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SUSTAINABILITY ASSURANCE, CARBON EMISSIONS PERFORMANCE AND REPORTING QUALITY OF CARBON INTENSIVE INDUSTRY IN SUB-SAHARAN AFRICA

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ABSTRACT

The quality of the sustainability report published across organisations has consistently been questioned over the years. In response, organisations have been increasing the credibility of their sustainability report through external assurance. This study examines the association between Sustainability Assurance (SA); big-4 and Sustainability Reporting Quality (SRQ) as well as examines the moderating effect of Carbon Emission Performance (CEP) between sustainability assurance and reporting quality of carbon intensive industry in sub-Saharan Africa. Ex-post facto research design was used. The population is 332 listed organisations. The population represents the sample size with the use of census sampling technique. The findings reveal that SA and the use of big-4 both improve SRQ. On the other hand, CEP does not moderate the association between SA and SRQ as CEP and SA both individually improve SRQ. The study offers a practical implication on the importance of SA in improving reporting quality in sub-Saharan Africa given the peculiarity of the region; it educates organisations in the region on the advantage they stand to benefit in publishing quality sustainability reports. It is also expected to improve the orientation of organisations and internal stakeholders towards SRQ as the adoption of SA benefits the stakeholders more through attraction of more investment. The findings also suggest to the government how the existence of a standard institutional framework will be helpful to organisations.

Keywords: Big-4 Audit firms, Carbon Emissions Performance, Sustainability Assurance, Sustainability Reporting Quality, Sub-Saharan Africa.

1. INTRODUCTION

Sustainability of the environment has become an increasingly important issue globally and it is no longer news that the publication of sustainability reports has gained widespread popularity worldwide[1]. Over the years, several

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standard-setting bodies have released guidelines on the publication of sustainability reports. For instance, the Global Reporting Initiative (GRI) has since its inception released guidelines which provide a common language that guides the sustainability report of companies[2]. Their guidelines have evolved over the years with the first published in 2000. Additional guidelines later emerged [GRI G2, GRI G3, GRI G3.1 and GRI G4 guidelines (GRI, 2022)] until the first standard was published in 2016 (GRI 2021). Recently, a public revision was made to their universal standards with GRI 1 issuing reporting principles, GRI 2 issuing required disclosures and GRI 3 addressing the definition of material topics[3].

Asides from the GRI developed by Global Sustainability Standard Board (GSSB), other standards that were more financially oriented were developed with the passage of time. Standards endorsed by the International Integrated Reporting Council (IIRC) and the Sustainability Accounting Standard Board (SASB) gained prominence in the field of sustainability reporting[4]. The International Reporting Standards (IFRS) Foundation even suggested in 2020 the need for a single sustainability standard-setting body[5] to harmonise and ensure the comparability of sustainability reports. To achieve this, an exposure draft was published in March 2022 by the IFRS/International Sustainability Standards Board (ISSB). The exposure draft according to

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1 Ayeni-Agbaje, A. R., Olaniyan, N. O., & Adebayo, A. I., 'Sustainability disclosure and its impact on firm value in Nigeria' [2022] African Multidisciplinary Journal of Development, 11(2), 102-121

2 GRI (2022). Our mission and history. Available at: www.globalreporting .org/about-gri/mission-history/ Retrieved June 28th, 2024.

3 GRI (2021). Universal standards. Available at: www.globalreporting.org/standards /download-the-standards/ Retrieved June 28th, 2024; Adams, C., Alhamood, A., He, X., Tian, J., Wang, L., & Wang, Y. [2022]. The development and implementation of GRI standards: Practice and policy issues, in Adams, C. (Ed.), Handbook of Accounting and Sustainability. London: Edward Elgar Publishing, 26-43

4 Adams, C., &Abhayawansa, S. 'Connecting the COVID-19 pandemic, Environ mental, Social and Governance (ESG) investing and calls for harmonisation of sustainability reporting' [2022] Critical Perspectives on Accounting, 82

5 Giner, B., & Luque-Vílchez, M. 'A commentary on the new institutional actors in sustainability reporting standard-setting: A European perspective' [2022], Sustainability Accounting, Management and Policy Journal, 13(6), 1284-1309

Luque-Vílchez et al.[6] were IFRS S1 "General Requirements for Disclosure of Sustainability-related Financial Information" and IFRS S2 "Climate-related Global Reporting Initiative Disclosures".

Despite the existence of several guidelines and principles by different standard setting bodies as regarding the publication of sustainability reports, the publication of the report still varies across the world depending on the availability of institutional frameworks that mandate the publication. Hence companies across the world engage in mandatory and voluntary reporting depending on the availability of institutional framework in their region[7]. The publication of sustainability reports is limited in sub-Saharan Africa[8], a region that is highly susceptible to the global environmental problem such as climate change and this might be due to their weak institutional environment. This was also revealed by Penney et al.[9] when they showed no difference in sustainability reporting of multinational enterprises in sub-Saharan Africa and the exclusively Africa market-listed firms in the region, where on a norm the multinationals should be leading in reporting. Although getting all companies in the world to report their sustainability activities is vital, the debate has recently been shifted from just reporting to the quality of the information reported. Several issues constitute factors that reduce the quality of sustainability reports. Besides the obvious weak institutional framework reported by Penney et al.[10] in sub-Saharan Africa, Abdullahi and Makama[11] revealed that the attitude of organisations also affect the quality of the report published. Organisations in sub-Saharan Africa view sustainability reporting to be expensive and don't bother about reporting due to the lack of pressure

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6 Luque-Vílchez, M., Cordazzo, M., Rimmel, G., & Tilt, C. A. 'Key aspects of sustainability reporting quality and the future of GRI' [2023], Sustainability Accounting Management and Policy Journals, 14(4), 637-659

7 Hardi, I., Idroes, G. M., Hardia, N. A. K., Fajri, I., Furqan, N., Noviandy, T. R., & Utami, R. T. 'Assessing the linkage between sustainability reporting and Indonesia's firm value: the role of firm size and leverage' [2023]. Indatu Journal of Management and Accounting, 1(1), 21-28

8 Tilt, C. A., Qian, W., Kuruppu, S., & Dissanayake, D. 'The state of business sustainability reporting in sub-Saharan Africa: An agenda for policy and practice' [2020]. Sustainability Accounting Management and Policy Journal, 2040-8021

9 Penney, E. K., Owusu-Ansah, A., Amewu, G., & Nsor-Ambala, R. 'Do firms operating in a shared institutional environment have similar sustainability disclosure practices? A comparative analysis of multinational and locally listed firms in Africa' [(2023], Cogent Business & Management, 10(2)

10 Ibid [11]

11 Abdullahi, A., & Makama, U. 'Sustainability reporting in Nigeria' [2021], Al-Hikmah Journal of Arts & Social Sciences Education, 3 (1)

from internal stakeholders. Likewise, the Botswana Stock Exchange (BSE)[12] revealed other issues such as the misconception of sustainability by listed organisations, lack of sustainability expertise by companies and committed personnel to sustainability reporting and the publication of incomplete sustainability information are all factors that impairs the quality of the sustainability report.

The publications of quality sustainability reports possess lots of benefits to companies. It enables the adequate assessment of sustainability risk as well as assisting auditors in their audit risk assessment[13]. In order to ensure the publication of a quality report, GRI revise their universal standards to provide more guidance[14] while the IFRS Foundation suggested a single sustainability standard-setting body[15] in order to ensure the harmonisation and comparability of the reports published globally. Another crucial way to ensure the publication of quality sustainability reports is sustainability assurance. In the view of Khaireddine et al. and Maroun, sustainability assurance has become a global trend[16] which is a third party verification of the sustainability efforts and reports of companies. It is the voluntary verification of sustainability report by companies[17]. Although companies could voluntarily assure their sustainability information, Abdullahi and

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12 BSE. [2021]. Guidance for listed companies on reporting ESG information to investors: A voluntary tool for issuers. Available at: https://www.bse.co.bw/wp-content/uploads/2021/02/BSE_Guidance-for-Listed-Companies-on-Reporting-ESG-Information-to-Invest....pdf. Retrieved June 6th, 2024

13 Al-Shaer, H. 'Sustainability reporting quality and post-audit financial reporting quality: Empirical evidence from the UK' [2020]. Business Strategy and the Environment, 29, 2355-2373.

