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MORALITY BEFORE KNOWLEDGE

Climate crisis and carbon accounting in West Africa: Institutional and financial dimensions

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ABSTRACT

Background: Climate change poses pressing challenges for developing regions, yet its impact on carbon accounting remains underexplored in West Africa. This study examines the effect of the climate crisis on carbon accounting practices across 14 West African countries, with attention to the mediating role of institutional capacity and the moderating role of financial sector depth. **Method:** Using a quantitative design, the study draws on panel data from the World Development Indicators (WDI) and Worldwide Governance Indicators (WGI) for 2005–2020. Carbon accounting practices were proxied by carbon dioxide damage as a percentage of Gross National Income (GNI), while climate crisis was measured by CO_2 emissions per capita. Estimation employed Fixed Effects regression models, with mediation and moderation tested through the Baron & Kenny (1986) framework and interaction term analysis in STATA. **Findings:** Results reveal that the climate crisis significantly promotes carbon accounting practices. Institutional capacity partially mediates this relationship, as regulatory frameworks improve under climate stress but are weakened by systemic reporting flaws. Financial sector depth independently enhances carbon accounting yet dampens the direct influence of climate pressures, confirming a moderating effect. **Conclusion:** The findings suggest that climate-induced pressures alone are insufficient without strong institutions and financial systems that prioritize environmental concerns. Policymakers should therefore strengthen regulatory capacity, enforcement mechanisms, and institutional independence to ensure environmental regulations yield meaningful accounting reforms. The study is limited by reliance on secondary data and proxy measures, which may not capture qualitative institutional nuances. The exclusion of The Gambia also constrains generalizability. Future research should explore firm-level practices and assess the effects of green finance and environmental taxation on disclosure. **Novelty/ originality of this article:** The study introduces an integrative framework linking institutional and financial dynamics to climate–accounting interactions, offering both conceptual and methodological contributions in a West African context.

KEYWORDS: accounting; carbon; climate; crisis; depth.

1. Introduction

One of the most significant worldwide issues of the twenty-first century is still climate change, which threatens societal welfare, destabilizes economies, and destroys ecosystems. In developing regions, where governance frameworks are frequently weak and adaptation ability is poor, its consequences are disproportionately severe (Niang et al., 2024). Carbon accounting, the systematic measurement, disclosure, and management of greenhouse gas (GHG) emissions across many scales, has become a vital instrument in global climate governance as mitigation and adaptation policies change. Evidence-based policymaking is

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made possible by carbon accounting, which also promotes transparency and adherence to international standards (Rana et al., 2025). In light of global accords like the United Nations Framework Convention on Climate Change (UNFCCC), the Paris Agreement's Nationally Determined Contributions (NDCs), and the operation of developing carbon markets, the significance of carbon accounting is especially clear. Corporate disclosure laws, financial market rules, and voluntary reporting guidelines like the Task Force on Climate-related Financial Disclosures (TCFD) have all contributed to the institutionalization of carbon accounting in industrialized nations. On the other hand, these processes are still in their infancy in most of Africa, especially in West Africa. The region's capacity to accomplish significant low-carbon transitions and meet its international commitments is seriously threatened by the lack of reliable and trustworthy carbon tracking systems.

Due in part to its growing urbanization, reliance on rain-fed agriculture, and delicate ecosystems supporting rural livelihoods, West Africa, home to well over 400 million people, is particularly vulnerable to the consequences of climate change. According to estimates, around 95% of croplands in the region are rain-fed, rendering farmers extremely vulnerable to changes in the climate (Teku & Eshetu, 2024). Food security and crop productivity have been severely weakened in the Sahel by ongoing droughts and increasing desertification in nations like Niger, Mali, and Burkina Faso. The magnitude of these issues is demonstrated by large-scale projects like the African Union's Great Green Wall, which aims to restore degraded land and fight desertification (WHO et al., 2022). Rising temperatures and more unpredictable rainfall are upsetting crop cycles and lowering yields in Ghana and Côte d'Ivoire, two countries that produce cocoa (Jiménez-Esteve et al., 2025).

Devastating flooding frequently affects major cities like Accra, Lagos, and Freetown, displacing residents and damaging infrastructure, severely taxing the already meager capacity of urban governance (Cobbinah et al., 2023). Rapid coastal erosion is threatening ecosystems and increasing vulnerability to climatic hazards, especially in heavily populated coastal areas, in coastal states including Senegal, Sierra Leone, and Benin (Dada et al., 2024). Lastly, regions with high biodiversity, such as the mangrove systems that stretch from Guinea-Bissau to The Gambia and the Upper Guinean rainforests, are degrading at startling rates (Montgomery, 2024). The economic cost of these vulnerabilities is staggering. According to World Bank estimates, coastal degradation alone imposes annual losses of approximately US $3.8 billion on countries such as Benin, Côte d’Ivoire, Senegal, and Togo, representing 5.3 percent of their combined GDP, and contributes to more than 13,000 deaths each year. These costs highlight that climate change in West Africa is not merely an ecological challenge but also a profound developmental threat, one that undermines long-term poverty reduction, stability, and prosperity (Kraay, 2019).

