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Innovative Climate Finance in Ghana: A Systematic Review of Green Bonds, Blended Finance, and Climate Funds

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ABSTRACT

This systematic review investigates the potential of innovative climate finance instruments, specifically green bonds, blended finance, and international climate funds, to support Ghana's climate resilience goals without compromising fiscal sustainability. Drawing on literature from 2000 to 2025 and guided by the Environmental Kuznets Curve (EKC), Sustainable Development Finance Theory, and Debt Sustainability Analysis (DSA), the study synthesises evidence from academic articles, policy documents, and institutional reports. The findings indicate that although these instruments offer strategic pathways for mobilising investment and diversifying Ghana's financing mix, their effectiveness is undermined by regulatory fragmentation, limited institutional capacity, and procedural inefficiencies. Green bonds are constrained by governance and disclosure gaps, blended finance suffers from weak coordination and legal ambiguities, and access to

international climate funds is hindered by administrative bottlenecks. The review's originality lies in its integration of fiscal sustainability and climate finance through a multi-theoretical lens, offering a novel synthesis of how Ghana can strategically scale climate finance amid debt constraints. To enhance the impact of these mechanisms, the study recommends a comprehensive green finance framework, institutional reform, and integration of climate-risk assessments into public financial management systems. This work contributes to bridging research and policy by outlining actionable reforms and calling for econometric research to evaluate fiscal-environmental outcomes.

KEYWORDS: Climate finance, green bonds, blended finance, Ghana, debt sustainability, environmental policy, fiscal resilience, systematic review

JEL CODES: G23, H63, O55, Q56, Q01,

1. INTRODUCTION

Climate change is increasingly recognised as one of the most critical challenges facing developing economies, particularly in sub-Saharan Africa. Countries like Ghana are already experiencing the adverse consequences of climate variability, including rising temperatures, erratic rainfall, droughts, flooding, and coastal erosion (World Bank, 2022). These environmental stresses have far-reaching socio-economic implications, threatening food security, water availability, public health, infrastructure, and overall economic growth. As a lower-middle-income country, Ghana remains highly vulnerable to climate risks due to its economic dependence on agriculture and natural resource extraction, both of which are climate-sensitive sectors (UNDP, 2023).

In response, Ghana has made considerable efforts to integrate climate change mitigation and adaptation into its national development agenda. Key policy frameworks such as the Ghana National Climate Change Policy, the National Adaptation Plan, and the updated Nationally Determined Contributions (NDCs) reflect the government's commitment to sustainable and inclusive climate action (Ministry of Environment, Science, Technology and Innovation [MESTI], 2021). These initiatives aim to reduce greenhouse gas emissions, promote renewable energy, enhance climate resilience, and align with global targets under the Paris Agreement.

However, despite these policy commitments, Ghana faces serious financing constraints that threaten the realization of its climate objectives. The country's public debt has risen sharply over the past decade, surpassing 90% of GDP as of 2023 and placing the country under debt distress (International Monetary Fund [IMF], 2023). This elevated debt burden has significantly reduced Ghana's fiscal space, constraining public investment in critical areas such as climate adaptation infrastructure, renewable energy, and environmental protection (Acheampong et al., 2019; Were, 2024). According to Towah (2019), the fiscal rigidity created by debt servicing obligations and macroeconomic instability has widened the financing gap for climate action, limiting Ghana's ability to mobilise domestic resources and access concessional international financing.

Moreover, global climate finance flows to Africa remain disproportionately low. Although international mechanisms such as the Green Climate Fund and the Global Environment Facility offer some support, these are often insufficient, highly competitive, and tied to complex eligibility and reporting requirements that low-capacity governments struggle to meet (Dzebo et al., 2021). Ghana's experience illustrates the broader challenge faced by many developing countries: the need

to reconcile urgent climate action with the realities of debt sustainability and limited budgetary flexibility.