14 Adams, C., Alhamood, A., He, X., Tian, J., Wang, L., & Wang, Y. [2022]. The development and implementation of GRI standards: Practice and policy issues, in Adams, C. (Ed.), Handbook of Accounting and Sustainability. London: Edward Elgar Publishing, 26-43.

15 Giner, B., & Luque-Vílchez, M. (2022). A commentary on the new institutional actors in sustainability reporting standard-setting: A European perspective. Sustainability Accounting, Management and Policy Journal, 13(6), 1284-1309.

16 Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023]. Sustainability Accounting, Management and Policy Journal, 2040-8021

17 Miralles-Quirós, M. M., Miralles-Quirós, J. L., Daza-Izquierdo, J. 'The assurance of sustainability reports and their impact on stock market prices' [2021]. Management Letters, 21(1), 47-60

Makama[18] posited that the assurance of sustainability report could also be backed up by a strong institutional environment. Assuring sustainability report entails incurring additional cost on the part of the company. Nevertheless, it guarantees the content and structure of the report as well as improves its reliability and comparability[19]; an effort aimed to be achieved by IFRS Foundation. Likewise, Du and Wu[20] opined that it reduces green washing, improves data accuracy and the information systems of companies[21], improves internal controls, assist in identifying key risks[22], and assist companies in becoming more transparent and reputable to their stakeholders[23]. The value attached to sustainability reports hinges on the perceived credibility of the information contained therein. Hence there is an increased need by companies to improve on the credibility of their sustainability reports[24].

CEP is another vital element that could stir companies to engage in sustainability assurance in order to improve the quality of their sustainability report. Since the era of the advocate for climate change by the United Nation, the carbon intensive industry has been under increasing pressure to lower their carbon footprint. Carbon emission performance signals to stakeholders the commitment of companies in their carbon footprint reduction as it reveals

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18 Abdullahi, A., & Makama, U 'Sustainability reporting in Nigeria' [2021]. Al-Hikmah Journal of Arts & Social Sciences Education, 3 (1)

19 Correa-Garcia, J. A., Garcia-Benau, M. A., & Garcia-Meca, E. 'Corporate governance and its implications for sustainability reporting quality in Latin American business groups' [2020], Journal of Cleaner Production, 260.

20 Du, K., & Wu, S. J. 'Does external assurance enhance the credibility of CSR reports? Evidence from CSR-related misconduct events in Taiwan' [2019], Auditing: A Journal of Practice & Theory, 38(4), 101-130

21 Gürtürk, A., & Hahn, R. 'An empirical assessment of assurance statements in sustainability reports: smoke screens or informative information?' [2016], Journal of Cleaner Production, 136, 30–41.

22 Maroun, W. 'Does external assurance contribute to higher quality integrated reports?' [2019] Journal of Accounting and Public Policy

23 Martínez-Ferrero, J., Ruiz-Barbadillo, E., & Guidi, M. 'How capital markets assess the credibility and accuracy of CSR reporting: Exploring the effects of assurance quality and CSR restatement issuance' [2021]. Business Ethics, the Environment & Responsibility, 30(4)

24 Idawati, W., Muchlis, &Ningtyas, R. D. (2023). The effect of company characteristics on company value with sustainability report assurance as a moderation variable. Research Journal of Finance and Accounting, 14(9), 30-40

their sustainability performance[25]. A quality sustainability report reveals information on emission performance and the external assurance of such information could widen the scope of the carbon emission information revealed. Since one of the companies' sustainability goal is to build their reputation with stakeholders, carbon emission performance represent an effective strategy[26] that could influence them in assuring their sustainability report in order to legitimise and signal a good sustainability standing to existing and potential stakeholders.

Majorly only few studies exist on sustainability assurance and reporting in sub-Saharan Africa and such studies has exist in countries like Nigeria[27] and South Africa[28] . Penney et al.[29] did a study on sub-Saharan Africa but did not reveal the countries included in the study. Bouaddi et al.[30] did a study on sub-Saharan Africa but also included other countries in other regions. Likewise the focus of these studies were on firm value, reporting practices, value relevance of sustainability assurance and they didn't combine companies

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25 Safdie, S.'What is carbon management?' [2023] Greenly. Available at: https:// greenly.earth/en-gb/blog/company-guide/what-is-carbon-management. Retrieved on May 1st, 2024.

26 Khatib, S. F. A., Ismail, I. H. M., Salameh, N., Abbas, A. F., Bazhair, A. H., & Sulimany, H. G. H. 'Carbon Emission and Firm Performance: The Moderating Role of Management Environmental Training' [2023]. Sustainability, 15,

27 Eneh, O. M. R., &Okegbe, T. O.. 'Effect of sustainability committee on social sustainability reporting of listed oil and gas firms in Nigeria' [2022]. International Journal of Research in Education and Sustainable development, 2(3), 76-88; Ayeni-Agbaje, A. R., Olaniyan, N. O., & Adebayo, A. I. 'Sustainability disclosure and its impact on firm value in Nigeria' [2022], African Multidisciplinary Journal of Development, 11(2), 102-121; Eze, M .N., &Akaegbobi, G. N. 'Carbon emissions management and performance of selected oil and gas firms in Nigeria' [2023], Open Access Journal of Management Sciences Research, 1(1), 35-50; Onuoha, C., Daferighe, E. E., Etim, E. O., Onuoha, J. C. 'Green board committee and profitability of publicly traded oil and gas companies in Nigeria' [2023], Global Scientific Journal, 11(4), 1437-1453.

28 Thompson, E. K., Ashimwe, O., Buertey, S., & Kim, S. Y. 'The value relevance of sustainability reporting: does assurance and the type of assurer matter?' [2022] Sustainability Accounting, Management and Policy Journal, 2040-8021

29 Penney, E. K., Owusu-Ansah, A., Amewu, G., &Nsor-Ambala, R. 'Do firms operating in a shared institutional environment have similar sustainability disclosure practices? A comparative analysis of multinational and locally listed firms in Africa' [2023], Cogent Business & Management, 10(2), 2207886

30 Bouaddi, M., Basuony, M. A. K., & Noureldin, N, 'The heterogenous effects of carbon emissions and board gender diversity on a firm's performance' [2023], Sustainability, 15, 14642

operating in a carbon intensive industry. This study will increase the number of empirical studies available in sub-Saharan Africa by analysing the moderating effect of carbon emission performance on the association between sustainability assurance and reporting quality.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Theoretical Background

In investigating sustainability assurance, researchers have made use of different theoretical perspectives such as stakeholder theory, legitimacy theory, and signalling theory. These studies either made use of a single theoretical perspective[31] or two theoretical perspectives[32]. However, in order to effectively explain the moderating link of carbon emission performance on the association of sustainability assurance and reporting quality, this study made use of a multi-theoretical perspective. In addition to the three theories listed above, institutional theory is added to discuss the case in sub-Saharan Africa.

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[31] Meutia, I., Ramadhani, M., & Adam, M. 'Does eco-efficiency improve financial performance of manufacturing companies in Indonesia?, [2019] JurnalDinamikaAkuntansi Dan Bisnis, 6(2), 137-150; Safitri, V. A., & Nani, D. A. 'Does good corporate governance and eco-efficiency really contribute to firm value?' [2021] An empirical study in Indonesian state-owned enterprises (soes). Akuntabilitas 15(1), 73-88; Mazzotta, R., Mazzitelli, D., & Veltri, S. 'Critical considerations on the association between external assurance of non-financial information and materiality disclosure quality in an integrated report context, In Non-financial Disclosure and Integrated Reporting: Theoretical Framework and Empirical Evidence' [2022]. Cham: Springer International Publishing, pp. 403-415; Reverte, C. 'Do investors value the voluntary assurance of sustainability information? Evidence from the Spanish stock market' [2021]. Sustainable Development,

[32] Agustia, D., Sawarjuwono, T., &Dianawati, W. 'The mediating effect of environmental management accounting on green innovation - firm value relationship' [2019], International Journal of Energy Economics and Policy, 9(2), 299-306; Martínez-Ferrero, J., Ruiz-Barbadillo, E., & Guidi, M. 'How capital markets assess the credibility and accuracy of CSR reporting: Exploring the effects of assurance quality and CSR restatement issuance' [2021]. Business Ethics, the Environment & Responsibility, 30(4), 551-569; Abdelhalim, A. M., Ibrahim, N., &Alomair, M. 'The moderating role of digital environmental management accounting in the relationship between eco-efficiency and corporate sustainability' [2023], Sustainability, 15

Stakeholder and legitimacy theory understand the organisation as part of a wider and complex social structure affected by other parties in the society[33]. Stakeholder theory propounded by Freeman (1984) emphasis the necessity of satisfying all stakeholder groups by choosing policies and practices that benefit all[34]. It recognizes the participation of groups outside the providers of capital in organisations (Freeman, 1984), how organisational activities affect them and their influence in pressuring them to adopt sustainability business practices through the reduction of their harmful environmental activities[35]. Existing studies have positively established a link between sustainability assurance and the credibility of sustainability reporting from stakeholders' perspective[36] . Consequently Zaman et al.[37] made known that higher stakeholder confidence in the quality of sustainability report resulting from third party assurance curtails the conflicts between stakeholders and the management.

