Economic Growth and Environmental Sustainability: Empirical Evidence from Selected African Countries

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Abstract. Environmental deterioration, driven by human activities, poses a critical global challenge. Its far-reaching consequences are a threat to the planet and future generations. Economic growth brought about by rapid industrialisation, increased economic activities, and globalisation has not only improved gross domestic product (GDP) and material well-being globally but consequently increased the emission of greenhouse gases, which in no doubt has far-reaching catastrophic impacts on society in the short-term and long term. Climate change, deforestation, pollution, natural resource depletion, food shortage and loss of biodiversity are interconnected problems of environmental deterioration. Climate change harms ecosystems and food security, increases global inequality, and brings about more frequent and severe weather events – deforestation results in habitat loss - destabilising ecosystems and reducing biodiversity. Pollution from industries, agricultural activities, and urban sources endanger ecosystems and harm human health. Like never before, harmonising the concepts of people (society), profit (economy) and the planet (environment) to achieve a sustainable solution has been more crucial.

For this reason, this study examines the impact of economic growth on environmental sustainability – empirically examining 15 randomly selected African countries. The Fixed Effect (FEM) method regression model was employed for the panel data. The analysis revealed that the coefficient of GDP growth rate is positive and statistically significant. However, the GDP growth rate squared is negative and statistically significant. These coefficients suggest that economic growth contributes positively and significantly to environmental degradation through the emission of greenhouse gases but substantially declines as the economy grows further. Thus, these coefficients show that we have an inverted U-curve, which supports the Environmental Kuznets Curve (EKC) Hypothesis. Agricultural value-added (AVA), manufacturing value-added (MVA) and foreign direct investment (FDI) have negative and significant impacts on greenhouse gas emissions, hence promoting environmental sustainability.

In contrast, trade openness had a positive but insignificant impact on greenhouse gas emissions. The study urges policymakers across Africa to be benevolent in crafting economic policies – considering the environmental and social effects to protect people's well-being today and in future generations. Appropriate sensitisation and policy initiatives such as taxes and subsidies should be effectively employed to reduce emissions

of greenhouse gases to the barest minimum while also promoting eco-investing and eco-friendly initiatives.

Keywords: Environmental Sustainability, Economic Growth, Greenhouse Gaseous Emissions, Environmental Kuznets Curve.

INTRODUCTION

Higher growth and economic prosperity have always been significant goals of governmental initiatives, and they still are now. However, achieving higher growth necessitates using natural resources (such as energy resources), which has detrimental consequences on the environment [4]. Achieving sustainable growth - continued improvements in the current quality of life at a lower intensity of resource use without endangering future generations is of immense importance in recent times, with global warming, climate change, and other environmental issues becoming increasingly severe and has thus received more attention than ever.

Since the beginning of humankind, the environment has served as a host to animals and humanity's activities [17]. The environment creates a habitable atmosphere for humans to live in and act towards improving their lot within that abode, which in turn breeds growth and development [16]. Nevertheless, man's desires to achieve growth, including meeting the increasing needs of the ever-growing global population, have encouraged mass production, technological advancement, industrialisation, urbanisation, and many more, which came with negative consequences on the environment. Inventions like automobiles, production plants, and carbon-emitting electricity generation machines have resulted in the emission of harmful substances into the atmosphere, resulting in heavy depletion of the ozone layer, climate change, food shortage, and loss of biodiversity.

In 1972, the UN Conference on the environment held in Stockholm, Sweden, was the first ever focus on the environment as a political concern, where the United Nations Environment Programme (UNEP) was established. Succeeding the Stockholm conference was the conference on environment and development (also known as Earth Summit) in Rio de Janeiro, Brazil 1992. According to the United Nations, the primary goal of the summit was to create a comprehensive agenda and new framework for global action on environmental and development concerns that would help direct worldwide cooperation and development strategy in the twenty-first century. John Elkington developed the Triple Bottom Line Theory – the people, profit, and planet in 1994, representing the three sustainability dimensions. People are related to the social dimension; profit is associated with the economic dimension, while the Earth is related to the environmental dimension. However, most countries often choose the economic dimension as the most critical dimension. According to [48], this is because economic growth is the foundation of any nation. An economic focus and sustainability will provide immediate financial support and the financial capabilities needed for further national development [48].

