

The role of environment sustainability accounting on competitive advantage and making decision: Evidence from Sudan

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ABSTRACT

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The study aims to identify the effect of environmental sustainability accounting (ESA) on competitive advantage (CA), and the effect of ESA on making decisions (funding, investment, and strategic) in Sudanese banking. A questionnaire was used to collect data from 135 accountants and managers of Sudanese banking. A descriptive method was used to confirm that the study's goals had been met. The questionnaire data is analyzed, and hypotheses are tested, using the Smart pls application. The study found a positive relationship between ESA and CA in the Sudanese banking sector. Additionally, ESA has a positive relationship with funding, investment, and strategic decisions in the Sudanese banking sector. Based on these findings, future research can help accountants comprehend the intricacies of ESA according to national and cultural conditions, especially in developing countries. Also, larger sample sizes may be used in future research on this topic, particularly if it is studied internationally.

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1. Introduction

Overall, the Industrial Revolution's disadvantages and effects began to surface when traditional agriculture gave way to industry as the primary economic activity in many towns. Industrial activity caused emissions and environmental degradation (Beredugo, 2012). In addition, the increase in the world's population has led to a sharp decline in available resources, an increase in waste deforestation, and resource depletion (Özaşkın & Görener, 2023). When people overuse the natural resources found in the environment for purposes other than sustaining their basic needs, they harm the environment. (ENDIANA et al., 2020). Businesses face increasing pressure to implement eco-friendly practices because of consumers' increased awareness of environmental issues and government regulations. Industry and academia have felt compelled to take immediate action to address environmental protection concerns to resolve these challenges (Rahman et al., 2024). To maintain a sustainable society, stakeholders pressure businesses to be activities compatible with the environment (Okoye et al., 2013). Over the past twenty years, there has been a noticeable increase in environmentally sustainable reporting, and the number of global assets allocated to these strategies climbed from USD

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13.3 trillion in 2012 to USD 35.3 trillion in 2020 (Chopra et al., 2024). Environment Sustainable Accounting (ESA) is accounting information that takes into consideration how a company's operations impact the environment and financial outcomes. To provide a more comprehensive picture of a company's success, it attempts to aggregate data on the environment (Nguyen & Tran, 2019).

Sustainability is a multifaceted and intricate issue that necessitates attention from several organizational levels. Enhancing an activity's sustainability, for instance by using fewer resources, typically affects other system/business objectives. As a result, before coming to a standard agreement, the stakeholders must carefully consider and balance the trade-offs of each choice. To guarantee that they adhere to sustainability initiatives, the roles and duties of every stakeholder must also be made clear (Cabot et al., 2009). By operating sustainably and avoiding hurting the ecology with their commercial operations, corporate sustainability seeks to alter human behaviour. As a result, environmental information advances in the direction of environmental sustainability, which is represented by ecological expenditure costs and intended to have an impact on internal decision-making while considering environmental factors (Nuleg et al., 2021).

Many studies have addressed issues of sustainability and environmental accounting in developed countries, while a few studies have addressed issues in developing countries, including a study by Beredugo (2012) believed that ESA is useful for providing the ecological information managers need to make decisions. The increased awareness of environmental-related costs might occasionally provide the chance to determine how to reduce or avoid these costs and improve environmental performance. Also, Von Schwedler (2016) concluded that ESA considers the environment while making financial decisions. It comprises figuring out, measuring, and revealing how a business's operations affect the environment. In addition, Wiredu et al., (2023) said that ESA aids companies in strengthening their competitive edge through the environmentally friendly consumption of clean products; it also modifies and raises the degree of knowledge and action of organizations and stakeholders about environmental issues in each firm. Sudan is one of the East African nations. Agriculture is the main driver of the Sudanese economy, but the country's industrial base is still weak. The products that industrial facilities could produce were food and drink items, sugar and vegetable oil (Dafa'Alla, 2018). The increased discovery, extraction, and economic exploitation of oil has boosted all sector's relative importance; nevertheless, when the country's southern part declared its independence in 2011, more than 75% of the oil fields were lost. The significance of banking, industry, and other sectors in the Sudanese economy decreased as a result (Musa & Ibrahim, 2023).