Legitimacy theory developed by Dowling and Pfeffer in 1975 provides an insight into understanding organisational practices in developing, implementing and communicating their social responsibility policies. It explains that industries with high carbon footprint tend to engage in

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33 Deegan, C. 'The legitimising effect of social and environmental disclosures: A theoretical foundation' [2002]. Accounting Auditing Accountability Journal, 15(3), 282-311.

34 Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023]. Sustainability Accounting, Management and Policy Journal, 2040-8021

35 Meutia, I., Ramadhani, M., & Adam, M. 'Does eco-efficiency improve financial performance of manufacturing companies in Indonesia?' [2019] JurnalDinamikaAkuntansi Dan Bisnis, 6(2), 137-150.

36 Cuadrado-Ballesteros, B., Martınez-Ferrero, J., & Garcıa-Sanchez, I. M. 'Mitigating information asymmetry through sustainability assurance: The role of accountants and levels of assurance' [2017]. International Business Review, 26(6), 1141-1156; Garcıa-Sanchez, I. M., Hussain, N., Martınez-Ferrero, J., & Ruiz-Barbadillo, E. 'Impact of disclosure and assurance quality of corporate sustainability reports on access to finance' [2019]. Corporate Social Responsibility and Environmental Management, 26, 832-848; Martínez-Ferrero, J., Ruiz-Barbadillo, E., & Guidi, M. 'How capital markets assess the credibility and accuracy of CSR reporting: Exploring the effects of assurance quality and CSR restatement issuance' [2021]. Business Ethics, the Environment & Responsibility, 30(4), 551-569.

37 Zaman, R., Farooq, M. B., Khalid, F., & Mahmood, Z. 'Examining the extent of and determinants for sustainability assurance quality: the role of audit committees' [2021]. Business Strategy and the Environment, 1-20.

sustainability assurance and even engage in high quality assurance of their report in order to boost their credibility with stakeholders[38]. The theory argues that the level of disclosure by organisations hinged on its response to stakeholders pressure[39], which enables them to influence stakeholder perceptions of their legitimacy while also reducing information asymmetry. Hence, sustainability assurance is an instrument that legitimises corporate credibility before stakeholders[40] as organisations improve their public confidence through the publication of sustainability reports that are externally assured.

Signalling theory established by Spence (1973) and advances in the field of accounting and finance by Ross (1977) suggest that the information revealed by organisations is a signal to the stakeholders. It explains that every information revealed has a consequence on organisations which can either be positive or negative depending on the information disclosed. Due to this, organisations willingly engaged in voluntary sustainability reporting and reporting valuable information[41]. Also, in order to signal a concern for the environment, organisations disclose their carbon emission. The information disclosed helps in building a strong relationship between organisations and their stakeholders[42] which enables investors to give a positive signal. The theory also explains why organisations engage in sustainability assurance which according to Kheireddine et al[43] is basically for two reasons: to signal

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38 Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023], Sustainability Accounting, Management and Policy Journal, 2040-8021

39 Masud, A. K., Nurunnabi, M., & Bae, S. M. 'The effects of corporate governance on environmental sustainability reporting: Empirical evidence from South Asian Countries' [2018]. Asian Journal of Sustainability and Social Responsibility, 3(3), 2-26

40 Reverte, C. 'Do investors value the voluntary assurance of sustainability information? Evidence from the Spanish stock market' [2021] Sustainable Development, 1-17

41 Hapsoro, D., & Falih, Z. N. 'The effect of firm size, profitability, and liquidity on the firm value moderated by carbon emission disclosure' [2020], Journal of Accounting and Investment, 21(2), 240-257

42 Rukmiyatia, N. M. S., Purbawangsaa, I. B. A., Baskaraa, I. G. K., &Candraningrata, I. R. 'The role of investor recognition mediates the effect of sustainability reporting quality on firm value' [2023], Uncertain Supply Chain Management, 11, 1561-1568

43 Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023], Sustainability Accounting, Management and Policy Journal, 2040-8021.

their sustainability commitment to stakeholders and reduce litigation risk. Hence organisations with higher sustainability performance are more likely to assure their sustainability report in order to signal good performance to stakeholders.

Introduced in the late 1970s by Meyer and Rowan, Institutional theory explains how the external environmental pressure faced by organisations shaped them to behave similarly. In addition to the pressures from stakeholders, organisations behaved in certain ways through pressure from regulatory authorities, industry shared value, belief system and norms and imitations practices in order to stay abreast in their performance. These pressures promote the sustainability performance of organisations[44] . As sustainability reporting in sub-Saharan Africa is driven by accountability to country's specific institutional context[45], the assurance of the same report could be backed by the establishment of strong institutional environment[46] since internal stakeholders seems to be unbothered by the publication of sustainability reports[47] and the assurance of the same in the region. The establishment of an institutional framework would also assist to solve the misconceptions on sustainability and also be used to create a positive attitude with organisations on the same matter.

2.2 Hypotheses Development

2.2.1 Sustainability Assurance and Sustainability Reporting Quality

The external assurance of sustainability reports have grown considerably in the last decade as a response to address the credibility concerns of the information provided in sustainability reports[48]. The external assurance

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[44] Bag, S., Dhamija, P., Bryde, D. J., & Singh, R. K. 'Effect of eco-innovation on green supply chain management, circular economy capability, and performance of small and medium enterprises' [2022], Journal of Business Research, 141, 60-72

[45] Cormier, D., Magnan, M., & Van Velthoven, B. 'Environmental disclosure quality in large German companies: Economic incentives, public pressures or institutional conditions?' [2005], European Accounting Review, 14(1), 3–39

[46] Abdullahi, A., & Makama, U. 'Sustainability reporting in Nigeria' [2021], Al-Hikmah Journal of Arts & Social Sciences Education, 3(1)

[47] Penney, E. K., Owusu-Ansah, A., Amewu, G., &Nsor-Ambala, R. 'Do firms operating in a shared institutional environment have similar sustainability disclosure practices? A comparative analysis of multinational and locally listed firms in Africa, [2023], Cogent Business & Management, 10(2),

[48] Boiral, O., Heras-Saizarbitoria, I., Brotherton, M. C., & Bernard, J. 'Ethical issues in the assurance of sustainability reports: Perspectives from assurance providers' [2018], Journal of Business Ethics,159 (4), 1111–1125

practices have become a standard practice for many large organisations[49] and still represent an emerging market. This has made it an important area of research coupled with events such as the mandating of sustainability reporting in South Africa. Prior studies has focused on and revealed board characteristics as a threats to assuring sustainability report[50], showed that organisations with high level of commitment to corporate social responsibility will adopt a wider assurance scope[51], the kind of assurance engagement that impact reporting quality[52], how legitimacy and preservation of relationship with stakeholders with the intention of signalling sustainability performance inspire external assurance[53], the value placed by investors reports externally assured[54], its positive impact on stock market value through sustainability report[55].

