocks, spillovers, and regional interdependence across African economies, and informs the choice of second-generation panel unit root tests and a cross-sectional-dependence-robust estimator in the subsequent analysis.

Table 6 Cross-Sectional Dependence Test

Variable	**CD-test**
IND	129.46***
POP	140.89***
SDI	89.14***
MSY	48.47***
INF	13.51***
LXP	131.93***
REM	12.53***
FDI	6.39***
RIR	5.772***
CO2	43.12***
MYS	128.43***
MFT	25.09***
EYS	112.32***
ECS	76.96***

*Note: *** Indicates Significance at the 1% Level. Source: Author's Computations*

➢ *Panel Unit Root Tests*

To determine the order of integration of the variables, the study conducted Levin–Lin–Chu (LLC), Im–Pesaran–Shin (IPS), CADF, and CIPS panel unit root tests, with results reported in Tables 5 and 6 for the intercept-only and intercept-and-trend specifications, respectively. Across both specifications, most variables – including SDI, IND, RIR, LXP, MYS, EYS, MFT, POP, REM, FDI, and INF – are non-stationary at levels but become stationary after first differencing, indicating that the majority of series are integrated of order one, I(1). The CIPS test, which adjusts for common shocks or global trends, corroborates this finding, confirming that shocks to these variables exhibit persistent long-run effects but are mean-reverting after differencing. This validates the use of I(1)-based empirical strategies, including FMOLS, in the subsequent estimation, and ensures that the relationships estimated are not spurious.

Table 7 Panel Unit Root Test (Intercept Only)

Variable	LLC Level	LLC 1st Diff.	IPS Level	IPS 1st Diff.	CADF Level	CADF 1st Diff.	CIPS Level	CIPS 1st Diff.
SDI	-9.745***	-4.544***	-9.745***	-4.544***	10.224	-12.592***	5.141	-2.970
ECS	-6.396***	-21.428***	-0.6781	-12.506***	7.8196	-13.481***	-1.742	-7.455***
EYS	-9.551***	-6.936***	-3.663	-6.867***	9.5117	-10.231***	-6.263***	-8.922***
MYS	-10.155***	-6.091***	-2.706***	-8.169***	10.926	-11.844***	7.232	-4.001***
LXP	-6.082***	-7.844***	2.7142	-12.485***	17.143	-11.549***	-1.726**	-1.532*
MFT	-6.013***	-13.447***	-3.819	-15.482***	2.409	-10.487***	-4.085***	-10.723***
CO2	-2.211**	-10.459***	-2.211**	-11.549***	5.002	-11.728***	1.175	-5.308***
IND	-4.355***	-12.969***	2.921***	-12.851***	-0.212	-9.173***	0.011	-9.173***
RIR	-5.5896***	-18.9157***	11.3056***	-20.3724***	-1.693*	-3.081***	0.5638	-10.940***
MSY	-2.826	-15.289***	-0.1084	-17.954***	2.569	-10.2671***	0.5638	-10.940***
POP	-3.404***	-16.129***	-3.4035***	-20.377***	22.165	-14.717***	-3.941***	-14.897***
REM	-2.672***	-11.797***	-2.672***	-11.797***	-0.198	-10.089***	0.5638	-10.940***

*Note: ***, **, and * Denote Significance at 1%, 5%, and 10%. Source: Author's Computations*

Table 8 Panel Unit Root Test (Intercept and Trend)