The development of efficient carbon accounting systems is still unequal and limited, despite the fact that West African governments have matched their policies with international frameworks like the Paris Agreement, the African Union's Agenda 2063, and the Sustainable Development Goals (SDGs). The technical know-how, data infrastructure, and enforcement power required to create reliable carbon inventories and enforce corporate disclosures are often lacking in regulatory authorities at the institutional level. One example of early innovation is Ghana's Climate Public Expenditure and Institutional Review (CPEIR), which incorporates climate-related spending into national budgetary and monitoring systems. Micro, small, and medium-sized businesses (MSMEs), which make up the majority of the local economy and frequently lack access to specialized resources or the capacity to comply, are particularly affected by the uneven implementation of the law (Nemec, 2025). These systemic issues are made worse by financial limitations. Rising public debt loads and conflicting social spending demands like security, education, and health are causing African governments' fiscal capacity to contract. Large portions of government spending are frequently diverted from vital development investments to debt servicing (Clift, 2024). Simultaneously, the lack of incentives for green investments or climate-related disclosure in shallow, immature financial markets hinders the private sector's involvement in carbon accounting (Ma-Nlep, 2025).

Technological barriers compound the institutional and financial limitations. While developed economies increasingly use advanced monitoring tools, such as digital platforms, satellite tracking, and blockchain-enabled verification, West African countries often lack access to such technologies. Even when technologies are present, adoption is constrained by low digital infrastructure, limited technical capacity, and insufficient regional collaboration (Ayim et al., 2022). In Ghana, institutional innovations such as the CPEIR and the establishment of a Climate Finance Division within the Ministry of Finance signal intent to integrate climate considerations into national financial systems. Between 2019 and 2020, Ghana mobilized approximately US $830 million in climate-related funds. Yet while these initiatives reflect progress at the macro level, carbon measurement at the corporate level, especially among MSMEs, remains very limited. This underscores the gap between national-level financial tracking and grassroots emissions reporting.

The climate governance conundrum is particularly evident in Nigeria, the largest economy in the region. Although the oil and gas industry continue to be the main source of national income, it also contributes significantly to greenhouse gas emissions, especially from gas flaring in the Niger Delta. Nigeria's answer was the Climate Change Act (2021), which requires the establishment of a Climate Change Fund, the approval of five-year carbon budgets, and the drafting of a national climate action plan. More recently, the Nigerian Upstream Petroleum Regulatory Commission declared that oil license applicants must use the Upstream Petroleum Decarbonization Template (UPDT) to show low-carbon credentials starting in 2025, including clear methane management plans (Nemec, 2025). Empirical studies further suggest that climate-related disclosures are positively associated with financial performance among Nigerian oil and gas firms, indicating that better carbon reporting can also yield business benefits (Nwankwoh & Oiji-Okafor, 2023).

In Senegal, the emphasis is on coastal zones' vulnerability. With shoreline retreat rates in some places above eight meters annually, coastal erosion at Saint-Louis has escalated to concerning proportions, and by 2042, there is expected to be a substantial loss of land. According to national estimations, sea level rise is accelerating at a rate of about 8.4 millimeters per year, putting more than one-third of Dakar's coastline at significant risk of submersion. Senegal has responded by mobilizing international adaptation money, notably UNFCCC-backed projects and assistance from the Adaptation Fund, to preserve sensitive areas including Rufisque, Saly, and Joal. Although there are still issues with scaling up the impact and incorporating emissions data into national planning, these actions show how targeted climate funding can help with both adaptation and reduction (Lebel et al., 2012). The deadly Freetown mudslide in 2017 in Sierra Leone revealed the relationship between institutional instability, bad urban design, and extreme weather. Sierra Leone still lacks a working carbon accounting framework and accurate emissions inventories, despite its involvement in international climate agreements.

In addition to impairing national resilience, the lack of such systems limits the nation's access to international climate finance, since eligibility for funding frequently depends on reliable monitoring and reporting systems. Despite these significant challenges, opportunities for advancing carbon accounting in West Africa are emerging. Regional organizations such as the Economic Community of West African States (ECOWAS) are promoting greater harmonization of environmental governance and energy strategies, creating platforms for shared data and the potential for coordinated carbon reporting systems (Nwaobi, 2025). The private sector, particularly in Ghana, Nigeria, and Côte d'Ivoire, is beginning to adopt environmental, social, and governance (ESG) frameworks, which could provide a foundation for broader uptake of carbon accounting practices. Access to international climate finance is also increasing, with countries in the region tapping into resources from the Green Climate Fund and other multilateral mechanisms (Green Climate Fund, n.d.). Finally, technological leapfrogging, through the use of satellite remote sensing, mobile-based data collection systems, and blockchain, offers an opportunity to overcome some infrastructural limitations and enhance emissions monitoring and verification (Ayim et al., 2022).