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[49] KPMG. [2020]. The time has come The KPMG Survey of Sustainability Reporting 2020", KPMG's Global Center of Excellence for Climate Change and Sustainability. Available at: https://assets.kpmg/content/dam/kpmg/xx/pdf/2020/11/the-time-has-come.pdf

[50] Garcıa-Sanchez, I. M., Hussain, N., Martınez-Ferrero, J., & Ruiz-Barbadillo, E. 'Impact of disclosure and assurance quality of corporate sustainability reports on access to finance' [2019], Corporate Social Responsibility and Environmental Management, 26, 832-848

[51] Clarkson, P., Li, Y., Richardson, G., & Tsang, A. 'Causes and consequences of voluntary assurance of CSR reports' [2019], Accounting, Auditing & Accountability Journal, 32(8), 2451-2474

[52] Maroun, W. 'Does external assurance contribute to higher quality integrated reports?' [2019] Journal of Accounting and Public Policy,

[53] Simoni, L., Bini, L., &Belluci, M. 'Effects of social, environmental, and institutional factors on sustainability report assurance: evidence from European countries' [2020]. Meditari Accountancy Research, 28(6), 1059-1087

[54] Reverte, C. 'Do investors value the voluntary assurance of sustainability information? Evidence from the Spanish stock market' [2021]. Sustainable Development, 1-17; Miralles-Quirós, M. M., Miralles-Quirós, J. L., Daza-Izquierdo, J. 'The assurance of sustainability reports and their impact on stock market prices' [2021]. Management Letters, 21(1), 47-60

[55] Bauwhede, H. V., &Cauwenberge, P. V. 'Determinants and value relevance of voluntary assurance of sustainability reports in a mandatory reporting context: Evidence from Europe' [2022]. Sustainability, 14; Thompson, E. K., Ashimwe, O., Buertey, S., & Kim, S. Y. 'The value relevance of sustainability reporting: does assurance and the type of assurer matter?' [2022] Sustainability Accounting, Management and Policy Journal, 2040-8021; Khaireddine, H., Lacombe, I., & Jarboui, A. 'The moderating effect of environmental performance on the relationship between sustainability assurance quality and firm value: A simultaneous equations approach' [2024], Benchmarking: An International Journal, 1463-5771; Elbardan, H., Uyar, A., Kuzey, C., & Karaman, A. S. 'CSR reporting,

In line with legitimacy and signalling theory, sustainability assurance increases the credibility of sustainability reports which improves its quality and boost organisations confidence before stakeholders[56]. In sub-Saharan Africa, assurance will be hinged on the country's-specific accountability requirement which started with the mandatory requirement by Johannesburg Stock Exchange in South Africa[57] as organisations' attitude of sustainability reporting does not depict their interest in obtaining a good image before stakeholders[58]. This might affect the way sustainability assurance will influence the quality of sustainability reports. Hence it is expected that sustainability assurance will positively improve the quality of sustainability reporting in sub-Saharan Africa. The hypothesis below is consequently formulated:

H_1: sustainability assurance is positively associated with sustainability reporting quality

Sustainability assurance practices can vary considerably in form of assurance scope and level, the standard used in assurance engagement and the assurance provider type[59]. Prior studies revealed that organisations with a high level of commitment get assured with big-4 audit firms[60] and investors appreciate a sustainability report externally assured by big-4 firms[61]. Rao and

assurance, and firm value and risk: The moderating effect of CSR committees and executive compensation' [2023], Journal of International Accounting, Auditing and Taxation, 53

56 Reverte, C. 'Do investors value the voluntary assurance of sustainability information? Evidence from the Spanish stock market' [2021]. Sustainable Development, 1-17; Khaireddine, H., Lacombe, I., & Jarboui, A. 'The moderating effect of environmental performance on the relationship between sustainability assurance quality and firm value: A simultaneous equations approach' [2024]. Benchmarking: An International Journal, 1463-5771

57 Cormier, D., Magnan, M., & Van Velthoven, B. 'Environmental disclosure quality in large German companies: Economic incentives, public pressures or institutional conditions?' [2005] European Accounting Review, 14(1), 3–39

58 Abdullahi, A., & Makama, U. 'Sustainability reporting in Nigeria' [2021], Al-Hikmah Journal of Arts & Social Sciences Education, 3 (1)

59 ACCA [2015]. The challenges of assuring integrated reports: Views from the South African auditing community. Available at: https://www.accaglobal.com/content/dam/ACCA_Global/Technical/integrate/ea-southafrica-IR-assurance.pdf

60 Clarkson, P., Li, Y., Richardson, G., & Tsang, A. 'Causes and consequences of voluntary assurance of CSR reports' [2019], Accounting, Auditing & Accountability Journal, 32(8), 2451-2474

61 Ibid (n 62)

Juma[62]revealed that assurance from big-4 assurance providers increases stock market value and engineering firms are seven times more likely to get assured by big-4. Likewise, García-Sánchez et al.[63] indicated that the assurance provider's accountant unique qualities such as experience and specialisation which is more present with big-4 assurance providers reduces decoupling practices. Also in South Africa, Thompson et al.[64] indicated that there is no discrimination between specialised consulting firms and Big-4 audit sustainability assurance service providers in the market. Since the sub-Saharan Africa climate is dominated by multinationals[65]who are more inclined in attracting investors and given the investors appreciation of sustainability report assured by big-4 assurance providers[66], it is expected that organisations that engage in the practices of sustainability report with assurance makes use of big-4 assurance providers. To this effect, the hypothesis below is formulated:

H_2: the size of the audit firm is positively associated with sustainability reporting quality

2.2.2 The Moderating Effect of CEP

The carbon-intensive industry has been under increasing pressure to lower its carbon footprint. For organisations in the carbon-intensive industry, the disclosure of their carbon performance is a strategic way to communicate their efforts and achievements towards the reduction of their carbon

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62 Rao, S., & Juma, N. 'Influence of firms' financial performance on disclosure of sustainability initiatives and assurance of sustainability reports' [2020], Corporate Governance and Sustainability Review, 4(2), 77-92

63 Garcıa-Sanchez, I. M., Hussain, N., Martınez-Ferrero, J., & Ruiz-Barbadillo, E. 'Impact of disclosure and assurance quality of corporate sustainability reports on access to finance, [2019],.Corporate Social Responsibility and Environmental Management, 26, 832-848

64 Thompson, E. K., Ashimwe, O., Buertey, S., & Kim, S. Y. 'The value relevance of sustainability reporting: does assurance and the type of assurer matter?' [2022] Sustainability Accounting, Management and Policy Journal, 2040-8021

65 Penney, E. K., Owusu-Ansah, A., Amewu, G., &Nsor-Ambala, R. 'Do firms operating in a shared institutional environment have similar sustainability disclosure practices? A comparative analysis of multinational and locally listed firms in Africa' [2023]. Cogent Business & Management, 10(2),

66 Clarkson, P., Li, Y., Richardson, G., & Tsang, A. 'Causes and consequences of voluntary assurance of CSR reports' [2019], Accounting, Auditing & Accountability Journal, 32(8), 2451-2474.

footprint to stakeholders[67], which also assist investors in making investment decisions[68]. Previous studies has largely been on the influence of carbon performance on firms value[69] and the positive impact of carbon disclosure on carbon emission performance[70]. Since the disclosure of carbon performance assists investors in making decisions, it is believed that it can moderate the association between sustainability assurance and reporting quality. Henceforth, the hypothesis below is formulated:

H_3: CEP positively moderates the association between sustainability assurance and sustainability reporting quality.

