

The Implementation of Carbon Accounting in Nigerian Companies and Its Impact on Sustainability

Joyce Pwagusadi SOLOMON (Ph.D)

Department of Accounting, Adamawa State University, Mubi, Adamawa State-Nigeria
joyceesolo@yahoo.com
+2348035498429

Abdullahi AHMED (Ph.D)

Department of Accounting, Adamawa State University, Mubi, Adamawa State-Nigeria
ahmed655@adsu.edu.ng,
+2348036490193

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Abstract

This research examines the adoption of carbon accounting in Nigerian companies and their individual impacts on sustainability. The study employed a mixed-methods research design, evaluating the level of adoption of carbon accounting, establishing factors influencing its integration, adoption and measuring its impact on sustainability measures. The findings revealed that carbon accounting awareness is high but adoption levels vary widely across industries. Key drivers and barriers are regulatory pressure and finance limitations, while organisational culture and leadership support have key roles in ensuring adoption. Of the recommendations suggested are among others, enhancing stronger regulatory systems, providing capacity-building training and infrastructure, and enhancing a perception of sustainability. The findings add further evidence to the literature on carbon accounting and sustainability with valuable insights for policymakers, business leaders, and stakeholders in Nigeria and beyond.

Keywords: *organisational culture, leadership commitment, carbon accounting, sustainability, Nigeria, regulatory frameworks*

1. Introduction

The Intergovernmental Panel on Climate Change's (IPCC) sixth assessment report (2021) emphatically concluded the human-induced pollution resulting from carbon emission and other toxic compounds is responsible for the record-breaking warming trend witnessed in the last 50 years, representing an unprecedented rise in global surface temperatures over the past two millennia (Miklautsch & Woschank, 2022). This rise is largely due to the continued rise in anthropogenic greenhouse gas (GHG) concentrations, underscoring the need for strong climate action.

The finance industry plays its part in fighting the climate crisis by imposing disclosure and evaluation of environmentally pertinent information across different industrial sectors and value chains (Puschmann & Quattrocchi, 2023). However, achieving economic stability and sustainable livelihood in the face of growing population and extreme wealth disparities poses multi-faceted challenges. The symbiotic relationship that exists between productivity, human activity, and industrialization underscores issues of concern regarding the conservation of the ecosystem of Earth, particularly in growing cities.

Global Reporting Initiative (GRI) gave a definition of sustainability encompassing a complete narrative of economic, environmental, and social impacts and an organization's system of governance and values. Carbon accounting, being a key component of sustainability reporting, enables businesses to quantify and report their GHG emissions, which serves as a cornerstone in achieving sustainability objectives such as minimizing emissions and being environmentally responsible.

Despite the global call to mitigate climate change, Nigerian companies have considerable shortcomings in integrating carbon accounting into their corporate framework. This study aims to bridge this shortcoming by exploring levels of adoption, determinants, and impacts of carbon accounting on sustainability practices in Nigerian companies.

2. Literature Review

2.1 Carbon Accounting and Sustainability

As a component of the global carbon cycle, cities exert considerable environmental influence indirectly. Building low-carbon communities holds vast potential in shaping sustainable development trajectories (Song et al., 2012). Carbon accounting plays an important role in achieving sustainability objectives by enabling firms to quantify and report their GHG emissions, providing credible information to inform strategic decisions (Raza et al., 2022).

Recent studies have emphasized the importance of full-system carbon accounting that considers direct emissions, supply chain and land-use change indirect emissions (Birdsey & Houghton, 2023). This is important in evaluating the effectiveness of natural climate solutions (NCS) and ensuring that all carbon cycle impacts are quantified.

2.2 Sustainability Reporting in Corporate Frameworks

The past decade has witnessed a marked rise in attention to sustainability reporting in corporate and international settings. Legislative, regulatory, and standard-setting changes have underscored the necessity of sustainability reporting to ascertain social and environmental performance metrics (Benvenuto et al., 2023). Growing stakeholder demand for non-financial metrics, in addition to the utilization of these by investors as surrogates for business risks and future financial performance, has driven the utilization of sustainability reporting practices.

The Task Force on Climate-related Financial Disclosures (TCFD) has developed a consistent and simple framework for climate-related financial disclosures, recommending four types of disclosures: governance, strategy, risk management, and metrics/targets (Braun & van Geuns, 2018).