Studies that addressed environmental and sustainability issues in Sudan, (Elobeid, 2012) aim to draw attention to how crucial institutions are to both sustainable development and economic growth. The study concludes that variations and weaknesses in development performance. (Ahmed, 2014) focus on the influence of financial data on Sudan's economic growth and decision-making. The findings indicated that accounting information plays a part in attaining economic growth and development. Mohammed (2019) analyses the factors impeding the adoption of accounting for environmental effects in the Sudanese industry. The result found the absence of monetary standards for environmental harm and the lack of tax incentives available to adopt them. (Mohammed, 2020) concluded that the lack of binding environmental rules and regulations from the state's competent authorities led to corporate enterprises' lack of interest in providing a sufficient disclosure of their environmental performance. (Musa, 2024) examines how Sudan's industrial sector's decision-making (DM) is impacted by the accounting components of economic, social, and environmental sustainability. The study's findings demonstrate the absence of an environmental component in decision-making.

This article aims to find out how ESA contributes to competitive advantage and decision-making processes in the Sudanese banking industry, especially since there is a dearth of research on this subject in Sudan.

2. Literature Review

2.1 ESA

The term ESA refers to how an organization might modify its routine accounting practices to promote both internal and external advancements toward sustainable growth. ESA is seen as a crucial instrument for fostering sustainable development and gaining a deeper understanding of the effects of economic activity on the environment (Isack et al., 2022). The term ESA describes the financial and non-financial data on an organization's environmental performance, impacts, and efforts that are revealed in its yearly financial reports and other communication materials. Stakeholders can assess an organization's sustainability and environmental responsibility initiatives with the use of these components (Ellili & Nobanee, 2023). Also, is described as incorporating environmental costs and benefits into financial statements and decision-making processes. This can assist businesses in identifying opportunities to lower environmental risks and costs, enhance their environmental performance, and better understand the environmental effects of their operations (Kanaka Raju & Hanumantha Rao, 2016). Moreover, to foster the development of entities, people, and the environment, Accounting is concerned with the environment and the responsible use of resources and appropriate stakeholder accountability. (Branco et al., 2024). The contemporary notion of ESA incorporates a more comprehensive case-based methodology, as opposed to concentrating solely on reducing and acknowledging specific environmental costs, or a specific set

of expenses in the production process. The company's financial statements show long-term investments in resources for the creation and maintenance of the environmental management system, in addition to environmental expenses. By providing value and gaining a competitive edge, these investments may affect future financial success if managers pay attention to performance (Rahman et al., 2024). Enhancing access to resources and services, controlling supply and demand, enhancing environmental quality, minimizing effects, lowering risks, and preparing for extreme exceptions are all included in the ESA (Dahash & Abdlamer, 2022). The goal of improving access to resources and services is to guarantee that people have reasonable, dependable, and suitable access to these resources. Allocating natural resources to suit the demands of present and future generations based on available resources is the main goal of managing supply and demand. Every business must submit an open, transparent, and sustainable report, with a special emphasis on environmental reporting. Corporate decision-making should prioritize the company's sustainability in the long run. This would benefit not only individual companies but also the stock market's quality, as superior information will eventually begin to identify the market rather than short-term incomplete data (Giang et al., 2020). Using the natural capital concept may assess and document how a business affects natural resources like minerals, water, and forests. This entails determining the worth of these resources as well as the ecosystem services they offer, and then disclosing this data in financial statements or sustainability reports. Businesses can find strategies to lessen their environmental effect and gain a better understanding of their reliance on natural resources with the aid of natural capital accounting (Dias & Meneses, 2022).

It is a component of an accounting tool that assists businesses in lessening environmental issues that affect communities and social welfare. The owners and management of the companies should be more conscious of the need to protect the environment. They must exhibit their corporate duty towards environmental conservation by integrating environmental data into reports that are either mandated or optional. Businesses should establish guidelines for environmental reporting that will benefit various stakeholder groups (Nuleg et al., 2021).

Typical components of ESA are:

- Environmental costs are the expenses, both direct and indirect, that a company bears because of its operations related to the environment, including waste management, pollution control, and environmental compliance. Financial statements include information on environmental costs, which are useful for assessing an organization's environmental performance (Braam et al., 2016).
- Environmental liabilities are the possible charges that a company might have to pay in the future because of harm that its operations may have caused to the environment. These are included in financial accounts and aid in determining how exposed a company is to environmental hazards (Siregar & Deswanto, 2018).
- Environmental investments: this describes the monetary funds that a company sets aside for projects related to the environment, like sustainable supply chain management, renewable energy, and water conservation. These are included in financial accounts and aid in assessing how committed a company is to sustainability (Shabbir & Wisdom, 2020)
- Environmental performance indicators are non-financial metrics, which are used to assess how well a business is doing in terms of the environment. Sustainability reports include environmental indicators that are used to monitor an organization's progress toward its environmental sustainability objectives (Deswanto, et al. 2018).