3. METHODOLOGY

The study makes use of an ex-post facto research design because it uses existing data derived from previous events. The study covers listed companies engaged in carbon-intensive activities in sub-Saharan Africa. The study's population consists of 332 organisations. This also represents the sampling

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67 Ummah, Y. R., & Setiawan, D. 'Do board of commissioners' characteristic and international environmental certification affect carbon disclosure? Evidence from Indonesia' [2021], Journal. Din. Akunt. dan Bisnis, 8(2), 215–228

68 Hardiyansah, M., Agustini, A. T., &Purnamawati, I. 'The effect of carbon emission disclosure on firm value: Environmental performance and industrial type' [2021]. Journal of Asian Finance, Economics and Business, 8(1), 123–133

69 Daromes, F. E., Ng, S., & Wijaya, N. 'Carbon emissions disclosure as mechanism to increase environmental performance and control of idiosyncratic risk: how they impact firm value' [2020], Indonesian Journal of Sustainability Accounting and Management, 4(2), 227–240; Hardiyansah, M., Agustini, A. T., &Purnamawati, I. 'The effect of carbon emission disclosure on firm value: Environmental performance and industrial type' [2021], Journal of Asian Finance, Economics and Business, 8(1), 123–133; Lu, W., Zhu, N., & Zhang, J. 'The impact of carbon disclosure on financial performance under low carbon constraints' [2021], Energies, 14, 4126; Eze, M .N., &Akaegbobi, G. N. 'Carbon emissions management and performance of selected oil and gas firms in Nigeria' [2023]. Open Access Journal of Management Sciences Research, 1(1), 35-50; Khatib, S. F. A., Ismail, I. H. M., Salameh, N., Abbas, A. F., Bazhair, A. H., &Sulimany, H. G. H. 'Carbon Emission and Firm Performance: The Moderating Role of Management Environmental Training' [2023]. Sustainability, 15, 10485

70 Alsaifi, K. 'Carbon disclosure and carbon performance: Evidence from the Uk's listed companies' [2021]. Management Science Letters, 11, 117-128; Siddique, A., Akhtaruzzaman, M. D., Rashid, A., & Hammami, H. 'Carbon Disclosure, Carbon Performance and Financial Performance: International Evidence' [2021], International Review of Financial Analysis, 75 (May), 1-55

size, hence census sampling was used. Data from 2012-2022 were obtained from their annual financial reports.

Table 1: Sectoral summary of listed carbon intensive companies in sub-Saharan Africa

Sectoral Description	Total Population of companies	Sample
Communication	50	50
Industrials	131	131
Materials	106	106
Oil and gas	20	20
Technology	36	36
Total	**332**	**332**

Source: Authors' Compilation (2024)

3.1 Model Specification

The model of Eneh and Okegbe (2022) was adapted and modified.

$SSR_{it} = \beta 0 + \beta 1SUCM_{it} + \beta 2CTR_{it} + \beta 3FSZ_{it} + \mu_{it}$ **[1]**

Where: SSR_{it} = Social Sustainability Reporting of firm i in period t, $SUCM_{it}$ = Sustainability Committee of firm i in period t, CTR_{it} = Capital Turnover Ratio of firm i in period t, FSZ_{it} = Firm Size of firm i in period t, μ_{it}= component of unobserved error term of firm i in period t, β0= constant term, β1, β2and β3 are sloped to be estimated of firm i in period t. í= firm identifier t= time variable.

The model was restated for this study as:

Hypothesis 1: sustainability assurance is positively associated with sustainability reporting quality

$SRQ_{it} = \alpha_0+\alpha_1SA_{it}+\alpha_2BSIZ_{it}+\alpha_3BOI_{it}+\alpha_4BOD_{it}+\alpha_5BOM_{it}+\alpha_6SIZE_{it}+ \alpha_7AGE_{it} + \alpha_8LEV_{it} + \alpha_9TOBINQ_{it} + \mu_{it}$ **[2]**

Hypothesis 2: the size of the audit firm is positively associated with sustainability reporting quality

$SRQ_{it} = \alpha_0+\alpha_1BIG\_4_{it}+\alpha_2BSIZ_{it}+\alpha_3BOI_{it}+\alpha_4BOD_{it}+\alpha_5BOM_{it}+\alpha_6SIZE_{it}+ \alpha_7AGE_{it}+ \alpha_8LEV_{it} + \alpha_9TOBINQ_{it} + \mu_{it}$ **[3]**

Hypothesis 3: Carbon emission performance positively moderates the relationship between sustainability assurance and sustainability reporting quality

$$SRQ_{it} = \alpha_0+\alpha_1 SA_{it}+\alpha_2 CO2_{it}+\alpha_3 SA\times CO2_{it} +\mu_{it} \quad [4]$$

Where:

SRQ is sustainability reporting quality, SRA is sustainability assurance, BIG_4 is the size of the audit firm, CO2 is carbon emission performance, BSIZ is board size, BOI is board independence, BOM is board meeting, SIZE is firm size, AGE is firm age, LEV is leverage, TOBINQ is market value, α_0 is constant, α_{1-9} are slope of the parameters and $_{it}$ is company'i' in year 't'.

Table 2: Description of variables

Label	Variable Type	Description	Measurements	Data Source
SRQ	Dependent	Sustainability reporting Quality	This equals 1 if a firm publishes a standardized GRI sustainability report, and 0 otherwise	Hadiati and Wahyudyatmika (2023), Al-Shaer et al. (2022),
SA	Independent	Sustainability Assurance	This is evidence that a sustainable report is externally assured. It equals 1 if externally assured, and 0 otherwise	Elbardan et al. (2023), Arbitar et al. (2022)
BIG-4	Independent	Audit Firm Size	A dummy variable measured as 1 if audited by the big-4 audit firm (PWC, Deloitte, EY& KPMG) and 0 otherwise.	Adu et al. (2021), Clarkson et al. (2019), Maroun (2019)
CO2	Moderating variable	Carbon emission performance	CO2 emissions (metrics tons per capita)	Amoah (2023)
Board Level Control Variable				
BSIZ		Board Size	Number of people making up the board of a company	Tingbani et al. (2020)
BOI		Board Independence	Ratio of NEDs on the board	Tingbani et al. (2020)
BOD		Board Diversity	Proportion of female members on the board of directors, that is, number of female directors expressed as % of total board size	Tingbani et al. (2020)
BOM		Board Meeting	Number of board meetings held in a year	Tingbani et al. (2020)
Firm Level Control				
SIZE		Firm Size	This is measured as the natural	Bark (2022),

		log of a firms' total asset	Minciullo et al. (2022)
AGE	Firm Age	The natural log of age of the firm since inception	Adu et al. (2021), Rachmawati (2021)
LEV	Leverage	This is measured as the ratio of total asset to total debt	Oyewo (2023) Al-Shaer et al. (2021)
TobinQ	TobinQ	Measured as market capitalization plus total debt divided by total assets. Market capitalization is measured as the number of shares multiplied by the closing price.	Hadiati and Wahyudyatmika (2023), Elbardan et al. (2023), Vahdati et al. (2022)

Source: Authors' Compilation, 2024

4. ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Descriptive

The data used in this study spans from 2012 to 2022 and includes variables such as Sustainability Reporting Quality, Sustainability Assurance, Board Independence, Board Diversity, Board Meetings, Board Size, Firm Size, Firm Age, Leverage, Profitability, Tobin's Q, Audit Firm Size, and Carbon Emission Performance (SRA_CO2). Table 3 presents the descriptive statistics which entails mean, maximum, minimum, standard deviation, variance, coefficient of variation, and standard error. The mean value of 0.1556 indicates an average of 15.56% of firms publish standardised GRI SR. This shows that a relatively small proportion of firms engage in standardised SR. The maximum value 1 indicates that some firms consistently publish standardised GRI SR. The SD of sustainability reporting quality (0.3625) indicates that there is a considerable variation among firms regarding the publication of SR. The coefficient of variation (CoV) of 2.3296 indicates high variability relative to the mean, suggesting substantial differences in reporting practices among firms. The value of the Standard Error (SE) of the mean is 0.0043. This suggests that the mean is estimated with good precision, indicating reliability in the average value reported. The mean value of 0.1155 indicates that on average, 11.55% of firms have their sustainability reports externally assured, indicating that external assurance is relatively uncommon. The minimum value of zero (0), indicates that some firms do not have external assurance for their sustainability reports. The maximum value of 1, shows that some firms consistently obtain external assurance. The SD of SRA (0.3197) indicates moderate variability in the practice of obtaining external assurance among firms. The CoV is 2.7674, the high CoV indicates

substantial variability in external assurance practices relative to the mean. The SE of the mean is 0.0039 which suggests good precision in the mean estimate, indicating reliability.

The mean (74.49) indicates that the average boards are composed of 74.49% independent members, suggesting a high level of independence. The minimum value is zero (0), which indicates that some boards do not have any independent members. The maximum value of 100, signifies that the boards of some companies are fully independent. The SD 14.54, indicates moderate variability in board independence among companies. The CoV of 0.1952 suggests that variability is small relative to the mean and indicates consistency in board independence levels. While the SE of 0.1534 indicates high precision in the mean estimate. For board diversity, the mean value of 18.82 shows that boards have an average diversity score of 18.82%, indicating low diversity. The minimum (0) means that some boards do not have any diversity. The maximum value of 100 means that some boards are fully diverse. The SD 14.96 indicates moderate variability in board diversity among carbon-intensive companies. The CoV of 0.7948 means that the variability in board diversity is moderately relative to the mean. SE of 0.1554 indicates high precision in the mean estimate.