To address this dual challenge, there is growing interest in exploring innovative climate finance mechanisms. These include instruments such as green bonds, debt-for-climate swaps, blended finance, and climate-aligned public-private partnerships, which can potentially unlock new funding sources and mitigate fiscal pressures (Banga, 2022; United Nations Economic Commission for Africa [UNECA], 2023). However, the effectiveness of these instruments in Ghana depends on a range of factors, including institutional readiness, regulatory frameworks, risk-sharing structures, and alignment with national development priorities.

Innovative climate finance mechanisms-encompassing instruments such as green bonds, blended finance, and international climate funds-are increasingly being recognised as viable alternatives to traditional public financing for climate action. These mechanisms offer pathways for mobilising private sector investment, leveraging concessional funding, and reducing pressure on already constrained national budgets (Fonta et al., 2018; Climate Policy Initiative, 2021; United Nations Development Programme [UNDP], 2021; Debrah et al., 2023). Green bonds, for instance, provide capital for environmentally sustainable projects while offering investors stable, long-term returns.

Blended finance combines public and philanthropic resources with private investment to de-risk climate-related projects, making them more attractive to commercial investors (Banga, 2022). Similarly, international climate funds-such as the Green Climate Fund (GCF) and the Climate

Investment Funds (CIF)-can support large-scale adaptation and mitigation programs in developing countries through grants, concessional loans, and technical assistance (Dzebo et al., 2021).

In Ghana, the uptake of these innovative finance mechanisms remains at an early stage, constrained by institutional capacity gaps, regulatory hurdles, limited technical expertise, and weak financial markets (Climate Policy Initiative, 2021; United Nations Development Programme [UNDP], 2021; Africa Policy Research Institute [APRI], 2022; Debrah et al., 2023; UNECA, 2023). Nonetheless, several pilot initiatives, including the issuance of sovereign green bonds and blended finance facilities for renewable energy, signal emerging opportunities for scaling up climate investment. A deeper understanding of how these instruments are being designed, deployed, and integrated into Ghana's fiscal and environmental policy frameworks is therefore essential for informing both policy and practice.

This study extends the author's earlier work on environmental finance in developing economies (Yeboah & Prempeh, 2023) by narrowing the geographic focus to Ghana and introducing new theoretical lenses. It provides a deeper, context-specific analysis of how green bonds, blended finance, and international climate funds intersect with Ghana's fiscal and policy architecture. In doing so, it offers original insights and policy recommendations tailored to the Ghanaian context.

To that end, this paper conducts a systematic review of the existing literature on innovative climate finance in Ghana. The review synthesises empirical and theoretical insights on the design, implementation, and effectiveness of these mechanisms within the Ghanaian context. It aims to answer key questions about the role of innovative climate finance in addressing the dual challenge

of climate vulnerability and public debt, and how these tools can be better harnessed to promote sustainable development.

1.2.Theoretical Framework

This review is grounded in the Environmental Kuznets Curve (EKC) hypothesis (Grossman & Krueger, 1991), which posits a nonlinear, inverted U-shaped relationship between economic growth and environmental degradation. According to this hypothesis, environmental degradation initially increases with economic growth, but after reaching a certain income threshold, further growth leads to environmental improvement due to increased environmental awareness, technological advancements, and stronger environmental regulations.

In the context of Ghana, empirical studies have examined the validity of the EKC hypothesis. Sarkodie and Strezov (2018) conducted a study analysing data from 1971 to 2013 for Ghana, among other countries. Their findings indicated that in the early stages of economic development, Ghana experienced increased carbon dioxide emissions, primarily due to reliance on biomass and fossil fuels. However, as the economy grew, there was a gradual shift towards cleaner energy sources and improved energy efficiency, supporting the EKC hypothesis.

Further supporting this, Fumey et al. (2024) utilised advanced econometric models to analyse the relationship between economic growth, renewable energy consumption, and carbon dioxide emissions in Ghana from 1993 to 2020. Their study confirmed the EKC hypothesis, revealing that while economic growth initially led to higher emissions, increased investment in renewable energy and sustainable practices eventually contributed to environmental improvement.