1.1 Research problem and significance

Over the past 20 years, West African governments have made clear commitments to international frameworks for climate policy, particularly the Paris Agreement and the Sustainable Development Goals (SDGs) of the UN. These pledges show that the pressing need to lower greenhouse gas (GHG) emissions, improve adaptive capabilities, and raise funds for climate action has been formally acknowledged. However, in spite of these commitments, the region still faces structural issues that make it difficult to put in place reliable and open carbon accounting systems. These kinds of tools are essential for tracking emissions, luring climate finance, and reassuring stakeholders, both domestic and foreign, that national climate policies are serious. The three interconnected areas of institutional capability, financial system growth, and technology infrastructure are where the shortcomings are most noticeable.

Credible carbon accounting is still fundamentally hampered by weak institutions. In many West African nations, regulatory bodies frequently lack the power, independence, or funding necessary to impose strict reporting requirements. The credibility of national promises is weakened by this institutional fragility, which also makes it harder for governments to guarantee adherence to international frameworks. Similarly, the mobilization of finance needed for low-carbon transitions is hampered by weak financial markets. The expansion of emissions reduction initiatives, renewable energy projects, and climate-related investments is still limited in the absence of robust and equitable finance institutions. These financial and institutional flaws are exacerbated by technological deficiencies. Accurate GHG reporting is severely hampered by the lack of current monitoring tools, trustworthy data gathering systems, and verification procedures. In effect, these intertwined limitations erode the trustworthiness and effectiveness of West Africa's climate strategies, raising concerns about the region's ability to embark on credible, sustainable, and low-carbon development pathways.

These issues have not yet received enough attention in the scholarly literature on carbon accounting in Africa. Despite an increase in studies on sustainability reporting, carbon-specific disclosures are still noticeably overlooked. The scientific rigor, regulatory accuracy, and institutional architecture specifically needed for GHG accounting are often overlooked in the literature that currently exists since it focuses primarily on broad environmental, social, and governance (ESG) variables (Ozcan & Ozturk, 2019). As a result, nothing is known about the unique influence that carbon disclosures have on financial flows, technology uptake, and climate governance. A significant disconnect between international reporting standards and the regional reality of West Africa's precarious institutional and financial systems has resulted from this lack of attention.

The literature's presentation of institutions as background variables rather than as direct mediators of carbon reporting methods is another drawback. While some studies acknowledge governance restrictions, few study how variables in institutional quality, such as regulatory enforcement capability, bureaucratic efficiency, and anti-corruption measures, directly impact reporting outcomes. According to Onyenweife et al. (2020), for instance, carbon disclosure in Nigeria is typically driven by compliance rather than proactive corporate accountability, reflecting regulatory pressure. Their research, however, falls short in examining the ways in which these disclosure patterns are mediated by institutional flaws like corruption or a lack of regulatory independence. The reason why certain regimes produce more transparent and reliable carbon accounting than others is left open by this omission.

The function of finance sector maturity as a moderating factor on carbon disclosure is also understudied. In addition to providing funding for low-carbon investments, financial markets encourage businesses and governments to embrace greater openness. However, this feature has been generally ignored in West African research. For example, Tetteh et al. (2025) only considers the quality of governance in Ghana, ignoring the ways in which institutional frameworks interact with financial depth, efficiency, and inclusivity to either support or restrict carbon reporting practices. This narrow focus has prevented scholars

from seeing how poor financial markets across the region reinforce the fragility of carbon accounting systems, notably by reducing the incentives and processes through which enterprises and states engage in honest disclosure.

The prevalence of single-country case studies in the literature is another persistent flaw that restricts the potential for regional comparisons. As an indication of a developing system for tracking financial flows related to climate change, Ghana, for instance, has started experimenting with climate finance tracking efforts. Nigeria, in contrast, remains strongly dependent on oil revenue, where carbon disclosure generally reflects the compliance requirements of foreign oil firms rather than systematic national reforms. A completely different problem confronts Senegal, whose sensitivity to climate change is influenced by rising sea levels and coastline erosion, which intensify the need for funding for adaptation. With its history of catastrophic mudslides and floods, Sierra Leone serves as a stark reminder of the catastrophe risk aspect of climate governance, where inadequate institutions impede reporting and adaptation. Yet, despite these diverse national experiences, few studies attempt to synthesize these cases into a comparative analysis that captures the broader dynamics shaping carbon accounting across West Africa's fragile institutional and financial environments.

Last but not least, a large portion of the literature views carbon accounting as a static compliance mechanism as opposed to a dynamic and changing procedure. The idea that disclosure only represents the application of regulations is inaccurate because domestic changes, technology advancements, financial innovations, and challenges from the global climate all constantly change the nature of carbon reporting. As Bui et al. (2022) explain, disclosure mechanisms are not fixed but adaptable, capable of strengthening or declining depending on institutional and financial situations. However, this understanding is still lacking when it comes to West Africa, where quick political shifts, erratic commodity markets, and growing climate risk exposure necessitate a more dynamic comprehension of how carbon accounting develops.