The mean value of board meetings (5.32) means that on average, firms hold about 5.32 board meetings per year. The minimum value (0) signifies that some firms hold no board meetings. The maximum of 42, indicates that some firms hold up to 42 board meetings per year, indicating high engagement. The SD (2.64), indicates some variability in the number of board meetings held by firms. The CoV of 0.4962 indicates moderate variability in the number of board meetings relative to the mean. The SE of 0.0294, suggests high precision in the mean estimate. The Mean value of 2.21e+08, means that the average firm size in the dataset is large, suggesting significant assets. The minimum value (0) means that some firms have no recorded assets. The maximum of 5.80e+10 signifies that the largest firms have substantial assets, indicating significant differences in firm sizes. The SD of 1.53e+09 indicates high variability in firm size among firms. The CoV of 6.9223, indicates extreme variability relative to the mean, suggesting substantial differences in firm sizes. The SE of 1.52e+07 suggests the mean is estimated with good precision. The mean value of 26.52, signifies that on an average, firms are about 26.52 years old. The minimum value (0) assumes that some firms are newly established. The maximum of 127 indicates that the oldest firm is 127 years old, indicating a wide range of firm ages. The SD of 17.83 indicates considerable variability in firm age among firms. The CoV of 0.6723 shows a

moderate CoV, which indicates variability in firm age is considerable relative to the mean. The SE of 0.2123 indicates high precision in the mean estimate. The mean of 364.99 shows that on average, the leverage ratio is quite high, indicating significant debt levels relative to assets. The minimum of zero (0) indicates that some firms have no leverage. The maximum value of 847932.8 means that some firms have extremely high leverage, indicating significant differences in leverage ratios. The SD of 12636.92 signifies there is high variability in leverage ratios among firms. The CoV of 34.6227 represents an extremely high CoV, which indicates very high variability relative to the mean and suggests substantial differences in leverage practices. The SE of 125.74 suggests the mean is estimated with good precision.

Table 3: Descriptive Statistics

Stats	SRQ	SRA	Board~ce	Board_~y	Board~y	Firm_S~e	Firm_Age	C_Leve~e
Mean	.1556061	.1155091	74.49091	18.82201	5.315535	2.21e+08	26.51822	364.9891
Max	1	1	100	100	42	5.80e+10	127	847932.8
Min	0	0	0	0	0	0	0	0
N	7037	6796	8981	9267	8072	10110	7051	10100
SD	.3625072	.3196589	14.5379	14.96056	2.63741	1.53e+09	17.82742	12636.92
VAR	.1314115	.1021818	211.3505	223.8184	6.955933	2.34e+18	317.8171	1.60e+08
CoV	2.329647	2.767391	.1951634	.7948441	.4961702	6.922317	.6722707	34.62273
SE (mean)	.0043214	.0038776	.1534049	.1554098	.0293553	1.52e+07	.2123065	125.742

Source: Authors' computation, 2024

The mean value of -9.71, indicates that an average profitability is negative, suggesting that, on average, firms are experiencing losses. The minimum value of -233779.3 indicates that some firms have experienced significant losses. The maximum value of 120669.7 indicates that some firms have substantial profits, indicating a wide range of profitability. The SD of 2844.22, shows that there is high variability in profitability among firms. The CoV of -292.8814 shows an extremely high negative CoV indicating very high variability relative to the mean and reflecting the diverse profitability outcomes. The SE of 28.34, suggests the mean is estimated with good precision. The mean value of tobinQ is 55.25 indicating that firms generally have a high market valuation relative to their assets. The minimum value of 0.0044 reveals that some firms have very low tobinQ ratios, indicating low market valuations relative to their assets. The maximum of 157668.9 means that some firms have extremely high tobinQ ratios, indicating significant differences in market valuation. The SD of 2299.12 means there is high variability in tobinQ ratios among firms. The CoV of 41.6099 shows a high

CoV which indicates extreme variability relative to the mean and suggests substantial differences in market valuation. The SE of 27.80 suggests the mean is estimated with good precision.

The mean value of 295165.7, means that average CO2 emissions are substantial, indicating that firms generally emit a high amount of CO2. The minimum value of 13.5 means that some firms have very low CO2 emissions. The maximum value of 7066500 means that some firms have extremely high CO2 emissions, indicating a wide range of emissions levels. The SD of 847869.4 means that there is high variability in CO2 emissions among firms. The CoV of 2.8725 is a substantial variability relative to the mean and reflects diverse emission levels. The SE of 30898.08 suggests that the mean is estimated with good precision. The mean of audit firm size (0.185) means that 18.5% of firms are audited by Big-4 firms and indicates that a minority of firms engage these major audit firms. The minimum value of zero (0) means that some firms consistently use Big-4 firms for audits. The SD of 0.3883 indicates that there is moderate variability in the usage of Big-4 audit firms. The CoV of 2.0988 indicates substantial variability relative to the mean and reflects diverse auditing practices. The SE is 0.0039 indicating that the mean is estimated with high precision. The mean value of 9.532 shows that the average board size is about 9.5 members, indicating that most firms have boards with around 9 to 10 members. The minimum value is zero (0) means that some firms do not have a board. The maximum of 43 means that some firms have large boards with up to 43 members. The SD of 3.7508 means there is moderate variability in board sizes among firms. The CoV of 0.3935 indicates moderate variability in board size relative to the mean. The SE (0.0387) indicates that the mean is estimated with high precision. The mean value of 192572.3 indicates that the average value of the interaction between sustainability assurance and CO2 emissions is substantial. The minimum value of zero (0) shows that some firms have no interaction effect between sustainability assurance and CO2 emissions. The maximum value of 7066500 means that some firms have extremely high interaction effects. The SD of 794581.5 means that there is high variability in the interaction effect among firms. The CoV of 4.1261 indicates substantial variability relative to the mean, reflecting diverse interaction effects. The SE (29348.54) suggests the mean is estimated with good precision.

Table 4: Descriptive Statistics

Stats	Profit~y	TobinQ	CO2	C_BIG4	Board~ze	SRA_CO2
Mean	-9.711156	55.25415	295165.7	.185032	9.532253	192572.3

Max	120669.7	157668.9	7066500	1	43	7066500
Min	-233779.3	.0044373	13.5	0	0	0
N	10071	6841	753	9674	9379	733
SD	2844.217	2299.119	847869.4	.3883436	3.750752	1745.318
VAR	8089572	5285947	7.19e+11	.1508108	14.06814	6.31e+11
CoV	-292.8814	41.60988	2.87252	2.098791	.3934801	4.126146
SE (mean)	28.34174	27.79724	30898.08	.0039483	.0387293	29348.54

Source: Authors' Computation, 2024

4.2 Regression Analysis

This section presents the regression analysis carried out in the study. The study has two objectives with three hypotheses. First it investigates the association of sustainability assurance with sustainability reporting quality and then determines the moderating effect of carbon emission performance on the association between sustainability assurance and sustainability reporting quality of carbon-intensive industry in sub-Saharan Africa. The analysis employs multiple linear regression models to quantify the effects of these relations taking into cognizance other variables.