Nevertheless, it is essential to meet all three dimensions simultaneously. The point of intersection of all three dimensions is considered the sustainability region. Subsequently, there have been several other summits on environmental sustainability issues, such as the New York Conferences of 1997, 2000, 2005, 2008, 2010, 2013 and 2015; Johannesburg of 2002, Rio 2012; and the United Nations Climate Change Conferences initiated since 1995 in Berlin, Germany to Glasgow, United Kingdom in 2021. Essentially, all these summits have been geared toward achieving a healthy environment (green future) and sustained levels of growth for the present and future generations.

Irrespective of various postulations and policy declarations and proceedings, there are still growing concerns about the increasing depletion of our environment, leaving very few desirable results. Data from the United States Environmental Protection Agency revealed a continued increase in global carbon dioxide emissions and other greenhouse gases into the environment. The agency stated that in 2014, China was the highest emitter of carbon dioxide, with 30% of global emissions. The United States followed this with 15%, and the European Union with a 9% global emission rate. The United States alone emits slightly less than Europe and Central Asia combined. In 2015, 196 countries were present for the Paris Climate Agreement to combat climate change, with a long-term plan to decarbonise their economies since greenhouse gaseous emissions (GHG) are a key element to global warming. In the two and half

decades preceding 2015, when the United Nations Framework Convention on Climate Change signed the COP21 Paris Agreement on climate change, which envisioned keeping global warming below 2 degrees Celsius, the emission of greenhouse gasses continued to rise. China, the United States of America, India, the European Union, Russia, Indonesia, Brazil, and Japan have remained the top emitters of greenhouse gases. However, data between 1990 and 2018 obtained from the World Bank revealed that when the average per capita CO2 emissions are used, countries like the United Arab Emirates (25 metric tons), Kuwait (23 metric tons), Bahrain (22 metric tons), Luxembourg (21 metric tons), USA (18 metric tons), North America region (18 metric tons), Australia (17 metric tons), Canada (16 metric tons), Brunei Darussalam (15 metric tons), Saudi Arabia (14 metric tons) and Trinidad and Tobago (13 metric tons) are considered as top emitters while China, India, Russia and Brazil are regarded as low emitter with about 4 metric ton, 11 metric ton, 1.1 metric ton and 1.8 metric ton emissions respectively. This is quite misleading given that per capita emissions are a negative function of population, and the latter countries have large populations. The energy industry has remained the most significant source of GHG emissions since reporting started in 1990, with 76% of world emissions in 2019. This covers the generation of heat and power and the final applications in industry, construction, transportation, and buildings. This explains why energy usage is a significant contributor to the atmospheric emissions of greenhouse gaseous emissions.

In the last decades, the African continent has experienced rapid growth and industrialisation, with countries like Angola, Egypt, Ethiopia, Kenya, Nigeria, and South Africa experiencing the highest growth rates. Economic growth implies more production and consumption, which involves greater fossil fuels and other nonrenewable energy use. The result is higher emission of greenhouse gases. Based on available data, the highest emitters of CO2 in Africa include Nigeria, South Africa, Libya, Egypt, Angola, and Algeria. Figure 1 below represents the average carbon dioxide emission for 21 African countries selected at random (Egypt, Nigeria, South Africa, Kenya, Togo, Mauritius, Ghana, Cameroon, Ivory Coast, Gabon, Tunisia, Uganda, Zimbabwe, Chad, Morocco, Tanzania, Botswana, Lesotho, Congo Republic, Zambia, and Mauritania) for periods between 1990 and 2020.