2.2 *Competitive advantage (CA)*

The definition of CA is companies with a variety of skills that can contend in the marketplace and provide superior to average outcomes. It is possible to define employed productive components as having innately different degrees of efficiency. Businesses that have access to these resources can meet customer demands more effectively and/or produce more inexpensively (Abdelraheem & Hussaien, 2021). Since it captures the objectives of all commercial organizations, the concept of competitive advantage is essential. They must constantly compete with other businesses in the same industry to preserve and expand their CA (Allawi et al., 2019). Businesses today have more challenges in maintaining a competitive edge; they lose their market leadership because of misguided resource allocation, stalled new investments, or the inertia of established businesses. Furthermore, it is difficult to translate resources into capabilities that are appropriate for the ever-changing environment (Hussain et al., 2021). Abdul Rahman et al. (2020) suggest that providing environmental accounting information impacts the attainment of sustainable competitive advantages for industrial enterprises with high pollution levels. Industrial businesses have a strict strategy about following environmental standards and strive to produce environmentally friendly products. This helps them gain sustainable competitive advantages that support their short- and long-term aims. Having an environment competitive edge is crucial for businesses to increase their attainment of sustainable performance. Environmental information fosters the establishment of sustainability performance priorities, explains the connection between employee activities and the organization's sustainable goals, and points management in the direction of environmental issues (Saputra et al., 2023).

Based on the above, the following hypothesis can be formulated:

H₁: *There is a relationship between ESA and CA in the Sudanese banking sector.*

2.2 Making decision (MD)

Decisions are the outcomes of choices. As a result, choosing a preferred option or a course of action from a range of alternatives is the outcome of the cognitive process known as decision-making. On the other hand, decision-making is frequently a much more "fuzzy process" that is less precise and influenced by numerous factors (Bell & Morse, 2014). All stakeholders, from the local to the global, must take sustainable development into account when making decisions for the society transition to proceed and become fully functional. By doing this, sustainability is transformed from a concept that "guides" activity to one that "generates action". Influence, information organization, and interpretation are three major obstacles to sustainable development decision-making (Waas et al., 2014). Information with either direct or indirect financial content that may be utilized as input to a firm's decision-making is what environmental information is, not a product for accountants to use or sell. Facility managers, financial analysts, and product designers are the users of environmental accounting data (Branco et al., 2024). Due to factors including investor pressure, and decision-making standards linked to set financial reporting systems, executives frequently take a short-term view. Businesses might incorporate sustainability and the environment into the framework they use to make long-term financial decisions. The company might implement flexible financial decision-making ways that cost savings through effective use of resources, increased revenue, risk control, and intangible assets (Siegrist et al., 2020). Significant corporate expenses are incurred by investments in the environment and sustainability. Off-balance-sheet intangible assets are challenging to quantify but can yield substantial returns. A rising portion of a company's market capitalization is made up of intangible assets (Siegrist et al., 2020). Executives are frequently hesitant to adopt sustainability initiatives because they think the expenses will outweigh the returns on investment (Henderson, 2015). In addition to providing information to stakeholders outside the company, such as banks, financial institutions, environmental management organizations, and communities, environmental accounting aids internal decision-making in the business's operations to enhance financial and environmental performance (Nguyen & Tran, 2019).

Among the studies that dealt with the relationship between ESA and investment decisions, financing decisions, and strategic decisions .ESA factors have been increasingly integrated into the evolution of investment decision-making. Investment decisions involve determining how much capital to invest and where to invest it, considering expected returns, associated risks, and environmental impacts (Рыманов & Rymanov, 2018). Also, the allocation of resources yields favourable environmental effects and financial returns, as determined by thorough ESA systems (Pike & Neale, 2003). The integration of environmental sustainability factors has resulted in major changes to financial decisions. Choosing the best capital structure and funding sources while taking financial costs and environmental impact measures into account is known as sustainable financing (Roses, 2014). Making sustainable financial decisions involves figuring out the best capital structure and funding sources while taking environmental impact measurements and financial expenses into account (Abdullah & Lim, 2023). Additionally, long-term strategic decisions that incorporate environmental sustainability criteria with conventional strategic planning and use environmental accounting data to guide organizational direction are known as sustainable strategic decisions. Also, comprehensive planning choices that align organizational capabilities with environmental opportunities and constraints, are supported by environmental accounting systems(Gandia et al., 2023).