These studies underscore the relevance of the EKC framework in assessing the trade-offs and synergies between economic growth and ecological sustainability in Ghana. Understanding this relationship is crucial for formulating policies that promote sustainable development while mitigating environmental degradation.

The second framework underpinning this review is the Sustainable Development Finance Theory (Sachs, 2005), which emphasises the integration of environmental, social, and economic dimensions into financial decision-making processes. This theory advocates for aligning financial systems with the principles of sustainable development, asserting that long-term economic resilience is intrinsically linked to environmental protection and social equity (Georgeson & Maslin, 2018; Ziolo et al., 2021).

Ziolo et al. (2021) argue that sustainable finance plays a pivotal role in achieving the Sustainable Development Goals (SDGs) by directing financial flows towards projects that generate positive environmental and social outcomes. Their study highlights that integrating environmental, social, and governance (ESG) factors into financial systems can lead to more effective risk management and value creation, thereby enhancing the overall sustainability of economic activities.

Furthermore, the incorporation of ESG considerations into financial decision-making processes is increasingly recognised as a strategic approach to fostering sustainable development. This integration not only addresses the immediate financial returns but also considers the long-term impacts on society and the environment, ensuring that financial activities contribute positively to broader sustainability objectives (Ziolo et al., 2021).

In the context of Ghana, applying the Sustainable Development Finance Theory provides a valuable lens for evaluating the transformative potential of climate finance instruments. By assessing how financial mechanisms can be structured to support sustainable development goals, policymakers and stakeholders can better understand the pathways through which financial systems can contribute to environmental sustainability and social well-being.

The third framework, Debt Sustainability Analysis (DSA) (International Monetary Fund, & World Bank, 2004), provides an evaluative tool for examining a country's capacity to manage its debt obligations without incurring fiscal stress. DSA is particularly critical in the context of climate finance, where governments often rely on debt instruments to fund climate-resilient infrastructure and adaptation programs. It allows for the assessment of whether such borrowing strategies are fiscally prudent and aligned with long-term macroeconomic stability (Mapuvire, 2023; Nattabi, 2025). Collectively, these three frameworks offer a robust analytical foundation for understanding how climate finance mechanisms can be leveraged to achieve both environmental goals and economic sustainability.

1.3.Research Problem

Ghana, like many developing economies, faces a dual challenge: advancing economic development while building resilience to the escalating impacts of climate change. Rising temperatures, extreme weather events, and shifting rainfall patterns threaten key sectors such as agriculture, energy, and infrastructure. In response, Ghana has committed to ambitious climate goals through its Nationally Determined Contributions (NDCs) and other climate policies. However, achieving these goals is hindered by rising public debt and constrained fiscal space,

which limit the government's ability to finance long-term climate resilience and low-carbon development strategies (Acheampong et al., 2019; Towah, 2019; Were, 2024).

In this context, innovative climate finance mechanisms- notably green bonds, blended finance, and international climate funds- offer promising alternatives to traditional public financing. These instruments aim to unlock private sector capital, diversify financing sources, and reduce the pressure on domestic budgets, all while targeting environmental outcomes (Fonta et al., 2018; Debrah et al., 2023). Yet, the application and integration of such instruments within Ghana's fiscal and policy architecture remain fragmented, and their long-term impact on both climate resilience and debt sustainability is not well understood.

1.4. Research Objectives

This study undertakes a systematic review of innovative climate finance mechanisms in Ghana, with a focus on evaluating their current use, structural challenges, and strategic relevance to climate and fiscal objectives. Specifically, the study seeks to:

- i. Analyse the application and evolution of green bonds, blended finance, and international climate funds within Ghana's climate finance architecture.
- ii. Identify institutional, legal, and capacity-related constraints affecting the effectiveness of these financing instruments.
- iii. Evaluate the role of innovative climate finance in advancing climate resilience while maintaining debt sustainability.

- iv. Recommend an integrated policy and institutional framework for enhancing the scalability and impact of climate finance mechanisms in Ghana.