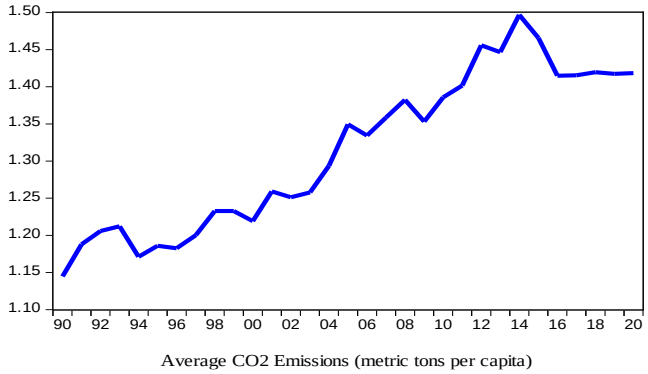

Figure 1 – Average CO2 emissions

Figure 1 indicates a continued increase in per capita carbon dioxide emissions within the selected African countries. On average, CO2 emissions within these regions increased from 1.14 metric tons per capita in 1990 to approximately 1.50 in 2015. However, following the 2015 COP21 Paris Agreement, the average per capita CO2 emission within these regions declined to approximately 1.42 metric tons in 2020, representing a 3.2% decline in CO2 emission.

In response to evaluating the nation's commitment to a green future, an index which measures environmental sustainability was developed by the Yale Center for Environmental Law & Policy and the Center for International Earth Science Information Network at Columbia University in collaboration with the Joint Research Centre of the European Commission and the World Economic Forum, this was termed the Environmental Performance Index (EPI). The Environmental Performance Index (EPI) is an index that offers a variety of indicators, including socioeconomic, environmental, political, and institutional indicators that have a significant impact on environmental sustainability at the local, national, and global levels. Initially, the EPI was formulated to support the United Nations' Millennium Development Goals (MDGs). It, however, adopted measures of the international environmental compact of Sustainable Development Goals (SDGs) to eradicate poverty and promote human development. The Environmental Sustainability Index (ESI) provides a gauge of a society's natural resource endowments and environmental history, pollution stocks and flows, and resource extraction rates, as well as institutional mechanisms and abilities to change future pollution and resource use trajectories. The EPI is used to evaluate the ESI, and the higher the point value, the better the environmental quality. The graph below shows the environmental index performance for thirty randomly selected African countries.

