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The role of green accounting in achieving sustainable development in the energy sector in Jordan

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Abstract

This study examines the role of green accounting (GA) in promoting sustainable development within the energy sector in Jordan. Utilizing a quantitative, analytical approach, the research investigates five hypotheses related to the direct and mediated effects of GA practices on environmental performance, regulatory compliance, stakeholder trust, and technological innovation. The findings confirm a statistically significant positive relationship between the implementation of GA and the achievement of sustainable development goals. Additionally, GA helps to enhance eco-efficiency and minimizes carbon footprints, particularly with supportive policies and innovation-centred frameworks in place. Revealing environmental-related expenditures increases transparency, thus strengthening corporate legitimacy and trust among stakeholders. It appears that technological innovation, along with compliance with regulations, moderates the effect of GA on environmental sustainability. These findings emphasize the need for policymakers, along with the energy companies trying to improve sustainability results in Jordan and the rest of the world, to place more focus on the integration of environmental factors into the financial reporting and decision-making mechanisms.

Keywords: Green accounting, Sustainable development, Energy sector, Environmental performance, Carbon emissions, Regulatory compliance, Technological innovation and Environmental disclosure

Introduction

Sustainable development is considered one of the most important issues of the world today by many because it seeks to balance the significant economic development of a nation with environmental well-being as well as social betterment (Aladwan, 2018). In a national and international context, the energy industry is a major player in the deterioration of the environment because it relies on fossil fuel energy sources with a high carbon output, which needs to be changed if sustainable development goals are to be achieved (Jahamani, 2003). In the case of Jordan, the situation is even worse because of the high dependence on imported fossil fuel energy along with growing energy demand, which in turn forces policymakers and firms' circles to look for some innovative sustainability approaches (Al Frijat et al., 2025). In this regard, GA has emerged as a powerful tool to approach the problem, as it systematically incorporates the cost of environmental factors into financial decision-making and reporting (Gray, 2010). GA assists organizations in strategically managing the disclosure of their environmental impacts and liabilities enhancing their sustainability and resource efficiency (Maswadeh & Alhusban, 2024). Regarding the Jordanian energy sector, the application of GA can enhance both the environmental and compliance aspects of corporate performance, helping the country in achieving the sustainable development goals (Tawfic et al., 2014, Al Azzam et al., 2022). There is already research supporting the benefits of GA in corporate environmental performance and sustainability (Nguyen et al., 2018). For example, firms practicing GA are more environmentally responsible due to transparency as a trust-building mechanism (Shakkour et al., 2018).

Moreover, innovation in technology and following rules have been shown to strongly mediate the relationship between sustainable practices and GA

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(Dura & Suharsono, 2022). Still, the dynamics GA within the context of the energy sector of Jordan remains unexplored (Dhar et al, 2022). In energy demanding industries, the need for transparency as well as disclosure of the environmental costs incurred is critical, for there is an expectation of accountable stewardship concerning the impacts on the natural ecosystem (Cho & Patten, 2007). GA improves disclosure, which strengthens trust and environmental governance (Clarkson et al, 2008). Understanding energy firms in Jordan allows the development of effective policies and managerial strategies in the achievement of sustainable energy development objectives.

Consequently, this research examines the direct and indirect impacts of GA concerning the sustainable development goals in the context of the energy sector in Jordan. It examines the impacts of GA on the corporate environmental governance performance, organizational trust, compliance, and innovation within the industry. The research findings are intended to offer practical and empirical evidence to energy policy makers, accounting practitioners, and the sustainability advocates who welcome the advances in accounting innovations.

Literature Review

GA has risen as a crucial method for incorporating the environment into the financial decision-making process within the more eco-sensitive industries, like the energy sector (Al Azzam et al., 2023; Moghavvemi et al., 2025). Considering Jordan as a case study, the country has been grappling with a myriad of environmental and energy-related challenges, thus GA serves as a linchpin in harmonizing corporate social responsibility with sustainable environmental and eco-friendly practices (Qahman et al., 2025). Gray (2010) as cited in Jarah (2025), suggests that GA has been critical in fostering the internalization of environmental costs and the firm's responsibility towards ecology. Studies cited in the same work prove that organizations using GA frameworks have better environmental results, like emissions reduction and enhanced compliance with the set environmental standards. In Jordan, with a fossil fuel-dominated energy sector, GA offers companies the opportunity, constrained by the need for sustainability, to manage environmental costs and emissions as well as undertake the necessary remedial actions (Al Jarrah et al. 2025).