4.2.1 SA and reporting quality

The estimation of the association between SA and reporting quality has been analysed in Model 1 and Table 5. It is shown that SA is positively associated with reporting quality (0.3328) with a p-value (P>|t| = 0.000), indicating a highly significant association. This which is in line with hypothesis 1 is consistent with legitimacy theory indicating that carbon-intensive industries are more inclined to externally assure their sustainability report to improve its quality[71]. This might not be unconnected to the increased pressure faced by the industry with stakeholders which threatened their legitimacy. To defend their companies' legitimacy and reduce stakeholders' pressure, they engage in the publication of quality sustainability reports by engaging in third-party verification of the report. The result is also explained by signalling theory which indicates that companies willingly report quality information to signal their concerns for the environment, maintain

[71] Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023]. Sustainability Accounting, Management and Policy Journal, 2040-8021

relationships with stakeholders[72] and avoid litigation risks[73]. The board size (0.0204) with p-value (P>|t| = 0.000) and board diversity (0.0032) with p-value (P>|t| = 0.000) both indicate a strong positive effect on reporting quality. This means that larger board sizes and gender-diverse boards influence the publication of quality sustainability reports in carbon-intensive industries. On the other hand, both board independence and board meeting shows a negative relationship with (-0.0009; P>|t| = 0.014) and (-0.0001; P>|t| = 0.939) respectively. This reflects that they both do not influence the publication of sustainability reporting quality, while board meetings reflect no meaningful relationship with its p-value. Although not all the board characteristics are used to support the publication of the quality report, this negates the stance of Garcia-Sánchez et al.[74] that board characteristics is a threat to the assurance of sustainability report and by inference the publication of quality sustainability report.

Also, firm size (3.07e-12; P>|t| = 0.608) and tobinQ (1.81e-07; P>|t| is 0.927) both reveal no meaningful relationship with sustainability reporting quality of carbon-intensive industry in sub-Saharan Africa. Firm age (0.0017; P>|t| = 0.000) shows that older firms in carbon intensive industry are more likely to public quality sustainability report while leverage (-6.33e-08; P>|t| is 0.997) and profitability (-1.66e-08; P>|t| is 0.997) are both negatively related with sustainability reporting quality with their p-value showing an insignificant relationship. This indicates that both variables have nothing to do with the publication of quality sustainability reports in carbon-intensive industries in sub-Saharan Africa. The F-test (10, 6002=124.05/ F = 0.0000) evaluates the overall significance of the regression model. Specifically, it tests whether at least one of the regression coefficients is different from zero. The F-test result indicates that the model as a whole is statistically significant. The p-value is less than 0.05, confirming that the overall model is significant and that at least one of the predictor variables significantly explains variability in SRQ. The p-value indicates that the model provides a good fit to the data. This suggests

[72] Hapsoro, D., & Falih, Z. N. 'The effect of firm size, profitability, and liquidity on the firm value moderated by carbon emission disclosure' [2020]. Journal of Accounting and Investment, 21(2), 240-257

[73] Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023]. Sustainability Accounting, Management and Policy Journal, 2040-8021

[74] Garcıa-Sanchez, I. M., Hussain, N., Martınez-Ferrero, J., & Ruiz-Barbadillo, E. (2019). Impact of disclosure and assurance quality of corporate sustainability reports on access to finance. Corporate Social Responsibility and Environmental Management, 26, 832-848

that the set of independent variables collectively has a significant impact on the dependent variable. The R-squared value of 0.1713 indicates that the model explains about 17.13% of the variability in sustainability reporting quality. While this demonstrates some level of explanatory power, it also highlights that there are other factors influencing the publication of quality sustainability reports that are not captured in this model. The adjusted R-squared value of 0.1699, being close to the R-squared value, suggests that the model's predictors are reasonably well chosen. It adjusts for the number of predictors and confirms that the model does not include unnecessary variables, providing a more accurate reflection of the model's explanatory power.

These findings are in line with the study of Simoni et al.[75] and Reverte[76] the intention to signal sustainability performance to stakeholders with the motive of preservation of relationship influence sustainability assurance including the value placed by investors on externally assured reports. It also supports the work of Kheireddine et al.[77] which reveals that companies externally assured their sustainability reports to boost their confidence before stakeholders. The findings negate institutional theory and reveal that carbon intensive industries in sub-Saharan Africa are not pressured by the institutional framework to publish quality reports and get it externally assured.

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[75] Simoni, L., Bini, L., &Belluci, M. 'Effects of social, environmental, and institutional factors on sustainability report assurance: evidence from European countries' [2020]. Meditari Accountancy Research, 28(6), 1059-1087.

[76] Reverte, C. 'Do investors value the voluntary assurance of sustainability informa tion? Evidence from the Spanish stock market' [2021]. Sustainable Development, 1-17

[77] Khaireddine, H., Lacombe, I., & Jarboui, A. 'The trilogy in sustainability of environmental performance, assurance quality and firm value' [2023]. Sustainability Accounting, Management and Policy Journal, 2040-8021.

Table 5 (Model 1): The model ascertains if sustainability assurance is positively associated with sustainability reporting quality.

Source	Ss		Df	Mf		
Model	142.0568765		10		14.2568765	
Residual	689.789459		6,002		0.11492660	
Total	**832.358224**		**6,012**		**0.13844947**	
SRQ	**Coef.**	**Std. Err.**	**T**	**P>|t|**	**[95% Interval**	**Interval]**
Board_Size	0.020438	0.001577	12.96	0.000	0.0173466	0.0235297
SRA	0.33822	0.014363	23.17	0.000	0.3046652	0.360978
Board_Indepen	0.0008539	0.000346	2.47	0.014	0.0015321	0.0001756
Board Diversity	0.0032091	0.000335	9.59	0.000	0.0025529	0.0038654
BOM	0.000144	0.001897	0.08	0.939	0.0038638	003575
Firm _Size	3.07e-12	5.99e-12	0.51	0.608	8.68e-12	1.48e-11
Firm _Age	0.00172	0.000248	6.94	0.000	0.0012339	0.0022058
C _Leverage	6.33e-08	4.07e-07	0.16	0.876	8.61e-07	7.352e-07
Profitability	1.66e-08	4.27e-06	0.00	0.997	8.38e-06	8.35e-06
TobinQ	1.81e-07	1.97e-06	0.09	0.927	3.69e-06	4.05e-06
_cons	0.10787	0.028705	3.76	0.000	0.1641428	0.0515996
Number of obs		6,013				
F(10, 6132)		124.05				
Prob> F		0.0000				
R-squared		0.1713				
Adj R-squared		0.1699				

Source: Author's Computation, 2024

4.3.2 Audit firm size and reporting quality

The estimation of the association between audit firm size and reporting quality as analysed in Model 2 is presented in Table 6. As shown in table 4 audit firm size measured by big-4 indicates a significant relationship between audit firm size and SRQ with a p-value less than 0.05. The coefficient (0.1114466) supports hypothesis 2 that organisations in the carbon-intensive industry make use of big-4 in their sustainability assurance and this improves the quality of their sustainability report. It also revealed that the SRQ of organisations audited by the big-4 is on average, 11.1% higher than those not audited by big-4. This is in support of Clarkson et al.[78] which says that investors appreciate the sustainability report that is externally assured.

[78] Clarkson, P., Li, Y., Richardson, G., & Tsang, A. 'Causes and consequences of voluntary assurance of CSR reports' [2019]. Accounting, Auditing & Accountability Journal, 32(8), 2451-2474

Table 6 (Model 2): The model ascertains if the size of the audit firm is positively associated with sustainability reporting quality

Source	SS	df	MS
Model	96.0341636	10	9.60341636
Residual	743.200738	6,132	0.121200381
Total	839.234902	6,142	0.136638701
Number of obs =	6,143		
F(10, 6132) =	79.24		
Prob> F =	0.0000		
R-squared =	0.1144		
Adj R-squared =	0.1130		
Root MSE =	.34814		

SRQ	Coef.	Std. Err.	T	P>|t|	[95% Conf.	Interval]
Board _Size	0.024419	0.0015898	15.36	0.000	0.0213025	0.0275356
C_BIG4	0.1114466	0.0106927	10.42	0.000	0.0904852	0.132408
Board _Indep	-0.0003578	0.0003468	-1.03	0.302	-0.0010375	0.000322
Board _Diversity	0.0046135	0.0003346	13.79	0.000	0.0039576	0.0052694
BOM	0.0022667	0.0019743	1.15	0.251	-0.0016037	0.0061371
Firm _Size	1.66e-11	6.16e-12	2.70	0.007	4.56e-12	2.87e-11
Firm _Age	0.0017684	0.0002547	6.94	0.000	0.001269	0.0022678
C _Leverage	-6.80e-08	4.18e-07	-0.16	0.871	-8.88e-07	7.52e-07
Profitability	-1.19e-06	4.34e-06	-0.27	0.784	-9.69e-06	7.31e-06
TobinQ	4.26e-07	2.03e-06	0.21	0.833	-3.55e-06	4.40e-06
_cons	-0.2114655	0.0287467	-7.36	0.000	-0.267819	-0.1551119