1.5. Research Questions

The review is guided by the following research questions:

- i. How have green bonds, blended finance, and international climate funds been utilised to finance Ghana's climate objectives?
- ii. What institutional, regulatory, and operational barriers limit the deployment and effectiveness of these mechanisms?
- iii. In what ways do these instruments contribute to Ghana's dual goals of environmental sustainability and fiscal stability?
- iv. What strategic reforms and policy innovations are required to optimise climate finance and integrate it within national development and debt management frameworks?

1.6. Scope of the Study

The review focuses on three core climate finance mechanisms—green bonds, blended finance, and international climate funds- as applied in Ghana between 2000 and 2025. It synthesises peer-reviewed articles, government documents, and reports from international agencies to provide a contextualised understanding of how these mechanisms function within Ghana's fiscal and environmental landscape. While the primary focus is on Ghana, insights may be relevant to other Sub-Saharan African economies facing similar development-finance trade-offs.

1.7.Limitations

As a literature-based study, the review is constrained by the availability and quality of existing publications. The analysis does not include primary data, which may limit the depth of insight into recent policy changes or implementation experiences. Additionally, the fast-evolving nature of climate finance means that some recent developments may not yet be reflected in the literature reviewed.

2. METHODOLOGY

This study adopts a systematic review methodology, adhering to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to ensure transparency and rigour in the review process. A comprehensive search was conducted across multiple academic databases, including Google Scholar, Scopus, JSTOR, and institutional repositories, to identify relevant literature on innovative climate finance mechanisms-specifically green bonds, blended finance, and international climate funds-within the context of Ghana or comparable developing economies.

The inclusion criteria for the review focused on publications from 2013 to 2024 that addressed the role of these financial instruments in promoting climate resilience and fiscal sustainability in Ghana. Publications were selected based on their relevance to the research questions, methodological rigour, and contribution to the understanding of climate finance dynamics in the context of developing economies (Akomea-Frimpong et al., 2022; Fu et al., 2024). A total of 87 documents were identified through the initial search process, which included peer-reviewed articles, reports from international organisations, and institutional publications.

The selected documents were subjected to a thematic analysis, which involved coding the literature to identify recurring themes, key findings, and gaps in the existing research. This approach enabled the synthesis of insights related to the challenges and opportunities associated with the implementation of green bonds, blended finance, and international climate funds in Ghana. The thematic analysis also facilitated the identification of common barriers to climate finance adoption, including institutional capacity constraints, regulatory gaps, and policy misalignments.

3. FINDINGS

3.1. Green Bonds

Ghana has taken initial steps toward adopting green bonds as a climate finance instrument to mobilise resources for renewable energy and urban resilience projects. In 2017, the government issued a \$2.25 billion domestic bond to support infrastructure development, including energy-related projects (Ministry of Finance, 2017; Nakouwo & Zhang, 2024). While not officially categorised as a green bond, the issuance was indicative of the country's intent to channel capital toward sustainability-linked infrastructure.

Despite this early progress, Ghana's green bond market remains underdeveloped and constrained by several structural challenges. A major impediment has been the absence of a dedicated regulatory framework for green bond issuance until recently. In response, the Securities and Exchange Commission (SEC) of Ghana introduced the *Securities Industry (Green Bond) Guidelines* in 2024, aligned with international best practices such as the ICMA Green Bond Principles (Securities and Exchange Commission, 2024).

In addition, the lack of a standardised green investment taxonomy has historically hindered the classification and assessment of green projects. This limitation was partially addressed in October 2024 when the Ministry of Finance launched Ghana's first *Green Finance Taxonomy*, aiming to streamline and standardise sustainable investment practices (Ministry of Finance, 2024).

Moreover, weak environmental disclosure and monitoring mechanisms have discouraged investor participation and limited the scalability of green bond issuance in the country (Bhutta et al., 2022; El-Sholkamy & Rahman, 2022). Regulatory reforms are expected to enhance transparency and investor confidence in Ghana's emerging sustainable finance landscape (TEMPLARS, 2024).