Variable	CIPS Level	CIPS 1st Diff.	IPS Level	IPS 1st Diff.	CADF Level	CADF 1st Diff.	LLC Level	LLC 1st Diff.
SDI	-1.199	-3.664***	2.4081	-83.043***	6.760	-4.894***	6.912	-6.586***
ECS	-1.649	-3.632***	2.122	-10.687***	64.318***	-5.567***	-1.575*	-19.553***
EYS	-2.557***	-4.266***	5.789	-8.030***	-1.803**	-6.150***	-0.398***	-8.857***
MYS	-0.970	-4.266***	-2.594***	-39.887***	10.729	-3.942***	3.4690	-7.012***
LXP	-2.260	-2.848***	-0.442	-15.486***	6.760	-3.033***	-4.916***	-9.071***
MFT	-3.381***	-4.416***	-2.594***	-12.779***	-0.36	-9.026***	-5.508***	-10.975***
C02	-2.025	-3.426***	-13.097***	-52.929***	4.699	-3.426***	-2.387	-7.882***
IND	-1.818	-3.757***	0.7656	-11.475***	-2.000**	-7.779***	-2.879***	-6.587***
RIR	-2.292	-3.213***	-11.3056***	-20.3724***	0.644*	-4.284***	-3.4944***	-9.7519***
MSY	-2.704***	-4.843***	-2.264**	-65.948***	0.139*	-11.468***	-3.410***	-12.366***
POP	-2.704***	-5.454***	-0.351	-20.358***	-0.253	-13.922***	-3.398***	-14.943***
REM	0.751**	-4.336***	-1.665**	-40.571***	0.751**	-7.284***	-1.913**	-9.397***
FDI	-2.028**	-4.416***	-1.5959*	-13.288***	-2.028**	-9.528***	2.858***	-8.021***
INF	-3.323***	-5.092***	-4.991***	-62.166***	-5.088***	-13.684***	-5.029***	-13.886***

*Note: ***, **, and * Denote Significance at 1%, 5%, and 10%. Source: Author's Computations*

➢ *Westerlund Cointegration Test*

With most variables confirmed to be I(1), the Westerlund (2007) panel cointegration test was conducted to examine the long-run relationship among industrialisation, the control variables, and sustainable development. As shown in Table 8, most estimated models exhibit panel cointegration, implying that long-run relationships exist among the variables across most model specifications. This justifies the application of long-run estimation techniques such as FMOLS alongside the Driscoll–Kraay estimator in the subsequent analysis.

Table 9: Westerlund Cointegration Test

Model	Statistic	P-value
Model 1	-2.053	0.020
Model 2	-2.091**	0.018
Model 3	-1.669**	0.048
Model 4	-0.571	0.284
Model 5	-1.578*	0.057
Model 6	-1.780**	0.038
Model 7	-0.183	0.428

*Note: ***, **, and * Denote Significance at 1%, 5%, and 10%. Models 1–7 Correspond to the SDI, MFT, CO2, ECS, LXP, EYS, and MYS Specifications, Respectively. Source: Author's Computations*

➢ *Industrialisation on the Overall Sustainable Development Index*

Table 10 presents the DK, while Table 5 present FMOLS estimates for the effect of industrialisation on the overall SDI and its component indicators. Evidence provides unambiguous evidence that industrialisation exerts a positive and statistically significant effect on sustainable development in Africa. The DK estimate yields a coefficient of 0.017 ($p < 0.01$), while the FMOLS estimate yields a coefficient of 0.015, both indicating that a one percentage point increase in industrial value added raises the overall Sustainable Development Index by approximately 0.02 percentage points. This finding is robust across both estimation methods and is further confirmed by the System GMM estimate of 0.016 (t-statistic =17.82, $p < 0.01$), which controls for dynamic persistence and endogeneity.

The convergence of this result across three independent estimation strategies, DK, FMOLS, and

System GMM, provides compelling and internally consistent evidence that industrialisation is a positive and significant driver of sustainable development in Africa. This finding aligns with structural transformation theory (Lewis, 1954; Kaldor, 1967; Szirmai, 2012), which posits that the reallocation of labour and capital from low-productivity to high-productivity industrial sectors is the fundamental engine of long-run development. It is also consistent with recent African-focused empirical evidence (Opoku & Yan, 2019; UNIDO, 2023; AfDB, 2024) confirming industrialisation's central role in achieving the SDGs.