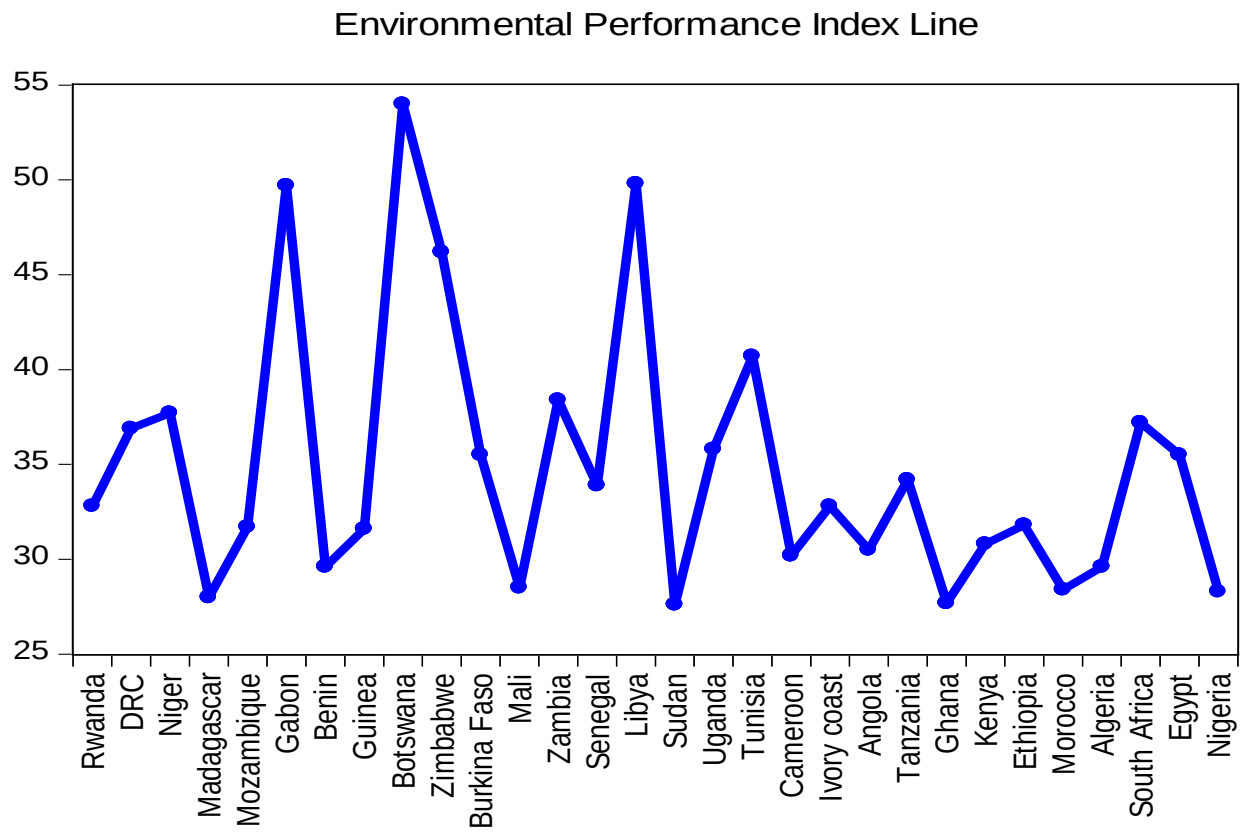

Figure 2 – 2022 Environmental Performance Index Line

The graphical representation reveals that lower to median-income countries in Africa tend to have better environmental quality than higher-income countries in Africa. However, some countries, irrespective of their level of economic development, tend to have a more deteriorated environmental quality than others. Increased economic activities, including production and consumption, may often result in environmental degradation because more harmful gases and chemicals are released into the environment especially when an environmentally unfriendly methods are adopted. Most developing countries, including those in the African continent, adopt environmentally unfriendly productive methods due to insufficient capital, poor institutional framework, and inadequate social infrastructures.

Possibly, environmental conditions might be improved in the long term to support the argument of [5] that after a certain point of achieved economic growth, legislative focus and social investment will be aimed towards sustaining the already deteriorating environment. On this note, this study seeks to explore the relationship between economic growth and environmental sustainability and examine the sustainability status in selected developing countries using panel data analysis. There aren't many empirical studies that focus on a sustainability-oriented EKC analysis in general. In particular, the topic of sustainability has not been covered in the SSA region's EKC analysis. This study improves on these backdrops by extending existing research frontiers and focusing analysis on the African continent. Following this section is the literature review. Section three explains the data, data sources, and methodology employed, section four discusses the results, section five concludes, and gives policy recommendations.

THE LITERATURE REVIEW

Conceptual Review

Sustainable Development. In 1987, Gro Harlem Brundtland officially defined sustainable development in the Brundtland report under the World Commission on Environment and Development [56]. The report defines sustainable development as growth that satisfies current demands without jeopardising the ability of future generations to satiate their own needs. This definition contains two key points: the concept of need, particularly the essential needs of the world's poor population. This requires an overriding priority, and the second is the limitations imposed by the state of technology and institutions on the environment's

ability to meet present and future needs [37]. The definition of sustainable development implies a continual change or evolution of the term "needs". It is doubtful that the present and future generations will have the same or identical needs and priorities [43].

Nevertheless, as explained by John Elkington's triple bottom line theory, sustainable development revolves around three broad dimensions - social, environmental, and economic dimensions. Likewise, [29] presented the paradigm of sustainable development. This paradigm consists of Economic Sustainability, Social Sustainability and Environmental Sustainability. This is elaborately displayed below.