Source: Author's computation, 2024

4.3.3 The moderating role of CEP

The coefficient of SA (0.1045875; P-value: 0.05) suggests that organisations with externally assured sustainability reports tend to have higher reporting quality. Specifically, SA increases SRQ approximately by 10.5%. The p-value indicates that the relationship is statistically significant. The coefficient of CO2 (1.58e-07; p-value: 0.006) indicates that higher CEP is associated with higher SRQ. This suggests that organisations with better CEP tend to report higher-quality sustainability information. The p-value indicates a statistical significance thereby implying that organisations with better CEP may be more committed to sustainable practices and, as a result, provide higher-quality sustainability reports. Therefore, improving CEP can be an effective strategy for firms to enhance their sustainability reporting quality. This shows that CEP is a strategic way for organisations to communicate their efforts and achievements towards the reduction of their carbon footprint to stakeholders which also assists investors in making investment decisions

which is in line with Ummah and Setiawan[79] and Hardiyansah et al[80]. The interaction that is SA*CO2 shows a negative coefficient and p-value greater than 0.05 (-8.28e-08; 0.182) indicating that the combined effect of having SA and high CEP is less than the sum of their individual effects. The t-value of -1.34 indicates that the coefficient is not significantly different from zero, suggesting a weak interaction effect. Since the p-value is greater than 0.05, hypothesis 3 is rejected indicating that there is insufficient evidence to support the expectation that CEP will positively moderate the relationship between SA and sustainability reporting quality. Although SA and CEP individually improve reporting quality, their interaction does not have a significant combined effect. Organisations in the carbon-intensive industry in sub-Saharan Africa should therefore focus on obtaining SA and improving their CEP independently to enhance their SRQ. This individuality is supported by signalling theory which explains that organisations disclose their CEP in order to signal concerns for the environment and build their relationship with stakeholders[81].

[79] Ummah, Y. R., & Setiawan, D. 'Do board of commissioners' characteristic and international environmental certification affect carbon disclosure? Evidence from Indonesia' [2021], Journal. Din. Akunt. dan Bisnis, 8(2), 215–228

[80] Hardiyansah, M., Agustini, A. T., &Purnamawati, I. 'The effect of carbon emission disclosure on firm value: Environmental performance and industrial type' [2021]. Journal of Asian Finance, Economics and Business, 8(1), 123–133

[81] Rukmiyatia, N. M. S., Purbawangsaa, I. B. A., Baskaraa, I. G. K., &Candraningrata, I. R. 'The role of investor recognition mediates the effect of sustainability reporting quality on firm value' [2023]. Uncertain Supply Chain Management, 11, 1561-1568

Table 7(Model 3): The model ascertains if CEP positively moderates the relationship between sustainability assurance and sustainability reporting quality

Source		Ss		Df	Mf	
Model		6.3267780		3	2.10892602	
Residual		161.449484		729	.221467056	
Total		**167.776262**		**732**	**.229202544**	
SRQ	**Coef.**	**Std. Err.**	**T**	**P>|t|**	**[95% Interval**	**Interval]**
SRA	0.1045875	0.0381339	2.74	0.006	0.029722	0.179453
CO2	1.58e-07	5.77e-08	2.74	0.006	4.47e-08	2.71e-0
SRA_CO2	8.28e-08	6.20e-08	1.34	0.182	2.05e-07	3.90e-08
_cons	0.5722407	0.0246289	0.025	0.000	0.5238887	0.6205926
Number of obs	73					
F (10, 6132)	9.52					
Prob> F	0.0000					
R-squared	0.0377					
Adj R-squared	0.0377					
Root MSE	.4706					

Source: Authors' computation, 2024

4.3. Multicollinearity Test

Multicollinearity refers to a situation in regression analysis where independent variables are highly correlated, leading to unreliable and unstable estimates of regression coefficients. Variance Inflation Factor (VIF) quantifies the severity of multicollinearity by measuring how much the variance of a regression coefficient is inflated due to multicollinearity and the correlation matrix identifies pairwise correlations between independent variables to highlight potential multicollinearity. The covariance matrix provides the covariates between coefficients, indicating how changes in one variable might be associated with changes in another.

In model 1, the covariance matrix indicates the following significant covariance: SA and Board Size (-3.113e-06) and SA and Firm Age (-2.204e-07). These values suggest potential relationships between these pairs of variables, though the magnitudes are relatively small. The correlation matrix indicates the following: TobinQ and Leverage (-0.4271) and Firm Size and Board Size (-0.1934), meaning that the correlation between TobinQ and Leverage is moderate and suggests a potential multicollinearity issue. The moderate correlation between TobinQ and Leverage indicates that these variables share a common variance, which could inflate the standard errors of the regression coefficients, leading to less precise estimates. Other variables exhibit low correlations, indicating that multicollinearity is not a widespread problem in this model. In model 2, the covariance matrix indicates the following notable covariance: BIG-4 and Board Size (-6.493e-07) and BIG-4

and Firm Age (-3.398e-07). These small values suggest weak relationships, while the correlation matrix: TobinQ and Leverage (-0.4270) and Firm Size and Board Size (-0.2035), similar to Model 1, the correlation between TobinQ and Leverage is moderate. The persistence of the moderate correlation between TobinQ and Leverage suggests that this issue is consistent across models. It indicates a need to address this specific pair of variables to improve the model's reliability. The slight increase in correlation between Firm Size and Board Size should be monitored, although it is not immediately concerning. In model 3, the covariance matrix indicates the following significant covariances: SA and CO2 (5.554e-1) and SRA_CO2 and CO2 (-3.326e-15). The covariances involving interaction terms highlight complex relationships. The correlation matrix: CO2 and SA_CO2 (-0.9296) shows a very high negative correlation indicating severe multicollinearity between CO2 and its interaction term with SA. The severe multicollinearity between CO2 and SA_CO2 suggests that these variables are almost linearly dependent. This can significantly distort the estimates of the regression coefficients, making it difficult to assess the individual effect of each variable accurately. The high correlation suggests that when CO2 increases, the combined effect with SA (as captured by SA_CO2) decreases, indicating redundancy in the information these variables provide.

5. CONCLUSION AND RECOMMENDATIONS

This study examined the practices of SA in sub-Saharan Africa, a region where studies on sustainability are limited to date. For this reason, this study examined the SA with reporting quality while also examining the moderating effect of CEP on the association between SA and SRQ. The findings indicated that SA has a significant positive effect on reporting quality in carbon-intensive industries in sub-Saharan Africa. This confirms that organisations in carbon-intensive industries are more inclined to increase the quality of their sustainability report through external assurance. Due to the increased pressure faced on the reduction of their carbon footprint, they will engage SA in their sustainability report to reduce stakeholders' pressure while improving on the legitimacy of their organisations at the same time. Since they are willing to report quality information on their sustainability activities, they intend to maintain their relationship with their stakeholders while signalling their concerns for the environment at the same time. The findings also show that these organisations engage in the service of big-4 which improves their sustainability reporting quality confirming that the unique qualities such as experience and specialisation provided by big-4 improve

carbon footprint[82] which interests investors more. The moderating effects reveal that CEP and SA are better off individually in improving SRQ. Their combined effect suggests a weak interaction depicting that CEP cannot influence organisations to improve the quality of their sustainability report through external assurance.

The study revealed the importance of SA in improving the quality of SRQ. This suggests a change of attitude towards the publication of SRQ to organisations in sub-Saharan Africa other than the carbon-intensive industry while also educating them on the necessity of the publication of SRQ. The study also suggests a need for a standard institutional framework in sustainability reporting in sub-Saharan Africa. This will encourage sustainability reporting while also improving its quality through the adoption of SA. This will also improve CEP as auditors through their expertise and experience will guide organisations on strategies to improve their CEP. Since both CEP and SA individually improve SRQ, an improvement in CEP will also automatically improve SRQ of organisations in sub-Saharan Africa.

[82] Garcıa-Sanchez, I. M., Hussain, N., Martınez-Ferrero, J., & Ruiz-Barbadillo, E. 'Impact of disclosure and assurance quality of corporate sustainability reports on access to finance' [2019], Corporate Social Responsibility and Environmental Mana gement, 26, 832-848