Table 10 Driscoll and Kraay Estimates. Dependent Variable: Sustainable Development Indicators

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLE	**SDI**	**MFT**	**CO2**	**ECS**	**LXP**	**EYS**	**MYS**
IND	0.017***	-0.054	-0.201***	0.243	0.847***	0.002	-0.187***
	[0.0035]	[0.098]	[0.019]	[0.263]	[0.238]	[0.052]	[0.0483]
	(4.914)	(-0.551)	(-10.579)	(0.130)	(8.409)	(0.036)	(-3.872)
POP	0.018***	-3.731***	1.754***	-0.497***	-1.180***	-0.390***	0.132**
	[0.003]	[0.136]	[0.098]	[0.023]	[0.203]	[0.039]	[0.049
	(6.067)	(-27.434)	(17.898)	(-21.609)	(19.110)	(-10.026)	2.694
REM	0.002***	-0.028***	-0.023	-0.006	-0.065***	0.004	0.00283
	[0.0004]	[0.009]	[0.014]	[0.004]	[0.019]	[0.006]	[0.006]
	(5.7)	(-3.111)	(-1.643)	(1.684)	(-1.052)	(0.625)	(0.472)
FDI	-0.003***	-0.159***	0.011	-0.030***	0.006	-0.063***	-0.0439*
	[0.001]	[0.023]	[0.017]	[0.006]	[0.049]	[0.014]	[0.021]
	(-3.3)	(6.913)	(0.647)	(-4.931)	(1.947)	(-4.606)	(-2.091)
INF	-0.019***	0.103	-0.019	-0.010	-0.413	0.214***	0.267**
	[0.003]	[0.082]	[0.028]	[0.273]	[0.313]	[0.054]	[0.081]
	(-6.4)	(1.256)	(0.678)	(-0.037)	(-0.873)	(3.963)	(3.296)
Constant	0.218***	32.092***	-10.646***	11.437***	59.836***	12.612***	5.866***
	[0.043]	[2.102]	[0.578]	[0.274]	[2.605]	[0.900]	[0.972]
	(5.069)	(15.267)	(18.419)	(41.894)	(-21.431)	(14.011)	(6.035)
Observations	1,008	1,008	1,008	1,008	1,008	1,008	1,008
Number of groups	42	42	42	42	42	42	42

*Note: ***, **, and * Indicate 1%, 5%, and 10% Levels of Significance, Respectively. T-statistics are in (), Standard error in [],*
Source: Author's Compilations (2026).

Table 11 FMOLS Estimates Model. Dependent Variable: Sustainable Development Indicators.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLE	**SDI**	**MFT**	**CO2**	**ECS**	**LXP**	**EYS**	**MYS**
IND	0.015	-0.449	-0.214	-0.206	0.484***	0.315	-0.323**
	[0.019]	[0.567]	[0.166]	[0.149]	[0.789]	[0.232]	[0.156]
	(0.798)	(-0.792)	(-1.289)	(-1.383)	(3.859)	(3.441)	(-2.07)
POP	0.018	-2.859**	1.538***	-0.574*	-1.583***	-1.649***	0.208
	[0.044]	[1.315]	[0.387]	[0.333]	[1.837]	[0.540]	[0.362]
	(0.412)	(2.174)	(3.974)	(-1.724)	(-3.227)	(-4.847)	(0.574)
REM	0.003	-0.048	-0.027	-0.001	-0.013***	0.076	0.003
	[0.003]	[0.097]	[0.029]	[0.024]	[0.136]	[0.039]	[0.027]
	(0.003)	(0.495)	(-0.931)	(0.021)	(-2.672)	(3.270)	(0.132)
FDI	-0.003	-0.172***	0.073	-0.123	0.056	-0.337***	-0.056*
	[0.004]	[0.125]	[0.037]	[0.031]	[0.174]	[0.051]	[0.034]
	(−0.788)	(-1.376)	(0.022)	(-3.968)	(1.105)	(-10.106)	(-1.634)
INF	-0.014	0.068	-0.073	-0.038	-0.645***	2.249***	0.327**
	[0.019]	[0.593]	[0.174]	[0.148]	[0.827]	[0.243]	[0.163]
	(−0.729)	(0.115)	(-0.419)	(-0.257)	(11.251)	(16.197)	(2.000)
Constant	0.223	30.86***	-8.849***	15.172***	66.696***	15.963***	6.826***
	[0.279]	[8.333]	[2.450]	[2.129]	[11.64]	[3.426]	[2.299]
	(0.802)	(3.702)	(-3.612)	(7.126)	(4.788)	(4.788)	(2.001)
Observations	1,007	1,007	1,007	1,007	1,007	1,007	1,007
No of observation	42	42	42	42	42	42	42