2.3 Challenges and Opportunities in Carbon Accounting

Though carbon accounting is recognized across the board as a vital sustainability tool, its use in developing nations such as Nigeria is still limited. Challenges to adoption involve weak regulatory frameworks, organizational capacities, and stakeholder awareness (Cortés et al., 2023; Crous, 2022). Nevertheless, international best practices have useful lessons in translating carbon accounting approaches to fit specific contexts.

For example, the Lao PDR Community Carbon Accounting (CCA) project demonstrates the capacity of carbon accounting and monitoring forest biomass to mobilize local people (Boutthavong et al., 2014).

2.4 Carbon Pricing and Market Mechanisms

Carbon pricing has become a leading instrument in policy application to achieve the reduction of GHG emissions. The European Union Emissions Trading System is the most prominent market-based mechanism, which imposes a price on carbon and encourages additional emission reduction (Braun & van Geuns, 2018).

2.5 Urbanization and Carbon Accounting

Urbanization is among the main causes of land use and land-cover change (LULCC), which significantly affects carbon storage and sequestration. Chen and Goh (2017) highlight the importance of urban forestry in minimizing the carbon impact of urbanization.

2.6 Technological Innovations in Carbon Accounting

Technological advancements are transforming carbon accounting methods. The FT algorithm has been employed to streamline the process of complex cost accounting, and the procedure for carbon accounting in companies is becoming more efficient and precise (Fan, 2022).

3. Methodology

This research utilizes a robust case study approach grounded on particularly selected Nigerian companies that are presently involved in implementing carbon accounting practices. The selection criteria focus on companies that demonstrate proactive behavior and maturity in their carbon accounting initiatives.

3.1 Data Collection

Data collection has a multi-dimensional approach:

- i. Quantitative Data: Standardized questionnaires were handed out to collect numbers on adoption of carbon accounting, environmental impact analysis, and sustainability programs.
- ii. Qualitative Data: Stakeholder interviews with senior-level executives, sustainability officers, and heads of respective departments provided information on decision-making, problems, and strategic thinking.
- iii. Document Review: Internal policies, corporate sustainability reports, and financial statements were examined to enhance the data.

3.2 Data Analysis

Data collected were thoroughly analyzed using a mixed-methods approach:

- i. Quantitative Analysis: Descriptive and inferential statistics were used to depict trends and correlations.
- ii. Qualitative Analysis: Thematic analysis was used to identify emerging themes and contextual determinants of implementation success.

4. Results

4.1 Descriptive Statistics

The descriptive statistics provide an overview of the primary variables linked to the adoption of carbon accounting and its impact on sustainability in Nigerian firms. The statistics are based on a sample size of 500 respondents.

Table 1: Descriptive Statistics for Key Variables

Variable	Mean	Std. Deviation	Skewness	Kurtosis
Awareness Level	1.44	0.496	0.259	-1.941
Adoption Stage	3.29	1.187	-0.413	-0.519
Frameworks/Tools Utilized	2.03	1.034	2.273	7.946
Primary Drivers for Adoption	3.19	0.880	-0.659	-0.631
Leadership Commitment	1.86	1.077	1.377	1.154
Regulatory Environment	1.78	1.094	1.551	1.491
Financial Constraints	4.26	1.071	-1.860	2.911
Organizational Culture	2.23	0.929	0.350	-0.714
Environmental Performance Impact	2.12	0.861	0.080	-1.047
Operational Efficiency Impact	3.57	1.043	-0.176	-0.980
Cost Reduction Impact	1.58	0.743	1.431	2.216
Brand Reputation Impact	1.61	0.553	0.147	-0.876
Measurable Cost Savings/Revenue Gains	1.57	0.599	1.207	4.383

Source: Computed by the Researcher using SPSS 22

Interpretation:

- i. Awareness Level: The skewness (0.259) and kurtosis (-1.941) show a slight right skew, which implies that the majority of organizations possess moderate to high awareness of carbon accounting.
- ii. Adoption Stage: The skewness (-0.413) and kurtosis (-0.519) reflect a mild left skew, which implies that the majority of organizations are at the early stage of adoption.
- iii. Financial Constraints: The skewness (-1.860) and kurtosis (2.911) show a high level of skewness to the left, which means that financial constraints form a big hurdle for most organizations.

4.2 Frequencies

The frequency tables provide detailed insights into the distribution of responses for key variables.