To address these gaps, this study adopts a multi-theoretical framework. Institutional Theory underscores how weak enforcement, bureaucratic inefficiencies, and corruption undermine carbon governance in West Africa, leading to fragmented or symbolic disclosures (Kumarasiri & Jubb, 2016; Kwakwa, 2023). Stakeholder Theory highlights the growing influence of communities, NGOs, governments, and donors in demanding transparency, particularly in aid-dependent contexts (Bui et al., 2022; Oyerogba et al., 2024). Legitimacy Theory emphasizes how states and firms seek international credibility to attract aid and investment, often adopting disclosure practices to signal alignment with global expectations. Finally, the Resource-Based View (RBV) explains how carbon accounting depends on access to internal resources, such as finance, technical expertise, and monitoring systems, that are shaped by the depth of domestic financial markets (Maama & Marimuthu, 2022; Alsaifi, 2021). Together, these perspectives offer a comprehensive lens for understanding how institutional and financial dynamics condition disclosure behaviors in fragile, climate-vulnerable contexts.

Building on these insights, the study proposes a conceptual framework in which the climate crisis serves as the independent variable and carbon accounting practices as the dependent variable. Institutional capacity functions as a mediating variable, while financial sector depth serves as a moderating variable. This approach captures not only direct causal effects but also the contextual mechanisms through which climate pressures are translated into disclosure practices (Figure 1). Previous research supports parts of this framework. Kumarasiri & Jubb (2016) linked institutional weaknesses to symbolic disclosures, while Maama & Marimuthu (2022) and Oyerogba et al. (2024) highlighted the role of financial development in ESG reporting. More recent contributions (Alsaifi, 2021; Kwakwa, 2023) provide evidence that institutional strength and financial sector development influence disclosure but have not tested mediation and moderation effects together. In West Africa, studies remain sparse: Onyenweife et al. (2020) found that regulatory mandates, not climate awareness, drove disclosure in Nigeria; Bui et al. (2022) showed that donor expectations

shaped carbon reporting in Ghana. However, most rely on descriptive methods, limiting causal inference. This gap motivates the present study.

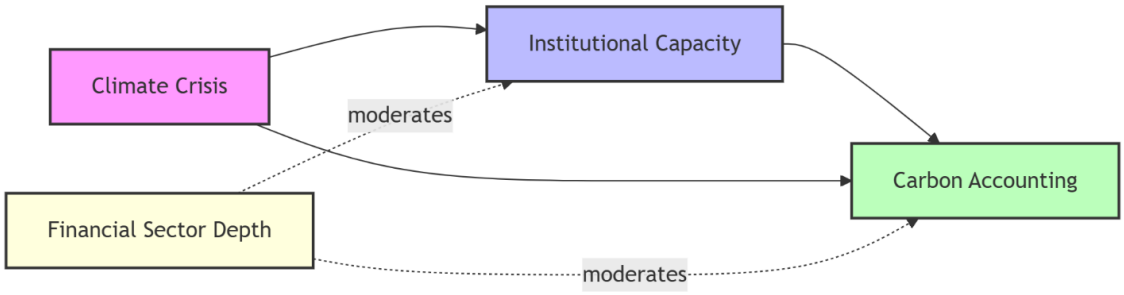

Fig. 1. Conceptual framework

1.2 Hypothesis

Guided by these theoretical perspectives, three directional hypotheses are advanced:
H1 (Institutional/Stakeholder lens): The climate crisis has a positive effect on carbon accounting practices in West Africa, such that higher climate pressures increase the extent of disclosure.
H2 (Institutional theory): Institutional capacity positively mediates the relationship between the climate crisis and carbon accounting practices, such that climate-induced stress enhances regulatory quality, which in turn improves disclosure.
H3 (RBV/Financial intermediation lens): Financial sector depth negatively moderates the relationship between the climate crisis and carbon accounting practices, such that deeper financial systems weaken the direct positive effect of climate stress on disclosure.

1.3 Research objectives

The main purpose of this study is to examine the relationship between the climate crisis and carbon accounting practices in West African countries, with particular attention to the mediating role of institutional capacity and the moderating effect of financial sector depth. Specifically, the study seeks to examine the impact of climate crisis indicators on carbon accounting practices in West African countries, assess the mediating effect of institutional capacity on the relationship between climate crisis and carbon accounting practices, and evaluate the moderating role of financial sector depth in the relationship between climate crisis and carbon accounting practices. By combining a multi-theoretical foundation with empirical analysis of 14 West African countries, this study advances environmental accounting research by integrating climate crisis indicators with institutional and financial dynamics. It further enhances empirical knowledge through mediation–moderation modeling, providing a more nuanced understanding of carbon governance in one of the world's most climate-vulnerable regions.