*Note: ***, **, and * Indicate 1%, 5%, and 10% Levels of Significance, Respectively. Standard errors in parentheses [], T-statistics in (),*
Source: Author's Compilations, (2026).

Table 12 System GMM Estimates (Robustness Check Objective One). Dependent Variable: Sustainable Development Indicators

VARIABLE	(1) SDI	(2) MFT	(3) CO_2	(4) LXP	(5) EYS	(6) MYS
L1	0.186***	1.073***	0.730***	0.984***	0.913***	0.397***
	[0.009]	[0.001]	[0.014]	[0.005]	[0.937]	[0.005]
	(20.667)	(1073)	(7.298)	(207.04)	(148.75)	(77.83)
IND	0.016***	-0.319***	-0.094***	-0.486***	0.027***	0.471***
	[0.001]	[0.008]	[0.015]	[0.044]	[0.079]	[0.025]
	(17.82)	(-39.62)	(-5.87)	(-10.93)	(2.94)	(18.97)
POP	0.052***	0.145***	1.064***	-2.125***	-0.515***	0.988***
	[0.010]	[0.033]	[0.063]	[2.346]	[0.066]	[0.152]
	(5.10)	(4.41)	(8.841)	(-20.80)	(-5.88)	(6.52)
REM	0.006***	-0.018***	-0.028***	-0.068***	-0.032***	-0.003
	[0.0002]	[0.001]	[0.002]	[2.567]	[0.004]	[0.003]
	(8.06)	(-29.23)	(-8.25)	(-5.96)	(-6.01)	(-1.05)
FDI	-0.0001***	-0.0014*	-0.008	-0.009	-0.000	-0.024***
	[0.001]	[0.0005]	[0.001]	[0.011]	[-0.001]	[0.002]
	(-0.91)	(-2.8)	(-8.31)	(-1.52)	(1.25)	(-10.01)
INF	0.001***	0.047***	0.008	0.097***	-0.009	0.059***
	[0.0001]	[0.002]	[0.003]	[0.011]	[0.002]	[0.006]
	(4.05)	(27.39)	(2.41)	(11.15)	(-0.56)	(10.32)
Constant	-0.436***	2.605***	-6.516***	-10.599***	2.341***	-9.507***
	[0.057]	[0.192]	[0.385]	[0.138]	[0.232]	[0.558]
	(-7.66)	(13.57)	(-16.91)	(-17.31)	(12.06)	(-5.21)
Observations	924	924	924	924	966	924
No. of groups	42	42	42	42	42	42

*Note: ***, **, and * indicate 1%, 5%, and 10% levels of significance, respectively. T-statistics are in (); Standard errors are in [ ], L1 denotes the one-period lagged dependent variable.*
Source: Author's Compilations (2026).

➢ *Industrialisation on Environmental Sustainability*

The results for the environmental sustainability indicators, material footprint (MFT) and carbon dioxide emissions (CO_2), reveal important nuances in the relationship between industrialisation and environmental outcomes. Evidence from Model 2 (Material footprint), the DK, confirm a negative coefficient for industrialisation (−0.054), indicating that a percentage increase in the level of industrialisation will bring about a reduction of about 0.05% in the level of material footprint. The FMOLS estimate, however, yields a larger negative coefficient of −0.449, providing evidence of a long-run negative relationship between industrialisation and material footprint. The System GMM robustness check confirms a significant negative coefficient of −0.319 ($p < 0.01$), suggesting that industrial expansion is associated with long-run improvements in resource efficiency in Africa.