3.2. Blended Finance

Blended finance—defined as the strategic use of concessional funds to attract private investment into sustainable development sectors—has begun to gain visibility in Ghana's climate finance ecosystem. This approach has proven useful in mitigating investment risks in key areas such as renewable energy and climate-smart agriculture (Alaerts, 2019; Choi & Seiger, 2020). For instance, blended finance mechanisms have been employed to support off-grid renewable energy technologies, enhancing affordability for rural households in Ghana (Global Partnership on Output-Based Aid [GPOBA], 2018).

However, the deployment of blended finance in Ghana remains uneven due to several institutional bottlenecks. These include fragmented policy coordination, insufficient financial structuring

capabilities, and ambiguous legal and contractual frameworks governing public-private partnerships (PPPs). The Public Private Partnership Act, 2020 (Act 1039), was enacted to provide a comprehensive legal framework for PPPs, aiming to address some of these challenges (Ministry of Finance, 2020). Despite this, the practical implementation of blended finance initiatives continues to face hurdles, such as limited capacity among local financial institutions and a lack of standardised procedures for project appraisal and risk assessment (Biekpe & Kodongo, 2019; Climate Policy Initiative [CPI], 2023; Forster et al., 2023). These challenges have curtailed the widespread adoption of blended finance and limited its transformative potential in Ghana's climate finance landscape.

3.3. International Climate Funds

Ghana has made commendable efforts in securing concessional climate finance from multilateral sources, notably the Green Climate Fund (GCF) and the Climate Investment Funds (CIF). These funds provide critical support for mitigation and adaptation projects, thereby reducing the country's dependency on commercial borrowing (Michaelowa et al., 2021; Green Climate Fund, 2024).

For instance, the GCF has approved projects such as the Ghana Shea Landscape Emission Reductions Project (FP137), which aims to restore degraded savannah forests and strengthen livelihoods through enhanced ecosystem services (Green Climate Fund, 2024a). Additionally, the Accelerating Solar Action Programme (ASAP) supports Ghana's transition away from fossil fuels in line with its Nationally Determined Contributions (Green Climate Fund, 2024b).

Similarly, the CIF has invested over \$75 million through its Forest Investment Program (FIP) to support projects that unite public and private sectors with Indigenous peoples and local communities in restoring degraded forest landscapes and improving forest management (Climate Investment Funds, 2024).

However, access to and effective utilisation of these funds require a high level of institutional readiness and strict adherence to fiduciary, social, and environmental safeguards. Delays in fund disbursement, bureaucratic inefficiencies, and capacity gaps in project development and reporting continue to constrain the full potential of international climate funds in Ghana's development finance mix (Michaelowa et al., 2021).

4. DISCUSSION

This study set out to explore how innovative climate finance mechanisms—green bonds, blended finance, and international climate funds—can be leveraged to advance sustainable development in Ghana. The analysis was guided by three interrelated theoretical frameworks: The Environmental Kuznets Curve (EKC) hypothesis, Sustainable Development Finance Theory, and Debt Sustainability Analysis (DSA). The integration of these frameworks provides nuanced insights into the economic-environmental trade-offs, financial architecture, and fiscal prudence underpinning climate finance strategies in the country.

4.1. Green Bonds and the Environmental Kuznets Curve

The adoption of green bonds in Ghana aligns with the EKC hypothesis, which posits that environmental degradation rises in the early stages of economic development but declines as

income increases and cleaner technologies and stronger regulations are adopted (Grossman & Krueger, 1991). Ghana's initial bond issuance in 2017, although not formally categorized as green, channeled significant resources into infrastructure development, including energy projects (Ministry of Finance, 2017). This indicates a transitional phase consistent with the EKC's turning point, where economic growth begins to be harnessed for environmental improvement.