Kahn's Paradigm of Sustainable Development

Elements	Criteria
Economic Sustainability	Growth Development Productivity Trickle Down
Social Sustainability	Equity Empowerment Accessibility Participation Sharing Cultural Identity Institutional Stability
Environmental Sustainability	Eco System Integrity Carrying Capacity Biodiversity

Environmental Sustainability. Environmental sustainability requires maintaining natural capital as both a provider of economic input (sources) and an absorber (sink) of economic output (waste) [13]. Environmental sustainability refers to responsible participation in the environment to prevent the depletion or degradation of natural resources and ensure long-term ecological quality. Environmental sustainability ensures that resources are not consumed faster than they are renewed. Environmental sustainability implies curtailing socioeconomic effects on the environment to preserve life and resources. Socioeconomic effects on the environment could fall under four effect categories: chemical, biological, physical, and sociological. The chemical effect category relates to releasing harmful gaseous substances into the atmosphere. The biological effect category consists of the loss of bio-diversities. The physical effect category relates to and is not limited to the loss of fertile land, food shortage, and lack of clean water. In contrast, the sociological effect category relates to the displacement of people and cultural erosion.

Green House Gases Emission and Economic Growth. Conceptually, economic growth is the quantifiable and consistent rise in a nation's per capita output or income through time, accompanied by increased labour force, consumption capital, and trade volume. It alludes to an increase in the gross national product or the income per person. In a different context, it may refer to an increase in a country's quantitative production of goods and services as economic growth. [38] viewed economic growth as the use of technological advancement and institutional and ideological adjustment to supply increasingly diverse economic goods to its population. According to [7], economic growth can be positive (expansion) or negative (contraction) depending on the values of current and past national output as given by the gross domestic product.

Specifically, the increase in economic activities measured by GDP implies more use of nonrenewable energies and greenhouse gas emissions. Economic growth implies increased industrial and agricultural activities (production and consumption), increased fossil fuel use, possible deforestation, land reclamation, environmental degradation, pollution, etc. Irrespective of the improved output and consumption patterns, there is an increasing tendency for rising emissions of greenhouse gases. This is more plausible because most countries' growth and use of renewable energies are in the early stages. According to the Oxford Dictionary, greenhouse gases contribute to the greenhouse effect by absorbing infrared radiation. Department of Agriculture, Water and the Environment, Australia noted that the greenhouse effect is a natural process that warms the Earth's surface. According to them, "When the sun's energy reaches the earth's atmosphere, some of it is reflected to space and the rest is absorbed and re-radiated by greenhouse gases". They also pointed out that the absorbed energy warms the atmosphere and the Earth's surface. This process maintains the Earth's temperature at around 33 degrees Celsius, which is warmer than it would otherwise be, allowing life on Earth to exist. Examples of greenhouse gases are methane, nitrous oxide, ozone, carbon dioxide and chlorofluorocarbons. Production plants, machines, and vehicles often release these gases.

Theoretical Framework

One of the most cited theories explaining the relationship between the environment and economic progress is the Environmental Kuznets inverted U-shaped curve, which suggests a non-linear relationship exists between the two variables [32]. The theory explains that the environment tends to deteriorate to a certain point (peak of the curve), after which more attention and sustainability investment will be stimulated to improve environmental conditions. The increased sustainability focus was attributed to the increase in per capita income. In a rough sense, the Kuznets environmental curve implies that low per capita income is associated with environmental degradation, while high per capita income is related to ecological sustainability. The EKC's reasoning makes intuitive sense: during the early stages of industrialisation, pollution increases more quickly because expanding material output is given top priority, and individuals are more concerned with their financial well-being than the environment. Rapid growth always results in greater use of natural resources and, consequently, more significant emissions of pollutants, which damage the environment. However, as industrialisation progresses and money rises, the desire to pay for a clean climate rises by a factor more significant than income, environmental regulatory agencies become more effective, and pollution levels decline [30]. This tends to imply that, rather than endangering the environment, economic expansion might, in the long term, be consistent with environmental improvements since nations might eventually grow themselves out of their environmental issues.