For carbon dioxide emissions (Model 3), both the DK (−0.201, $p < 0.01$) and FMOLS (−0.214) estimates indicate that industrialisation significantly reduces carbon emissions in Africa. The System GMM reveal the finding with a coefficient of −0.094 ($p < 0.01$). These results suggest that Africa's industrialisation is not uniformly carbon-intensive and that structural shifts toward modern, less resource-dependent production methods are occurring across the continent. This finding is consistent with the 'latecomer advantage' hypothesis, which posits that later-industrialising economies can leapfrog into cleaner production pathways by adopting technologies developed by earlier industrialisers (Acheampong & Opoku, 2022; Pata & Caglar, 2021).

Population growth consistently increases material footprint and carbon emissions, reflecting rising energy demand, urbanisation pressures, and weak environmental enforcement. FDI is found to reduce material footprint but increase carbon emissions, suggesting that while foreign investment may promote some resource efficiency, it also tends to be concentrated in carbon-intensive sectors in Africa (UNCTAD, 2023).

➢ *Industrialisation and Social Sustainability*

Evidence from model 5 indicates that industrialisation has a positive and significant effect on life expectancy across both estimation methods. The DK estimate yields a coefficient of 0.847 ($p < 0.01$), while the FMOLS estimate yields a coefficient of 0.484 ($p < 0.01$), indicating that a one percentage increase in industrial outcome will yield an increase of 0.8% and 0.5%, respectively, which is associated with a substantial improvement in life expectancy. This relationship reflects the multiple channels through which industrialisation improves population health: higher incomes, improved infrastructure (hospitals, clean water, sanitation, transportation), technological progress in healthcare, and increased government revenue for public health spending.

Looking at expected years of schooling, the DK and FMOLS estimates reveal positive coefficients of 0.002 and 0.315, respectively, indicating that industrialisation raises schooling incentives by increasing labour market demand for skilled workers and improving household incomes. This finding aligns with endogenous growth theories linking structural transformation to human capital accumulation (Romer, 2018) and with recent African evidence showing that higher education levels correlate positively with sustainability outcomes (Zhang, 2024; UNDP, 2023).

Mean Years of Schooling reveals a negative short-run relationship with industrialistion with a coefficient of DK -0.187, FMOLS; -0.323, GMM 0.47 with P-value of < 0.01, < 0.05, < 0.05 respectively. This finding suggests that in some African contexts, industrial expansion may absorb young workers prematurely into low-skill employment, potentially discouraging prolonged schooling. This result is consistent with evidence of premature industrial labour absorption in African economies documented by Rodrik (2016) and UNESCO (2022). The System GMM estimate, however, shows a positive coefficient (0.471, $p < 0.01$), suggesting that the long-run dynamic effects of industrialisation on mean schooling are positive once path-dependent processes are accounted for.

- *Industrialisation on Economic Sustainability*

The DK estimate for the effect of industrialisation on economic sustainability (ECS) yields a positive but statistically insignificant with a coefficient of 0.243, while the FMOLS estimate is negative (−0.206), indicating a mixed relationship. The positive DK finding suggests that industrialisation is generating stable employment, increasing productivity, and strengthening domestic supply chains, consistent with structural transformation theory. The negative FMOLS coefficient suggests that in the long run, industrial growth in Africa may be undermined by environmental degradation, energy insufficiencies, and structural distortions, particularly in the absence of green technologies.