2. Methods

This chapter outlines the research methodology utilized to explore the connection between climate crisis indicators and environmental accounting practices in West African nations, while evaluating the mediating influence of institutional capacity and the

moderating effect of financial sector depth. The methodology is shaped by the study's aims and designed to guarantee rigorous, replicable, and trustworthy results. This chapter addresses the research philosophy, approach, population, data sources, definitions of variables, analytical methods, model specifications, and ethical considerations, providing justification for each decision. This research adopts a deductive approach, initiating with the development of hypotheses derived from established theories, including Institutional Theory, Stakeholder Theory, Legitimacy Theory, and the Resource-Based View. These hypotheses are subsequently tested with empirical data (Levitt et al., 2018). The choice of a deductive approach is warranted as the study intends to confirm theoretical propositions through statistical analysis, particularly utilizing panel data regression, mediation, and moderation modeling.

The study's target population encompasses all 15 member nations of the Economic Community of West African States (ECOWAS), as acknowledged by the African Union. However, to maintain data availability and consistency throughout the study period from 2005 to 2020, 14 West African countries were ultimately included in the analysis. The Gambia was omitted due to significant inconsistencies and gaps in data across key variables during the study timeframe. The selection of West African countries is based on the region's heightened vulnerability to climate change, the generally underdeveloped status of carbon accounting and environmental reporting systems, and the varying levels of institutional robustness and financial sector advancement. This regional focus allows for the examination of differences among countries in their responses to climate risk and the institutional and financial mechanisms that either promote or impede the integration of carbon accounting practices within a shared geopolitical and economic framework.

The study relies solely on secondary panel data acquired from reputable international sources. Climate crisis indicators, including CO_2 emissions, temperature anomalies, and metrics of environmental degradation, are sourced from the World Bank's World Development Indicators (WDI) and Climate Data Explorer (CAIT). Information on institutional capacity comes from the Worldwide Governance Indicators (WGI), which assess the rule of law, government effectiveness, and regulatory quality. Financial sector depth is evaluated using indicators such as domestic credit to the private sector and financial system efficiency, which are gathered from the IMF Financial Development Index and World Bank Global Financial Development Database. Environmental accounting practices are measured through sustainability and environmental disclosure scores obtained from the Refinitiv ESG database, Global Reporting Initiative (GRI) records, and UNEP environmental accounting reports.

Table 1. Variables, indicators, measurement sources

Variable	Indicator(s)	Measurement source
Carbon accounting	Carbon dioxide damage (as % of GNI)	WDI
Climate crisis	CO_2 emissions (metric tons per capita)	WDI
Institutional capacity	Regulatory Quality,	WDI
Financial sector depth	Domestic credit to private sector by banks (% of GDP)	WDI

To fulfill the aims of this research, a panel data analysis approach is utilized because it effectively merges both cross-sectional and time series information, thereby improving the accuracy, consistency, and explanatory capacity of the findings. According to Baltagi (2021), panel data allows for the management of unobserved heterogeneity across nations while capturing dynamic changes over time. Considering the multi-country focus of this study and the twelve-year timeframe examined (2012–2023), panel data is especially suitable for investigating the intricate relationships among climate crisis indicators, institutional capacity, financial sector depth, and environmental accounting practices.

The analysis begins with the estimation of both fixed effects (FE) and random effects (RE) regression models to assess the direct impact of climate crisis indicators on environmental accounting practices. These models enable the testing of whether country-

specific traits that are not directly observable influence the dependent variable. To identify the more appropriate model between FE and RE, the Hausman specification test is utilized. A significant outcome from this test suggests a correlation between the unobserved effects and the explanatory variables, thus supporting the fixed effects model. To tackle the second research objective, which focuses on the mediating role of institutional capacity, the study employs panel mediation analysis. This follows the methodology established by Baron & Kenny (1986), augmented by Sobel tests to validate the significance of the indirect effects. In this analysis, the model investigates whether institutional capacity acts as an intermediary variable through which climate crisis indicators influence environmental accounting practices. The mediation pathway is assessed using STATA, which provides a strong framework for testing the significance and intensity of indirect effects within panel datasets.

Moreover, to explore the third research objective, the moderating effect of financial sector depth is analyzed using moderated regression analysis. This analysis involves creating an interaction term between climate crisis indicators and financial sector depth to evaluate whether the relationship between climate variables and carbon accounting practices differs across countries with varying financial system development levels. A significant interaction term signifies a moderation effect, indicating that financial sector depth either enhances or diminishes the influence of the climate crisis on environmental accounting. To ascertain the robustness and reliability of the estimates, the analysis incorporates heteroskedasticity and autocorrelation-consistent (HAC) standard errors. This is crucial in panel data frameworks where error terms may not exhibit homoscedasticity or could exhibit serial correlation, potentially skewing standard errors and test statistics. These modifications ensure the accuracy of statistical conclusions. All empirical analyses will be conducted utilizing STATA version 17, a sophisticated econometric software adept at managing complex panel data configurations, executing mediation and moderation models, and performing post-estimation diagnostics. The selection of STATA is warranted by its suitability with macroeconomic data, its ability for robust estimation, and its comprehensive toolsets for advanced econometric analysis.