In the 1950s, Simon Kuznets developed a hypothesis that was later used to explain the impact of economic growth on the environment. The reformed hypothesis argued that economic growth will result in environmental deterioration in the short run. Still, after certain levels of economic development, society will begin to reconcile with the environment and reduce the levels of degradation. The earliest form of the Kuznets curve in 1955 focused on income inequality and per capita income. However, it was later adopted by [22, 41, 45, 46] to explain the relationships between economic growth and environmental sustainability [8]. The environmental Kuznets curve suggests that as real income increases, individuals and governments devote more time and resources to protecting the environment and mitigating environmental degradation. The EKC further explains that environmental degradation is associated with low per capita income and suggests that poor nations use inefficient and environmentally unfriendly production and consumption methods, which results in harmful environmental consequences. These poor countries cannot afford more efficient and environmentally friendly methods. Still, as per capita income increases, the EKC suggests that there will be an improvement in the environment as these countries begin to adopt environmentally friendly processes and devote more investment and legislation to protecting the environment.

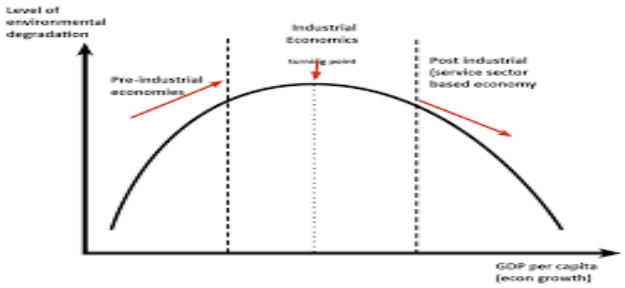

Figure 3 – Environmental Kuznets Curve

Some post-Kuznets theory has different views on the turning point established by Simon Kuznets. Some new views argue that as economic growth increases, existing pollutants will be reduced, but new pollutants that substitute the existing ones will increase. For instance, the race-to-bottom theory emphasises that environmental damage will increase at first due to international competition. However, a point is eventually reached where developed countries will reduce their environmental impacts and transfer/outsource polluting activities to developing or poor countries [51, 54].

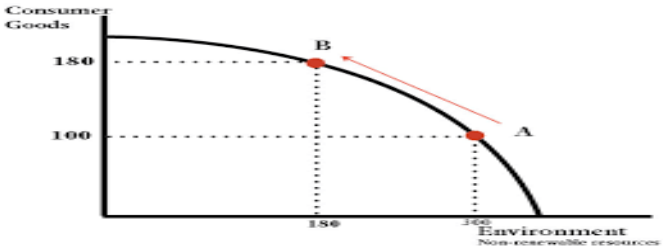

Figure 4 – Trade-off between Consumer Goods and Environment

Based on this theory, nations can combine production and environmental protection. At one point, a choice to increase production, says to point B (180, 180) on the production possibility

frontier (PPF), will result in less environmental protection/stock of resources from 300 to 180 units. On the other extreme side, increasing environmental protection to point A (300, 100) would reduce production to 100 units. In other words, a trade-off exists between more/less goods and less/more environmental stock. The best combination, therefore, depends on domestic and international law and priorities. However, adopting efficient techniques that have less implication on the environment has been observed to increase both production and environmental protection.

Empirical literature

The study on environmental-growth nexus spanned from the early 1990s. Lying in the frontier is [22], and different studies were conducted afterwards. However, there has been inconclusive evidence. The study of [14] between 1961 and 2010 adopted the ARDL model to examine the relationship between carbon emissions, income, and electricity production from renewable energy sources in Turkey. Based on their findings, the researchers conclude that there is an inverted U-shaped relationship between per capita emissions and per capita real income, which supports the environment Kuznets curve. In Tunisia, [28] examined the causal relationship between CO2 emissions, economic growth, renewable and non-renewable energy consumption, and trade between 1980 and 2009, and it was found that trade, per capita export, and import positively impacted per capita CO2 emission. However, the study outcomes supported an inverted EKC in the short run alone. In Pakistan, [3] examined the relationship between CO2, energy consumption, economic growth, trade liberalisation and population density using the ARDL model. Contrary to the findings of [28], [3] found an inverted EKC to exist in the long run alone. While population density was shown to cause environmental degradation, trade openness was revealed to improve the environment in the short run. [55] employed the ARDL model to test the EKC in India by incorporating coal consumption and trade openness between 1966 and 2009. It was reported that EKC exists in both the short and long run and that trade openness and coal consumption increased carbon emissions in the long run.