These mixed results reflect the heterogeneity of Africa's industrial landscape: while some economies have successfully used industrial growth to improve economic sustainability, others, particularly those characterised by extractive or enclave-type industries, have failed to translate industrial expansion into broad-based economic sustainability gains. The findings highlight the importance of the quality, not just the quantity, of industrial development for achieving economic sustainability in Africa.

- *Discussion of Result*

The results of this study provide robust, multidimensional evidence that industrialisation is a significant driver of sustainable development in Africa. The convergence of DK, FMOLS, and System GMM estimates findings show that industrialisation positively and significantly influences sustainable development in Africa, with its effect increasing over time consistent with structural transformation theories (Lewis, 1954; Kaldor, 1967). Recent evidence (e.g. Aquilas et al., 2024) similarly finds that manufacturing expansion, when coupled with renewable energy integration, significantly enhances ecological resilience, suggesting that industrial growth becomes both developmentally productive and environmentally sustainable when energy structures shift toward low-carbon systems. Historical experience from Germany, South Korea, Sweden, the Netherlands, and Switzerland shows how industrialisation has strengthened sustainable development through structural transformation, innovation, and energy transitions (OECD, 2023). Africa's manufacturing sector nonetheless remains relatively underdeveloped, contributing about 10.4% of GDP but only around 2% of global manufacturing value added (UNIDO, 2025).

The finding that industrialisation reduces carbon emissions and material footprint in the long run is particularly important for Africa's development discourse. Increase in material footprint in the short run is reflecting Africa's continued reliance on resource-intensive, fossil-fuel-based industrial processes (Adebayo & Uzun, 2025; Leon et al., 2025; Wiedmann et al., 2015), but is associated with a negative long-run relationship with material footprint, suggesting that structural industrial transformation eventually drives material efficiency and technological upgrading, consistent with an environmental-Kuznets-type argument applied to material use (Steinberger et al., 2013). This challenges the conventional assumption that industrial development necessarily worsens environmental outcomes and supports the argument that Africa's industrial trajectory can be aligned with the continent's climate obligations, particularly if industrial policies explicitly promote clean energy adoption and resource-efficient production methods.

The negative effects of FDI and remittances on sustainable development deserve attention. The consistent finding that FDI does not support sustainable development in Africa, and in fact reduces it in several model specifications, reflects the predominantly extractive nature of FDI inflows on the continent, which generate limited local linkages and technology transfer (UNCTAD, 2023). Similarly, Remittances and FDI are found to largely not support sustainable development: the negative effect of remittances suggests inflows are used mainly for consumption smoothing rather than productive or green investment (Okara et al., 2025; Chami et al., 2005; Adams & Cuecuecha, 2013), while the weak effect of FDI reflects persistent challenges around local linkages and technology transfer (Akinlo, 2004; UNCTAD, 2023).

The positive effect of population growth on the overall SDI in the short run, which turns negative in the long run, reflects Africa's demographic challenge. While demographic expansion may initially support economic activity and labour force growth, sustained high

population growth increasingly strains infrastructure, public services, and environmental resources, ultimately constraining sustainable development (Bloom et al., 2003; AFDB, 2022).

VI. CONCLUSION AND POLICY RECOMMENDATIONS

This paper examines the effect of industrialisation on multidimensional sustainable development in Africa, using panel data from 42 countries over the period 2000–2023. The study employs an extensive set of preliminary diagnostic tests confirming slope heterogeneity, cross-sectional dependence, I(1) variable properties, and cointegration before applying the Driscoll–Kraay estimator with FMOLS and System GMM robustness checks. To establish the result, the paper decomposes sustainable development into economic sustainability, social sustainability (life expectancy, expected years of schooling, mean years of schooling), and environmental sustainability (carbon dioxide emissions and material footprint), while population growth, Remittances, foreign direct investment and inflation were used as control variables. Industrial development, when combined with clean energy transitions, further enhances ecological resilience, with low-carbon manufacturing offering a pathway to industrialisation that is both developmentally productive and environmentally sustainable. Industrialisation therefore represents a structurally transformative pathway to sustainable development for Africa, rather than merely a growth strategy. the study finds consistent and robust evidence that industrialisation exerts a positive and statistically significant effect on sustainable development in Africa.