Objective 1: Direct effect of climate crisis on environmental accounting

To examine the direct impact of climate crisis indicators on environmental accounting:

$$EAP_{it} = \beta_0 + \beta_1 CCI_{it} + \beta_2 GDP_{it} + \beta_3 TO_{it} + \mu_i + \varepsilon_i \quad \text{(Eq.1)}$$

Where:

CAP_{it} = Carbon Accounting Practices in country i at time t

$CCIit$ = Climate Crisis Indicators

GDP_{it} and TO_{it} = Control variables (GDP, trade Openness)

μ_i = Country-specific effect

ε_{it} = Error term

Objective 2: Mediating role of institutional capacity

$$IC_{it} = \beta_0 + \beta_1 CCI_{it} + \beta_2 GDP_{it} + \beta_3 TO_{it} + \varepsilon_i \quad \text{(Eq.2)}$$

$$CAP_{it} = \beta_0 + \beta_1 CCI_{it} + IC_{it} + \beta_2 GDP_{it} + \beta_3 TO_{it} + \varepsilon_i \quad \text{(Eq.3)}$$

Where IC represents Institutional Capacity, a significant coefficient on IC_{it} while controlling for CCI_{it} supports mediation.

Objective 3: Moderating role of financial sector depth

$$CAP_{it} = \beta_0 + \beta_1 CCI_{it} + \beta_2 FSD_{it} + \beta_3 (CCI + FSD)_{it} + \beta_4 GDP_{it} + \beta_5 TO_{it} + \varepsilon_i \quad \text{(Eq.4)}$$

Where FSD is Financial Sector Depth, the interaction term (CCI×FSD) tests for moderation. A significant coefficient β_3 indicates that the effect of climate crisis on environmental accounting depends on financial depth.

3. Result and Discussion

This section outlines the empirical findings of the research based on the analysis of panel data collected from 14 West African nations spanning the years 2005 to 2020. The objective is to assess the impact of the climate crisis on carbon accounting practices, while also considering relevant economic control variables. The chapter initiates with a summary of how each objective was quantified, followed by the delivery and interpretation of results related to each research objective.

3.1 Presentation of results

3.1.1 Impact of climate crisis on carbon accounting

To evaluate the direct impact of the climate crisis (CC) on carbon accounting practices (CAP), the research utilized a panel regression model, which captures variations across both cross-sectional and time-series dimensions. The dependent variable, CAP, was represented by carbon dioxide damage as a percentage of Gross National Income (GNI). The primary independent variable reflecting the CC was carbon dioxide emissions per capita (in metric tons). To account for macroeconomic effects, two economic indicators, GDP growth (annual %) and Foreign Direct Investment, net inflows (% of GDP), were included as control variables representing trade openness. A Fixed Effects (FE) model was estimated using STATA to ensure the results' robustness. The findings are displayed in Tables 2.

Table 2. Fixed effects regression results (FE model)

Variable	Coefficient	Std. Error	t-value	p-value
Climate Crisis (CC)	1.9474	0.1948	10.00	0.000
GDP Growth (gdp)	-0.0028	0.0037	-0.77	0.445
FDI (fdi)	0.0025	0.0016	1.58	0.115
Constant	0.2711	0.0814	3.33	0.001

Model summary:
R-squared (within) = 0.3462
Number of countries = 14
Number of observations = 224
F (3,207) = 36.54, $p < 0.001$

The results from the fixed effects model confirm a statistically significant and positive relationship between climate crisis and carbon accounting practices. This implies that as climate crisis intensity (measured by emissions per capita) increases, countries are more likely to adopt or strengthen environmental accounting practices. The results indicate that a one-unit increase in climate crisis leads to an estimated 1.95 percentage point rise in carbon accounting practices, holding other variables constant. The GDP growth rate had a negative but statistically insignificant effect in the model, suggesting that short-term economic growth does not have a clear direct impact on carbon accounting practices.

3.1.2 Mediating role of institutional capacity

To assess the mediating effect of Institutional Capacity (IC) on the relationship between climate crisis and carbon accounting practices, the study adopted a panel mediation analysis based on the Baron & Kenny (1986) framework. This involves estimating two regression equations, where first, Institutional Capacity (proxied by regulatory quality) was regressed on the climate crisis indicator (CO_2 emissions) along with control variables, and second, carbon accounting practices (measured by carbon dioxide damage as % of GNI) were regressed on both the climate crisis indicator and Institutional Capacity, including the same control variables. Mediation is supported if the climate crisis indicator significantly predicts institutional capacity and institutional capacity significantly predicts environmental

accounting when controlling for the climate crisis. The results were estimated using panel regression, and are presented in Tables 3 and 4.

Table 3. Effect of climate crisis on institutional capacity (Mediator model)

Variable	Coefficient	Std. Error	z-value	p-value
Climate crisis	0.4765	0.1080	4.41	0.000
GDP growth	-0.0005	0.0023	-0.24	0.811
FDI	-0.0016	0.0010	-1.70	0.089
Constant	-0.8237	0.1007	-8.18	0.000

Model summary:
Number of observations: 224
Number of countries: 14
R-squared (overall) = 0.2730
Wald $\chi^2(3) = 21.48$, $p < 0.001$

The results show that CC have a statistically significant and positive effect on IC, suggesting that worsening climate conditions are associated with increased attention to institutional regulation. This supports the first condition of mediation.