Based on the above, the following hypotheses can be formulated:

H₂: *There is a relationship between ESA and DM in the Sudanese banking sector.*

These are divided into the following sub-hypotheses:

- There is a relationship between ESA and funding decisions in the Sudanese banking sector.
- There is a relationship between ESA and investment decisions in the Sudanese banking sector.
- There is a relationship between ESA and strategic decisions in the Sudanese banking sector.

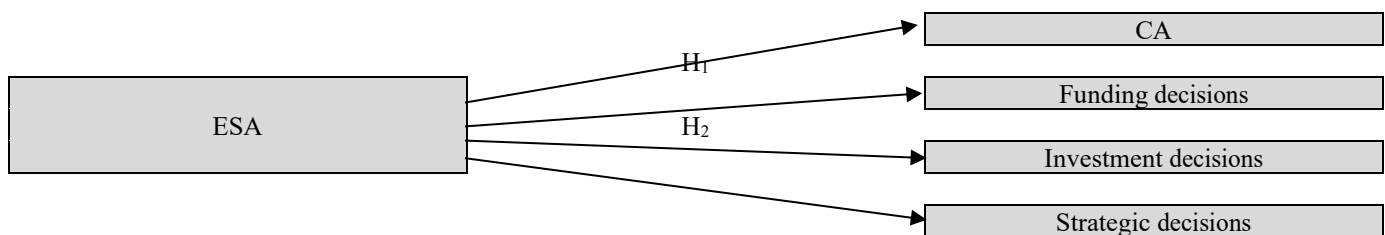


Fig. 1. The proposed study

3. Methods

The study explores the impact of ESA on competitive advantage and making decisions in Sudanese industrial companies. The descriptive analytical method was used. A questionnaire was used to gather data from the study sample accountants and managers in Sudanese private food factories in Khartoum city before the war, and Port Sudan town after the war. 150 electronic questionnaires were distributed, and 135 responses were collected. That is a response rate of 90%. The questionnaire consists of three main parts. The first part measured ESA. The second part measured CA. The third part measured DM, these decisions are divided into financial, investment and strategic. For this purpose, the researcher used a five-point scale, ranging from “strongly disagree” to “strongly agree.” Partial least squares structural equation modelling, (PLS-SEM), was used to assess the structural model.

4. Results

4.1 Measurement model assessment

Construct reliability, indicator reliability, and convergent validity

The assessment of model fitness in the (PLS-SEM) results commenced with an evaluation of factor loadings (FL) .Hair et al. (2022) suggest that FL values exceeding 0.7 are deemed favorable. In Fig. 1 and Table 1, All FL values exceeded 0.7, confirming the reliability of the study’s measures.

Table 1

The summary of the factor loading

	Outer loadings
Environmental dimension1 ← ESA	0.796
Environmental dimension2 ← ESA	0.790
Environmental dimension3 ← ESA	0.833
Environmental dimension4 ← ESA	0.843
Environmental dimension5 ← ESA	0.816
Funding Grant Decisions1 ← Funding Grant Decisions	0.816
Funding Grant Decisions2 ← Funding Grant Decisions	0.776
Funding Grant Decisions3 ← Funding Grant Decisions	0.831
Funding Grant Decisions4 ← Funding Grant Decisions	0.790
Funding Grant Decisions5 ← Funding Grant Decisions	0.747
Investment decisions1 ← Investment decisions	0.755
Investment decisions2 ← Investment decisions	0.745
Investment decisions3 ← Investment decisions	0.847
Investment decisions4 ← Investment decisions	0.791
Social dimension3 ← ESA	0.770
Social dimension4 ← ESA	0.711
Strategic decisions1 ← Strategic decisions	0.840
Strategic decisions2 ← Strategic decisions	0.830
Strategic decisions3 ← Strategic decisions	0.868
Competitive advantage1 ← Competitive advantage	0.839
Competitive advantage2 ← Competitive advantage	0.844
Competitive advantage3 ← Competitive advantage	0.779
Competitive advantage5 ← Competitive advantage	0.793

To guarantee internal consistency, the researcher evaluated Cronbach’s alpha (CA) values, targeting values above 0.7. Table 1 indicates that all constructs surpassed this threshold. Given concerns about CA’s underestimation, it is advisable to also evaluate rho_Alpha and composite reliability (CR). Both CR and rho should be more than 0.7 for confirmatory purposes, according to Hair et al. (2022). Table 1 confirms that all constructs meet this criterion. Additionally, convergent validity, which assesses the correlation between a measure and similar conceptual measures, is achieved when the average variance extracted (AVE) exceeds 0.5.