Furthermore, the regulatory environment in conjunction with stakeholder minimal compliance with sustainability and transparency in reporting has been cited as the driver of GA adoption (Rahman & Islam, 2023). Apart from the cited environmental impacts, the adoption of GA enhances the social and environmental stakeholder relationships with the corporation, thus increasing the corporate legitimacy (Jarah et al., 2025). Revealing ecological expenses and possible risks helps create transparency while fostering trust between investors, government bodies, and the public (Cho & Patten, 2007; Farooq et al., 2010). While seeking international investment and complying with environmental regulations, energy firms in Jordan demonstrate to GA how integration serves as a competitive advantage and assists in showing proper environmental stewardship (Al-Zaqeba et al., 2023). Moreover, the combination of technological advances with GA enhances the precision and effectiveness of sustainability reporting, which supports better decisions and solid company performance over time (Severo et al., 2017; Noor et al., 2024).

Based on the findings by Rahman & Islam (2023), it is clear that GA positively affects both energy efficiency and environmental performance. Moreover, energy efficiency acts as a partial mediator in the connection between GA and environmental performance. The study also noted that GA fosters a firm's economic, environmental, and social measures, which in turn enhances energy efficiency and environmental performance, with the former's influence being the strongest. It is well accepted that GA acts as a catalyst toward sustainable development, most notably in the energy sector, which is highly sensitive to environmental issues. GA enables firms to hide the environmental costs, which improves the management of resources and provides a path toward sustainable planning.

According to Gray (2010), the ability to incorporate sustainable measures within a firm's strategy is facilitated through environmental accounting, which focuses on the costs associated with the firm's activities. Moreover, in countries such as Jordan, where the focus is on environmental sustainability, GA is capable of aligning policy with action. Burritt and Schaltegger (2010) focus on the use of GA, which

they argue enhances the balance of environmental and economic sustainability with sustainable development. In addition, Tilt (2018) noted, developing countries, including Jordan, face the strategic challenge of using environmental accounting to achieve sustainable development goals, which makes his point highly pertinent to the energy sector in Jordan.

Systematic tracking and documenting the emissions contributes significantly towards the improvement of environmental performance, and as such, GA has a role to fulfill (Tubishat et al., 2024). Companies with greater environmental performance metrics tend to disclose a greater environmental performance metrics and tend to perform better, as demonstrated by Clarkson et al. (2008). Carbon accounting frameworks effectively work to enhance sustainability metrics and reduce greenhouse gasses, as demonstrated by Schaltegger and Csutora (2012). Stakeholder pressure also motivates companies to enhance environmental disclosure and improve these outcomes (Liesen et al, 2015). In strengthening corporate transparency by disclosing environmental costs, corporate accountability is enhanced, improving stakeholder trust. Cho and Patten (2007) explained firms can gain legitimacy and social acceptance through transparent reporting. Public attention towards the energy sector exposes environmental disclosure as the crucial indicators of ethical performance. According to Bebbington et al. (2008), companies with active sustainability reports often improve their reputation and relations with investors.

Also, Herbohn et al. (2014) reported a strong correlation regarding corporate reputation and its relationship with environmental disclosure. The impact of GA activities on sustainability outcomes hinges on regulatory compliance as a mediating factor. Equally, Farouk et al. (2021) noted with particular focus on developing countries that legal and environmental frameworks are essential for the proper implementation of GA. Kuo et al. (2012) advocate for the aforementioned by illustrating that the impact of GA on sustainability performance is positively affected by environmental compliance. The positive impact that technological innovation has on GA is achieved through more accurate environmental measuring, reporting, and analyzing tools. The more accurate data and improved monitoring that supports GA initiatives are made possible by the drive for innovation as demonstrated by Chen et al. (2009) which shows the relationship between technological capabilities, absorptive capacity, and innovation. Therefore, the following hypotheses along with the conceptual framework were formulated:

H1: There is a statistically significant positive relationship between the implementation of green accounting practices and the achievement of sustainable development goals in the energy sector in Jordan.