Table 4. Effect of climate crisis and institutional capacity on carbon accounting (Outcome model)

Variable	Coefficient	Std. Error	z-value	p-value
Climate crisis	1.3971	0.1570	8.90	0.000
Institutional capacity	-0.5135	0.1068	-4.81	0.000
GDP growth	-0.0049	0.0038	-1.30	0.192
FDI	0.0028	0.0016	1.75	0.080
Constant	0.1698	0.1339	1.27	0.205

Model summary:
Number of observations: 224
Number of countries: 14
R-squared (overall) = 0.0871
Wald $\chi^2(4) = 93.34$, $p < 0.001$

The results indicate that while CC remain a strong and significant predictor of carbon accounting practices, institutional capacity has a negative and statistically significant effect on environmental accounting outcomes. This suggests a partial mediation effect, climate crisis influences both institutional development and carbon accounting, but stronger regulatory institutions may paradoxically constrain carbon damage disclosures in this context, possibly due to compliance pressures, administrative limitations, or measurement constraints in the West African region.

3.1.3 Moderating role of financial sector depth

To investigate whether financial sector depth (FSD) moderates the relationship between climate crisis and carbon accounting practices. A statistically significant coefficient for the interaction term (CCI × FSD) would support the moderating role of financial depth. The estimation was done using the Fixed Effects (FE) model, with results summarized in Table 5. The results show that both climate crisis and financial sector depth independently have significant positive effects on carbon accounting practices. However, the negative and statistically significant coefficient of the interaction term (cde × dcp) confirms a moderation effect: as financial sector depth increases, the positive influence of climate crisis on carbon accounting weakens. This suggests that deeper financial systems may buffer or dilute the immediate policy or accounting responses to environmental degradation, potentially due to risk management frameworks, investment priorities, or institutional rigidities.

Table 5. Moderating effect of financial sector depth on climate crisis and carbon accounting

Variable	Coefficient	Std. Error	t-value	p-value
Climate crisis	2.5616	0.2690	9.52	0.000
Financial sector depth	0.0095	0.0042	2.29	0.023
Interaction (cde × dcp)	-0.0169	0.0043	-3.93	0.000
GDP growth	-0.0021	0.0036	-0.60	0.552
FDI (% of GDP)	0.0022	0.0015	1.47	0.142
Constant	0.0398	0.1000	0.40	0.691

Model summary
Number of observations: 224
Number of countries: 14
R-squared (within) = 0.3923
F (5,205) = 26.47, p < 0.001

3.2 Discussion of the results

This section offers a detailed discussion of the empirical results based on the three research objectives. The outcomes are interpreted within the larger context of West African economies and evaluated against applicable theoretical frameworks and existing empirical literature. These discussions also serve to either support or contradict the study's hypotheses concerning the impact of the climate crisis, the capacity of institutions, and the depth of the financial sector on carbon accounting practices.

3.2.1 Effect of climate crisis on carbon accounting practices

The results presented in Table 2 demonstrate a strong and statistically significant positive correlation between the climate crisis and carbon accounting practices across West African nations. Specifically, an increase of one unit in CO_2 emissions per capita leads to a 1.95 percentage point increase in carbon accounting practices, assessed by the proportion of carbon dioxide damage relative to GNI. This supports Hypothesis 1: the climate crisis has a positive effect on carbon accounting practices in West Africa. These results are consistent with institutional and stakeholder theories, which suggest that worsening environmental conditions generate external pressures on both governments and firms to disclose environmental impacts and adopt sustainable practices (Freeman, 2010). As CO_2 emissions rise in the region, countries seem to be motivated to acknowledge environmental damage in their national accounts, thereby institutionalizing carbon accounting practices. From an empirical standpoint, the findings align with the work of Ozcan & Ozturk (2019), who indicated that environmental degradation in emerging economies leads to increased sustainability and environmental disclosures. Likewise, Hsiao & Kelly (2018) found that companies in Asia react to ecological pressures by enhancing environmental transparency, a trend that is reflected in the governmental accounting frameworks of West African nations.

Nevertheless, the insignificant impact of GDP growth suggests that short-term economic performance does not directly promote or inhibit environmental accounting. This supports earlier research (Burritt & Schaltegger, 2010), which asserts that without specific environmental mandates, economic growth focused on GDP often progresses without robust environmental accountability measures. The non-significant coefficient for FDI indicates that while foreign capital inflows are economically critical, they are not consistently associated with improvements in environmental accounting, potentially due to weak enforcement or varying environmental commitments among foreign investors operating in West Africa.

3.2.2 Mediating role of institutional capacity

Tables 3 and 4 reveal insights into the mediating effect of institutional capacity, represented by regulatory quality, between the climate crisis and carbon accounting practices. The first regression analysis shows that the climate crisis significantly enhances

institutional capacity, suggesting that environmental degradation can serve as a driving force for regulatory advancement in West African countries. This aligns with institutional theory, which posits that crisis situations often stimulate the development of formal structures to legitimize governmental and organizational actions. However, when both climate crisis and institutional capacity are considered in the model (Table 4), the coefficient for institutional capacity is significantly negative, indicating that improved regulatory quality is paradoxically linked to lower reported carbon damage. This finding supports only partial mediation and provides a more intricate narrative.