Table 2

Construct reliability, indicator reliability, and convergent validity

	Cronbach's alpha	Composite reliability (rho a)	Composite reliability (rho c)	Average variance extracted (AVE)
ESA	0.903	0.905	0.923	0.632
Funding Grant Decisions	0.856	0.895	0.894	0.628
Investment decisions	0.795	0.819	0.865	0.617
Strategic decisions	0.804	0.819	0.883	0.716
Competitive advantage	0.834	0.863	0.887	0.663

Discriminant validity

Several tests were done at the end of the measurement model to check if the constructs in the model were distinct from each other. Discriminant validity (DV) means how much a specific construct differs from other constructs (Duarte & Raposo, 2010). There are different ways to confirm discriminant validity, and one method is the Heterotrait-Monotrait ratio (HTMT).

Table 3

Discriminant validity using HTMT.

	ESA	Funding Grant Decisions	Investment decisions	Strategic decisions	Competitive advantage
ESA					
Funding Grant Decisions	0.477				
Investment decisions	0.766	0.756			
Strategic decisions	0.606	0.709	0.803		
Competitive advantage	0.489	0.631	0.722	0.680	

Structural model assessment

The structural model assessment involved examining the relationships between constructs, drawing from existing literature (Hair et al., 2019). In our study's model, we specifically conceptualized direct effects. To test these direct effect hypotheses, we employed 5000 subsamples with bias-corrected bootstrapping, resulting in 95% confidence intervals. For further details, please refer to Table 4 and Fig. 2.

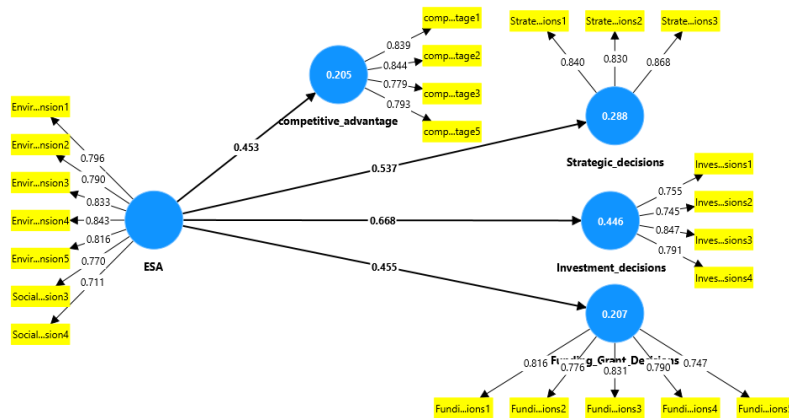


Fig. 2. The results of the hypotheses testing

We discovered the following outcomes when testing hypotheses. First, there was support for Hypothesis 1 (H1). Specifically, ESA has a positive impact on Funding Grant Decisions, there was statistical significance to this impact ($\beta = 0.455$, $t = 5.955$, $p > 0.000$). Moderate was the related effect size ($F2 = 0.262$).

Hypothesis 2 (H2) was not supported. Specifically, ESA has a positive impact on Investment decisions, there was statistical significance to this impact ($\beta = 0.668$, $t = 15.707$, $p > 0.000$). Large was the related effect size ($F2 = 0.805$).

Hypothesis 3 (H3) was supported. Specifically, ESA has a positive impact on Strategic decisions, there was statistical significance to this impact ($\beta = 0.537$, $t = 7.724$, $p > 0.000$). Moderate was the related effect size ($F2 = 0.404$).

Hypothesis 4 (H4) was supported. Specifically, ESA has a positive impact on competitive advantage, there was statistical significance to this impact ($\beta = 0.453$, $t = 5.963$, $p > 0.000$). Moderate was the related effect size ($F2 = 0.258$).