As observed by Sarkodie and Strezov (2018), Ghana's earlier reliance on fossil fuels and biomass was associated with rising emissions; however, a gradual transition to renewable energy is now evident. This is further corroborated by Fumey et al. (2024), who found that renewable energy investment has recently contributed to emission reductions. Nevertheless, Ghana's green bond market remains underdeveloped due to regulatory gaps, lack of standardised taxonomies, and weak environmental disclosure practices (Bhutta et al., 2022; El-Sholkamy & Rahman, 2022). The introduction of the Green Bond Guidelines by the Securities and Exchange Commission (2024) and the recent launch of the Green Finance Taxonomy (Ministry of Finance, 2024) suggest a movement toward the EKC's post-inflexion phase, where institutional frameworks begin to support sustainable finance and environmental improvement.

4.2. Blended Finance and Sustainable Development Finance Theory

Blended finance's potential in Ghana is best understood through the lens of Sustainable Development Finance Theory, which advocates for the integration of environmental, social, and economic dimensions in financial decision-making (Sachs, 2005; Ziolo et al., 2021). By using concessional funds to de-risk private investments, blended finance offers a mechanism to mobilise

capital into sectors critical for sustainable development, such as off-grid energy and climate-smart agriculture (Alaerts, 2019; GPOBA, 2018).

However, as the findings show, the deployment of blended finance remains constrained by fragmented policy environments, limited structuring capabilities, and inconsistent legal frameworks (Biekpe & Kodongo, 2019; CPI, 2023). Despite the enactment of the Public Private Partnership Act (Act 1039) in 2020 to provide legal clarity (Ministry of Finance, 2020), the lack of capacity within local financial institutions and ambiguous project appraisal standards continue to inhibit its effectiveness.

According to Ziolo et al. (2021), sustainable finance must move beyond profit-maximisation to consider ESG (environmental, social, and governance) metrics. In this context, Ghana's slow progress in blended finance reflects an underdeveloped ESG ecosystem. Strengthening institutional and regulatory support could enable blended finance to function as a catalyst for achieving the Sustainable Development Goals (SDGs), as proposed by Sustainable Development Finance Theory (Georgeson & Maslin, 2018).

4.3. International Climate Funds and Debt Sustainability Analysis

The reliance on international climate funds such as the Green Climate Fund (GCF) and Climate Investment Funds (CIF) introduces fiscal and macroeconomic dimensions that are well addressed by the Debt Sustainability Analysis (DSA) framework (IMF & World Bank, 2004). While concessional funding from these sources reduces Ghana's dependency on commercial borrowing and offers favourable terms, it still contributes to the overall public debt burden.

Michaelowa et al. (2021) underscore the importance of institutional readiness and fiduciary compliance in accessing these funds, a sentiment echoed in this study's findings. Projects such as the Ghana Shea Landscape Emission Reductions Project (Green Climate Fund, 2024a) and the Accelerating Solar Action Programme (Green Climate Fund, 2024b) exemplify how international climate finance can support environmental objectives while reducing fiscal risks.

However, persistent delays in disbursement, coupled with bureaucratic inefficiencies and capacity limitations in project reporting, undermine the full potential of these instruments. From a DSA perspective, it is imperative that Ghana's climate finance strategy aligns with broader debt management goals to ensure long-term fiscal sustainability (Mapuvire, 2023; Nattabi, 2025). This includes prioritising concessional over non-concessional borrowing, enhancing absorptive capacity, and integrating climate finance planning within national debt frameworks.

4.4. Integrating Frameworks for Policy and Practice

Taken together, the findings demonstrate the complementary nature of the three theoretical frameworks. The EKC highlights the environmental dynamics of economic transformation, Sustainable Development Finance Theory underscores the importance of aligning finance with sustainability objectives, and DSA provides a fiscal lens for evaluating the prudence of climate-related borrowing.

For Ghana to unlock the full potential of innovative climate finance, a multi-pronged policy approach is essential- one that strengthens regulatory frameworks for green bonds, builds institutional capacity for blended finance structuring, and ensures that concessional climate

funding aligns with prudent debt strategies. Such alignment would not only enhance environmental outcomes but also bolster macroeconomic stability and social inclusion.