Similarly, [27] studied Indian and Chinese economies using the ARDL model for periods between 1971 and 2007. EKC was found to exist in both China and India and energy consumption increases per capita emission by 0.97% in India. [44] employed panel analysis to examine the impact of energy consumption and CO2 emissions on the economic growth of 58 countries. It was revealed that CO2 emissions negatively and statistically significantly impact economic growth. However, the study also showed that energy consumption and FDI positively and significantly affect economic growth in the countries. [59] studied the relationship between total energy consumption, FDI, economic development and CO2 emissions for BRICS countries between 1990 and 2012. The study concludes that due to restrictions in advanced economies, foreign investors find their way into developing countries with little or no environmental restrictions to cause environmental degradation, which makes their conclusion in tandem with the race-to-bottom theory. Energy consumption and trade openness were found to have a long-run negative effect on the environment in the study [53]. Author [1] used the ARDL model to study environmental sustainability and its relationship to economic growth in Ghana, and the results fell short of confirming the EKC hypothesis in both the short- and long-term.

Earlier studies by [57, 42, 23, 25, 15] supported the Kuznets postulation. According to them, they supported the finding of [5] that economic growth is a prerequisite and a requirement for environmental sustainability. However, [4] argued that environmental degradation is not only caused by the impact of income per capita growth but also by other economic development factors [24]. More recent studies have recorded different results regarding sustainability in various regions. The studies of [47, 9, 58, 17, 31, 11] supported the evidence of the EKC hypothesis, while the studies of [6, 36, 35, 40] are of contrasting views and mixed results were recorded in the studies of [10, 19, 26, 20, 21, 33, 34, 39, 49].

METHOD

To access environmental sustainability and economic growth in Africa, cross-sectional data on greenhouse gaseous emissions, GDP growth rate, manufacturing value-added, agricultural value-added, and foreign direct investment were sourced for Nigeria, South Africa, Cameroon, Egypt, Ethiopia, Morocco, Kenya, Ghana, Tanzania, Angola, Ivory Coast, Zimbabwe, Chad, Botswana, and Tunisia as specific African countries to be studied. Data for these countries were sourced from World Development Indicators (2022)

between 1990 and 2022. The study expresses environmental sustainability (proxy by greenhouse gaseous emissions) as a function of GDP growth rate, manufacturing value, agricultural value addition and foreign direct investment, and it is shown below:

$$GHG = ƒ(GDPG, GDPG^2, MVA, AVA, FDI) \quad (1)$$

$$GHG_{it} = \alpha + \beta_1 GDP_{it} + \beta_2 GDPG^2_{it} + \\ + \beta_3 MVA_{it} + \beta_4 AVA_{it} + \beta_5 FDI_{it} + \epsilon_{it} \quad (2)$$

where GHG represents greenhouse gas emissions in MtCO2e; PGDP represents per capita GDP, a proxy for economic development; MVA represents manufacturing value added (% of GDP); AVA represents agricultural value added (% of GDP); FDI represents foreign direct investments (% of GDP); ϵ is the noise or stochastic term; T is time; *i* is countries and i= 1, 2, 3, …., 21; βs are the coefficients of the explanatory variables.

RESULTS AND DISCUSSION

This paper employed the Fixed Effect (FEM) method and rejected the possibility of using the Pooled OLS as shown by the Breusch-Pagan - Lagrange Multiplier (LM) test. The Hausman tests also indicated that the Fixed Effect model is a more efficient for regressing the model (Table 1).

The Hausman test justifies the decision to use the Fixed Effect (FE) model with a prob value of 0.0000. The result of the random effect panel model is presented in Table 2.