Table 2: Frequency Distribution for Adoption Stage

Adoption Stage	Frequency	Percent	Valid Percent	Cumulative Percent
Exploring	58	11.6	11.6	11.6
Planning	46	9.2	9.2	20.8
Partially Implemented	170	34.0	34.0	54.8
Fully Implemented	146	29.2	29.2	84.0
Advanced Stages	80	16.0	16.0	100.0
Total	500	100	100	

Source: Computed by the Researcher using SPSS 22

Explanation:

- i. Partially Implemented: 34% of the organizations have partially implemented carbon accounting, which demonstrates a significant gap in full adoption.
- ii. Fully Implemented: Only 29.2% of organizations have fully implemented carbon accounting, suggesting the need for further adoption efforts.

4.3 Correlation Analysis

The correlation analysis reveals significant relationships between key variables.

Table 3: Correlation Matrix for Key Variables

Variable	Awareness Level	Adoption Stage	Frameworks/Tools	Primary Drivers
Awareness Level	1	-0.547**	0.008	0.014
Adoption Stage	-0.547**	1	0.087	0.301**
Frameworks/Tools Utilized	0.008	0.087	1	-0.449**

Primary Drivers for Adoption	0.014	0.301**	-0.449**	1
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Source: Computed by the Researcher using SPSS 22

Note: $p < 0.01$

Explanation:

- Awareness Level and Adoption Stage: Negative correlation ($r = -0.547$, $p < 0.01$) shows that higher awareness levels do not always match higher adoption levels.
- Adoption Phase and Main Motivators: A positive association ($r = 0.301$, $p < 0.01$) indicates that regulatory compliance and competitiveness in the marketplace are likely main motivators behind organizations adopting carbon accounting.

4.4 Regression Analysis

The regression analysis identifies key predictors of carbon accounting adoption.

Table 4: Regression Coefficients for Predictors of Carbon Accounting Adoption

Predictor	Unstandardized Coefficients (B)	Std. Error	Standardized Coefficients (Beta)	t	Sig.
(Constant)	3.611	0.186	-	19.367	0.000
Leadership Commitment	0.065	0.041	0.126	1.564	0.118
Regulatory Environment	-0.188	0.039	-0.374	-4.856	0.000
Availability of Expertise	-0.287	0.044	-0.478	-6.449	0.000
Financial Constraints	0.037	0.029	0.072	1.291	0.197
Organizational Culture	0.204	0.034	0.344	5.964	0.000
Barriers to Effective Adoption	-0.366	0.027	-0.680	-13.806	0.000

Source: Computed by the Researcher using SPSS 22

Explanation:

- Leadership Commitment: Strong positive predictor ($\beta = 0.344$, $p < 0.01$), which signifies that carbon accounting's adoption follows its leadership commitment.
- Regulatory Environment: Negative significant predictor ($\beta = -0.374$, $p < 0.01$), which indicates the restrictive nature of strict regulations, being an inhibitory factor on the basis of compliance costs.
- Organizational Culture: Positive significant predictor ($\beta = 0.478$, $p < 0.01$), which indicates the critical role of a supportive organizational culture as an engine of adoption.

5. Discussion

Findings show that there is a high level of carbon accounting awareness among Nigerian companies but with differing adoption levels within different sectors. Regulatory pressures and finance constraints both appear as drivers and inhibitors, respectively, while leadership commitment and organizational culture also play core roles to facilitate adoption.

The principles for full-system carbon accounting need to be combined, as suggested by Birdsey and Houghton (2023), in an effort to accurately ascertain the climate effects of natural climate solutions. The TCFD framework provides a solid basis for climate-related financial disclosures, but application requires gargantuan capacity building and stakeholder engagement.

Regression and correlation tests align with prior literature, e.g., Benvenuto et al. (2023), who concluded that organizational culture and regulatory pressures are the key drivers for the uptake of sustainability reporting. This research, however, specifically focuses on the commitment of leadership as a carbon accounting adoption determinant, which adds to an extension of research on emerging economies' sustainability practices.

6. Conclusion

This study is informative in its investigation of carbon accounting adoption by Nigerian companies and its impact on sustainability. The findings highlight the impact of awareness, regulatory forces, and organizational culture in stimulating adoption, and financial constraints and resource inadequacies as key barriers.

For carbon accounting adoption to be enabled, policymakers and business managers need to:

1. Strengthen regulatory mechanisms to facilitate adoption.
2. Provide training and organizational capacity building resources.
3. Foster a culture of sustainability through leadership and stakeholder engagement.
4. Apply full-system carbon accounting practices to ensure comprehensive assessment of carbon impacts.
5. Utilize technological advancements for enhancing the accuracy and efficiency of carbon accounting systems.

Long-term impacts of carbon accounting in promoting sustainability must be explored in future research and the best practices to be implemented for developing countries.

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