5. CONCLUSION

This review examined the role of innovative climate finance mechanisms—green bonds, blended finance, and international climate funds—in supporting Ghana’s sustainable development trajectory. Grounded in the Environmental Kuznets Curve (EKC) hypothesis, Sustainable Development Finance Theory, and Debt Sustainability Analysis (DSA), the analysis revealed that while significant progress has been made, substantial institutional, regulatory, and capacity-related constraints continue to limit the transformative potential of climate finance in Ghana.

Green bonds show early promise but remain underutilised due to weak regulatory foundations, a lack of standardised green taxonomies, and limited investor confidence. Blended finance offers a strategic pathway to de-risk private capital for sustainable projects but is hampered by fragmented governance structures and underdeveloped financial markets. International climate funds provide critical concessional resources, yet their deployment is slowed by capacity limitations and bureaucratic hurdles, raising concerns about alignment with long-term fiscal sustainability.

Collectively, these findings underscore the need for a coherent, well-coordinated national climate finance strategy that integrates environmental objectives with economic resilience and debt prudence. By aligning finance mechanisms with sustainable development goals (SDGs), Ghana can enhance its capacity to transition toward a low-carbon, climate-resilient economy.

6. POLICY IMPLICATIONS

The findings carry several important policy implications for Ghana's climate finance ecosystem. First, strengthening regulatory coherence and institutional capacity is vital for creating an enabling environment for sustainable investments. This includes the operationalisation of the Green Bond Guidelines and Green Finance Taxonomy, which would help streamline the process of assessing and classifying green investments. Additionally, addressing institutional capacity gaps within both the public and private sectors is crucial for ensuring the effective design, appraisal, and implementation of climate projects. A comprehensive regulatory framework will instill confidence among investors and support the scaling up of climate finance instruments such as green bonds.

Furthermore, there is a strong need to mainstream sustainability within public finance frameworks. Integrating climate finance into national budgeting, debt management, and fiscal planning will ensure that concessional borrowing from climate funds is aligned with macroeconomic stability objectives. This alignment will be consistent with the principles of Debt Sustainability Analysis (IMF & World Bank, 2004), ensuring that climate investments contribute to long-term fiscal health without exacerbating national debt burdens.

In addition, embedding environmental, social, and governance (ESG) criteria into financial markets is essential for fostering transparency, accountability, and investor confidence. By incorporating ESG standards, Ghana can enhance the credibility of its climate finance initiatives, particularly in the scaling of blended finance and green bond markets. This integration would not only attract more private sector involvement but also ensure that financial flows are directed

toward projects that meet sustainability goals, as outlined in the Sustainable Development Finance Theory (Ziolo et al., 2021).

Lastly, policymakers should prioritise climate investments based on insights from the Environmental Kuznets Curve (EKC) hypothesis. According to the EKC framework, economic growth can lead to environmental improvements once a certain income threshold is crossed, particularly through investments in renewable energy, clean transportation, and sustainable agriculture. These sectors are best positioned to align with the EKC trajectory, where economic growth contributes to environmental enhancement. By targeting investments in these areas, Ghana can create a sustainable and resilient economy that benefits both its people and the environment (Grossman & Krueger, 1991; Fumey et al., 2024).

7. RECOMMENDATIONS

Based on the empirical findings and theoretical underpinnings, several key recommendations are proposed to enhance Ghana's climate finance landscape. First, it is crucial to operationalize a National Climate Finance Strategy that clearly defines the roles and responsibilities of various stakeholders, including the government, development partners, and the private sector. This strategy should prioritize scalable instruments such as green bonds and blended finance, ensuring that these mechanisms are aligned with Ghana's Nationally Determined Contributions (NDCs). Such a strategy would help streamline climate finance efforts and direct resources towards high-impact projects.

In addition, establishing a centralised Climate Finance Unit within key governmental bodies, such as the Ministry of Finance or the Environmental Protection Agency, is essential for effective coordination and oversight. This unit could take the lead in coordinating donor engagement, ensuring compliance with environmental, social, and governance (ESG) standards, and providing technical assistance to subnational entities and financial institutions. A dedicated unit would enhance the overall efficiency of climate finance administration and promote greater synergy among stakeholders.