This outcome challenges the premises of legitimacy theory, which contends that stronger institutions inherently lead to better sustainability disclosures. Instead, it may reflect specific contextual factors in West Africa, such as regulatory institutions facing resource constraints or political limitations, regulatory reforms being implemented symbolically for appearances rather than effectively (Meyer & Rowan, 1977), and a focus on compliance with general economic or trade regulations instead of environmental governance. Therefore, while environmental degradation catalyzes institutional reforms, their effectiveness in advancing carbon accounting may be compromised by weak institutional enforcement, limited technical expertise, or competing policy priorities. This contrasts with findings in more developed regions (Delmas & Toffel, 2004), where stronger institutions typically result in greater transparency in environmental practices. Nonetheless, Hypothesis 2, which posits that institutional capacity mediates the relationship between climate crisis and carbon accounting, is partially supported. The mediation is statistically confirmed, but the unexpected negative direction of the institutional capacity effect warrants deeper policy scrutiny.

3.2.3 The moderating influence of financial sector depth

The findings presented in Table 5 demonstrate a significant moderating role of financial sector depth in the relationship between the climate crisis and carbon accounting. While both the climate crisis and financial depth independently have a positive impact on carbon accounting practices, the interaction term is negative and statistically significant. This suggests that as financial sector depth becomes greater, the positive influence of the climate crisis on carbon accounting diminishes, thereby supporting Hypothesis 3. This observation can be understood in various ways. First, more developed financial systems may offer advanced risk management tools, enabling economic actors to hedge against or postpone immediate actions in response to environmental deterioration. Second, financial institutions might emphasize short-term gains over environmental transparency, particularly in areas with less mature green finance frameworks. Third, nations with deeper financial structures could draw investments into sectors that harm the environment, thus reducing the motivation for enhanced carbon accounting.

These findings align with the conclusions of Tamazian et al. (2009), who contend that advancements in finance do not necessarily lead to improved environmental outcomes in developing economies. In the West African scenario, where environmental regulations are weak and green investment options are still emerging, the financial sector may not yet act as a driving force for better environmental accounting. Theoretically, this perspective somewhat contradicts resource-based theory, which posits that improved financial infrastructure provides the necessary resources for supporting sustainable initiatives. Instead, these outcomes are more in line with the concept of institutional capture or regulatory inertia, where dominant financial players influence environmental reporting in ways that favor market objectives over ecological considerations. The lack of significance regarding GDP growth and FDI further indicates that larger macroeconomic factors do not directly affect the implementation of carbon accounting, reinforcing the necessity for focused institutional and financial sector reforms to efficiently internalize environmental costs.

4. Conclusions

This study investigated the impact of the climate crisis on carbon accounting practices across fourteen West African countries between 2005 and 2020, focusing on the mediating role of institutional capacity and the moderating influence of financial sector depth. The findings revealed that climate pressures, measured through CO_2 emissions per capita, positively and significantly influenced carbon accounting, proxied by CO_2 damage as a percentage of GNI, indicating that worsening environmental conditions stimulate disclosure and reporting practices. Institutional capacity, represented by regulatory quality, was found to partially mediate this relationship, but stronger institutions were paradoxically linked to lower reported carbon damage, reflecting enforcement gaps, limited resources, and the largely symbolic implementation of environmental regulations in the region. The results further showed that financial sector depth moderated the relationship, as deeper financial systems independently promoted carbon accounting yet weakened the direct effect of climate pressures, suggesting that advanced financial priorities may shift focus away from urgent environmental responses. Collectively, the study demonstrates that climate pressures alone cannot ensure robust carbon accounting, which requires effective governance structures and financial systems that deliberately integrate environmental accountability.

The research concludes that while the climate crisis plays a significant role in motivating carbon accounting practices in West Africa, the effectiveness of this relationship depends on institutional and financial dynamics. Institutional capacity mediates climate–accounting linkages but may unintentionally constrain disclosure, while financial sector depth reduces the immediacy of environmental responsiveness. Therefore, policy recommendations emphasize strengthening institutional enforcement, improving technical capacity, and aligning financial incentives with sustainability objectives. However, the study acknowledges limitations, including reliance on secondary data, proxy-based measures of institutional and financial indicators, the omission of The Gambia due to data gaps, and variations in reporting quality across countries. To address these gaps, future research should adopt mixed-method or longitudinal approaches, investigate firm-level practices, and examine the influence of green finance, taxation, governance transparency, and political stability on carbon disclosure. Such efforts would provide more comprehensive insights into how climate pressures can be effectively translated into meaningful accounting practices in West Africa.

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Author Contribution

All authors contributed to the conceptualization and design of the study. Data collection and analysis were collaboratively conducted. All authors participated in interpreting the results, drafting the manuscript, and approving the final version.

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