Table 4

Hypotheses testing results.

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (O/STDEV)	P values
ESA → Funding Grant Decisions	0.455	0.469	0.076	5.955	0.000
ESA → Investment decisions	0.668	0.675	0.043	15.707	0.000
ESA → Strategic decisions	0.537	0.548	0.069	7.724	0.000
ESA → competitive advantage	0.453	0.471	0.076	5.963	0.000

Coefficient of determination

The coefficient of determination (R^2) serves as a metric for assessing the predictive capability of a model by quantifying the proportion of variance in the outcome variables explained by the predictors. Cohen (1988) categorized R^2 values into three levels:

small ($R^2 = 0.20$), medium ($R^2 = 0.50$), and large ($R^2 = 0.80$). In our study, the R^2 values are shown in the next table (see Table 10).

Table 5

R-square

	R-square
Funding Grant Decisions	0.207
Investment decisions	0.446
Strategic decisions	0.288
Competitive advantage	0.205

Effect size

As indicated by F2 statistic, we gain insights into the individual contributions of each predictor to the variance explained in the outcome variables. Following Cohen's (1988) classification, F2 values fall into three categories: weak ($F2 = 0.02$), moderate ($F2 = 0.15$), and large ($F2 = 0.35$). Upon examining the results presented in Table 5, it becomes evident that this study encompasses a range of effect sizes. Consequently, we infer that the impact of individual predictors on the variance explained in the outcome variables is diverse and multifaceted.

Table 6

Effect sizes of the latent variables.

	f-square
ESA → Funding Grant Decisions	0.262
ESA → Investment decisions	0.805
ESA → Strategic decisions	0.404
ESA → competitive advantage	0.258

Path collinearity

Also known as the Variance Inflation Factor (VIF) or Common Method Bias, this study examined VIF values to ensure they remained below 3.3. Elevated VIF values can indicate pathological collinearity and common method bias (Kock, 2015). As indicated in Table 6, the observed VIF values fell within an acceptable range, indicating that the study model was free from pathological contamination and common method bias. This reflects the quality of both the measurement and structural models (Kock, 2015).

Table 7

Variance Inflation Factor (VIF)

	Funding Grant Decisions	Investment decisions	Strategic decisions	Competitive advantage
ESA	1.000	1.000	1.000	1.000

5. Discussion

The study found a positive relationship between ESA and CA in the Sudanese industrial sector. Additionally, a positive relationship between ESA and DM in the Sudanese industrial sector. But found no relationship between the moderating effect and CA in the Sudanese industrial sector. The study results are consistent with (Abdul Rahman et al., 2020; Saputra et al., 2023; Rahman et al., 2024), Who found that there is an impact of environmental sustainability information in achieving a CA.

The study results are consistent with (Cabot et al., 2009; Nguyen & Tran, 2019; Giang et al., 2020; Siegrist et al., 2020; Nuleg et al., 2021; Branco et al., 2024) who found corporate decision-making should prioritize the company's sustainability depends on environmental information. Businesses might incorporate sustainability and the environment into the framework they use to make long-term financial decisions. While different from the study (Henderson, 2015) found that executives are hesitant to adopt environmental sustainability initiatives because they think the expenses will outweigh the returns on investment.

6. Conclusion

The study looked at the contribution of ESA on CA and DM in the Sudanese banking sector. The findings indicate a definite influence of ESA on CA. This paper explores opinions of banking accounts in Sudan toward the ESA, which is conspicuously absent from the literature. Also, a positive impact of ESA on funding, investment, and strategic decisions. The study highlights issues of ESA and its relationship between DM and CA, which has not been addressed by many studies, especially in developing countries in general, and Sudan in particular. Must possess the knowledge and abilities necessary for accountants to create a

sustainability report, comprehend the intricacies of social, economic, and environmental issues, and generate superior financial and non-financial data that aids in DM and fosters CA. The need for requirements from central bank directives that promote banking to embrace green financing and finance. The latest developments in ESA would necessitate curriculum modifications for auditing educators. To achieve these gains, interdisciplinary approaches must be used in future developments in accounting education.

The study's main limitation is reflected in the sample 135 responses from the respondents. The reason is that Sudan was affected by internal conflict and the closure of many banks in places where there were military battles in middle and western Sudan. Additionally, solely employ questionnaires for data collection. Larger sample sizes may be used in future research on this topic, particularly if it is studied internationally.

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