Capacity-building initiatives are also crucial for improving the effectiveness of climate finance in Ghana. Targeted training programs for local banks, municipal authorities, and project developers on climate risk assessment, project structuring, and fiduciary standards would significantly boost absorptive capacity and project readiness. Empowering local actors with the necessary skills and knowledge will facilitate the successful implementation of climate finance projects and strengthen the sustainability of such initiatives.

Furthermore, Ghana should actively leverage regional and international platforms to strengthen its climate finance efforts. By engaging in regional green finance initiatives under the African Development Bank, ECOWAS, and the African Green Finance Coalition, Ghana can share knowledge, exchange best practices, and attract investment through blended finance facilities. Collaboration within these regional networks can foster innovation, expand access to funding, and increase the scalability of climate finance initiatives in Ghana.

Lastly, enhancing the Monitoring, Reporting, and Verification (MRV) systems for climate finance flows and project outcomes is critical for ensuring transparency, accountability, and progress tracking. Robust MRV systems will allow the government and other stakeholders to track the effectiveness of climate finance investments, measure progress toward meeting climate goals, and fulfil international reporting obligations. Effective MRV mechanisms will also help build investor confidence and demonstrate Ghana's commitment to sustainable development.

8. DIRECTIONS FOR FUTURE RESEARCH

While this review provides a foundational understanding of Ghana's evolving climate finance landscape, several research gaps require further exploration to deepen the knowledge base and inform policy improvements. Future research should focus on the empirical testing of the theoretical frameworks applied within Ghana's specific context. While the Environmental Kuznets Curve (EKC), Sustainable Development Finance Theory, and Debt Sustainability Analysis (DSA) offer useful conceptual insights, there is limited empirical validation using longitudinal econometric models tailored to Ghana. Future studies should consider applying time-series or panel data approaches to evaluate the causal relationships between climate finance flows, environmental outcomes, and macroeconomic indicators, particularly focusing on the country's unique socio-economic dynamics.

Another critical area for future investigation is the micro-level assessment of climate finance impacts. There is a need for detailed project-level evaluations that explore how specific climate finance instruments, such as blended finance for off-grid solar or Green Climate Fund (GCF)-funded agricultural projects, influence household resilience, livelihoods, and emissions reductions.

These granular, bottom-up assessments would complement broader macroeconomic models and provide more targeted policy recommendations for improving the effectiveness and inclusivity of climate finance interventions.

Additionally, further research could delve into the behavioural and institutional dimensions of climate finance in Ghana. Understanding how institutional dynamics, public perceptions, and stakeholder incentives influence the design and implementation of climate finance initiatives is crucial. Investigating behavioural barriers within local financial institutions, public procurement agencies, and other key actors can provide insights into how to refine capacity-building efforts, improve governance structures, and address resistance to sustainable finance solutions.

Comparative studies involving other Sub-Saharan African economies, such as Kenya, Nigeria, or Rwanda, would also provide valuable insights into the challenges and opportunities Ghana faces in scaling climate finance. Cross-country analyses could highlight best practices, common bottlenecks, and successful regulatory, fiscal, and policy innovations that could be adapted to Ghana's context.

Given the increasing reliance on debt instruments to fund climate action, it is important to explore the long-term debt sustainability of green borrowing under various climate and economic growth scenarios. Future research should simulate how different climate and economic conditions might impact Ghana's ability to manage its debt obligations while financing sustainable development initiatives. This research is particularly relevant in light of Ghana's ongoing sovereign debt restructuring and fiscal reforms.

Lastly, future work should explore the role of subnational governments and informal actors in climate finance delivery, especially in underserved populations. Investigating how metropolitan, municipal, and district assemblies (MMDAs) and informal financial actors contribute to the implementation of climate finance at the local level could reveal new pathways for localising climate finance and enhancing inclusivity in climate governance. Understanding these dynamics is crucial for fostering equitable and sustainable development across all regions of Ghana.

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