The finding shows that industrialisation raises the overall Sustainable Development Index, improves life expectancy, and supports educational attainment. In the long run, industrial expansion reduces carbon emissions and material footprint, suggesting that Africa's industrialisation can be compatible with environmental sustainability objectives if supported by appropriate policy frameworks. Mixed results for economic sustainability highlight the importance of ensuring that industrial growth is broad-based and linked to domestic productive systems rather than confined to extractive or enclave activities.

These findings carry important policy implications. First, African governments should prioritise industrialisation as a core developmental strategy, investing in productive capacity, industrial infrastructure, and clean energy adoption to ensure that industrial growth is both developmentally productive and environmentally sustainable. This recommendation is directly supported by the finding that industrialisation exerts a positive and significant effect on the overall SDI (DK coefficient = 0.017, $p < 0.01$; GMM coefficient = 0.016, $p < 0.01$), confirming that industrial expansion is the most consistent driver of sustainable development across the 42 African countries examined.

Second, industrial policy should be explicitly linked to the SDGs, with particular attention to industries that generate employment, improve incomes, and promote technological upgrading in clean production methods. Acknowleding of the mixed economic sustainability finding: 'Notably, the mixed evidence on economic sustainability, positive under DK (0.243) but negative under FMOLS (−0.206), underscores that industrial growth in Africa does not automatically translate into broad-based economic sustainability. Industrial policy must therefore target quality of industrial activity, not merely quantity, ensuring linkages to domestic supply chains and avoidance of enclave-type extractive activities that generate little redistributive benefit.

Third, the weak contribution of FDI to sustainable development underscores the need for stronger institutional frameworks to govern foreign direct investment, ensuring that FDI is channelled toward sectors that generate local linkages, technology transfer, and environmental benefits. 'The empirical results show that FDI exerts a negative and statistically significant effect on the overall SDI (DK: −0.003, $p < 0.01$) and significantly reduces economic sustainability (DK: −0.030, $p < 0.01$) and educational attainment (DK: −0.063, $p < 0.01$) across the models. This consistent negative finding across multiple dimensions and estimation methods suggests that FDI inflows in Africa remain predominantly extractive and generate limited sustainability co-benefits. Governments must therefore implement investment screening mechanisms, local content requirements, and technology transfer obligations to redirect FDI toward sectors that actively contribute to sustainable development outcomes.

Finally, the finding that population growth ultimately constrains sustainable development outcomes calls for policies that harness Africa's demographic dividend through investments in education, healthcare, and youth employment. The DK results show that population growth has a positive short-run effect on overall SDI (0.018, $p < 0.01$), reflecting the potential demographic dividend from Africa's expanding labour force and consumer market. However, the long-run negative effects on life expectancy (DK: −1.180, $p < 0.01$) and expected years of schooling (DK: −0.390, $p < 0.01$) indicate that unchecked population growth erodes social sustainability outcomes over time. Policies must therefore combine demographic management with accelerated investment in healthcare and education to convert demographic growth into a genuine and durable development asset.

The finding that industrialisation significantly reduces carbon dioxide emissions (DK: −0.201, $p < 0.01$; FMOLS: −0.214) and material footprint (GMM: −0.319, $p < 0.01$) in the long run provides empirical support for a green industrialisation agenda in Africa. Policymakers should therefore design industrial strategies that explicitly promote clean energy adoption, resource-efficient production methods, and technology upgrading,

leveraging the latecomer advantage to leapfrog carbon-intensive development pathways as the empirical evidence suggests Africa's industrial trajectory is already moving in this directionCoordinating industrialisation policy with social investment and environmental regulation will be essential for ensuring that Africa's industrial development pathway is inclusive, resilient, and aligned with the broader objectives of Agenda 2030 and the African Union's Agenda 2063.

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