Table 1 – Breusch- Pagan and Hausman Test

Breusch- Pagan	Cross- section	Time	Both
Prob.	0.0000	0.1633	0.0000
Hausman Test	Chi^2 Statistics	Chi^2 d.f	Prob.
Cross Section Random	55.121074	6	0.0000

Table 2 – Results of the Estimated Model

Explanatory Variables	Coefficients	t-statistics	Prob.
GDPG	0.030047	5.299197	0.0000
GDPG2	-0.002422	-4.366143	0.0000
AVA	-0.009286	-4.079248	0.0001
MVA	-0.036466	-6.841731	0.0000
FDI	-0.019000	-2.799994	0.0053
TOP	0.001948	1.604652	0.1093
C	4.988047	38.59331	0.0000
F – Statistics	314.1467		0.0000

Table 2 represents the results of the random effect model of the panel regression. The p-value of the F-statistics shows that all explanatory variables except trade openness jointly impact the dependent variable and are significant even at a 1% level. The estimates show that the coefficient of GDP growth rate is positive and statistically significant. However, the GDP growth rate squared is negative and statistically significant. These coefficients suggest that economic growth contributes positively and significantly to environmental degradation through the emission of greenhouse gases but substantially declines as the economy grows further. Thus, these coefficients show that we have an inverted U-curve, which supports the Environmental Kuznets Curve (EKC) Hypothesis. According to the EKC Hypothesis, countries often prioritise economic growth over environmental concerns at the early stage of their economic development. Industries may engage in resource-intensive activities without adequate environmental regulations, leading to pollution and degradation of natural capital. As a country's economy grows and per capita income rises, the EKC Hypothesis suggests that society becomes more concerned about environmental issues and the quality of life, hence, more environmentally responsible. This can lead to increased demand for environmental protection and better regulations and policies. Economic growth might still contribute to environmental degradation but at a lower rate. However, beyond a certain level of per capita income, the theory suggests that societies become wealthy enough to afford cleaner and more efficient technologies, stricter regulations and environmental policies, and more sustainable consumption patterns. At this stage, environmental concerns become more critical, and economic growth starts to disassociate from environmental degradation, resulting in an overall improvement in environmental conditions. We also find that agricultural value-added (AVA) as a percentage of GDP, manufacturing value-added (MVA) as a percentage of GDP and foreign direct investment (FDI) have negative and significant impacts on greenhouse gas emissions, hence promoting environmental sustainability. In contrast, trade openness had positive but insignificant effects on greenhouse gas emissions.

CONCLUSIONS

This paper reviewed the concept of environmental sustainability and economic growth with evidence from countries that towed the line in the

past and recent times to develop theoretical backings and policies to combat more of the hazards against a green future. Though the path to environmental sustainability and economic growth in each country and territory may differ, the goal is the same for all. It is worth noting that the global environment keeps deteriorating despite policies put forward since the Rio 1992 Earth Summit. Micro and macroeconomic environment changes sprout issues that make achieving a green future daunting. However, depending on the commitment towards environmental sustainability and measures put in place, environmental sustainability must be reached as soon as possible – humanly and economically. This may imply that strategies and policies to be developed should be communicated effectively to shareholders and tailored towards specific countries and economic needs for optimum results.

This paper's analysis reveals that economic growth's impact on environmental sustainability is significant. Conclusions were made that increased economic growth will increase greenhouse emissions and deter environmental sustainability. However, the result also follows the Kuznets inverted U-curve, which suggests improving environmental conditions as per capita income increases.

The study urges policymakers across Africa to be benevolent in crafting economic policies – considering the environmental and social impacts to protect people's well-being today and in future generations. Appropriate sensitisation and policy initiatives such as taxes and subsidies should be effectively employed to reduce emissions of greenhouse gases to the barest minimum while also promoting eco-investing and eco-friendly initiatives. Mainly, investment in renewable energy is always a solution to environmental sustainability at every level of economic advancement, safeguarding and sustaining resources and creating long-term sustainable mechanisms for cycling and recycling natural resources where necessary to promote a green economy. Efforts should also be made to rehabilitate degraded ecosystems.

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