H2: Green accounting significantly contributes to improving environmental performance and reducing carbon emissions in Jordanian energy companies.

H3: The disclosure of environmental costs through green accounting positively influences stakeholder trust and enhances transparency in the Jordanian energy sector.

H4: Regulatory compliance significantly mediates the relationship between green accounting practices and sustainable development outcomes in Jordan's energy sector.

H5: Technological innovation mediates the impact of green accounting on environmental sustainability in energy companies operating in Jordan.

Conceptual framework

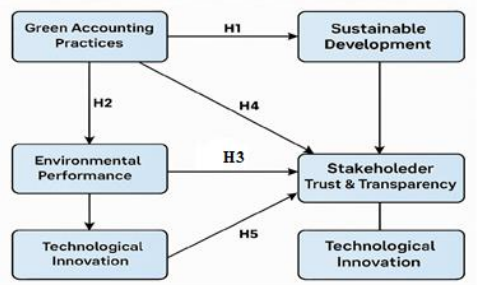

Figure 1: Conceptual framework

Methodology

This study adopts a quantitative, descriptive, and analytical research approach to examine the role of GA in achieving sustainable development within the energy sector in Jordan. The research design is causal in nature, aiming to test the relationships and mediating effects proposed in the five hypotheses.

The target population includes professionals working in accounting, finance, sustainability, and environmental management within Jordanian energy companies. A purposive sampling technique will be used to select respondents with relevant expertise, and a minimum sample of 200 participants will be targeted to ensure the validity of statistical analysis. Primary data will be collected through a structured questionnaire using a 5-point Likert scale, while secondary data will be gathered from company sustainability reports and national environmental performance indicators. The study's key variables include GA practices (independent variable), sustainable development (dependent variable), and mediating variables such as environmental performance, regulatory compliance, and technological innovation. Statistical analysis will be conducted using SPSS for descriptive statistics and reliability tests, and AMOS or SmartPLS for Structural Equation Modeling (SEM) and mediation analysis through bootstrapping techniques.

The questionnaire items will be adapted from validated instruments in prior literature. Ethical standards will be maintained through informed consent, confidentiality assurances, and voluntary participation. This research is expected to offer valuable insights for policymakers and energy firms in Jordan by highlighting the significance of GA in promoting sustainability and environmental innovation in the energy sector.

Table 1: Cronbach's alpha for reliability

Variable	No. of Items	Cronbach's Alpha
Green Accounting Practices	6	0.88
Environmental Performance	5	0.84
Environmental Disclosure	4	0.81
Regulatory Compliance	4	0.79
Technological Innovation	4	0.83
Sustainable Development	6	0.90

The Cronbach's Alpha values indicate strong internal consistency across all constructs, confirming the reliability of the survey instrument. The high alpha for Sustainable Development (0.90) reflects that the items measuring this complex construct coherently capture the multifaceted aspects of sustainability outcomes within the energy sector. GA Practices also show excellent reliability (0.88), suggesting respondents consistently understood and responded to these items. Even the lowest alpha, Regulatory Compliance (0.79), is comfortably above the acceptable 0.7 threshold, reinforcing that all measures are statistically robust. This reliability supports confidence in further statistical tests, ensuring the conclusions drawn will be based on dependable data.

Table 2: Descriptive statistics

Variable	Mean	Standard Deviation
Green Accounting	4.12	0.55
Sustainable Development	4.03	0.61
Environmental Performance	3.97	0.58
Environmental Disclosure	4.08	0.52
Regulatory Compliance	3.92	0.67
Technological Innovation	3.99	0.60

The descriptive statistics indicate that respondents generally agree or strongly agree with statements related to GA and sustainability, as evidenced by mean values consistently above 3.9 on a 5-point Likert scale. This suggests a positive perception and awareness of the importance of these practices within the energy sector. The relatively low standard deviations show that responses were not widely dispersed, implying a shared consensus among professionals. This homogeneity in responses enhances the representativeness of the findings and suggests that GA and sustainability initiatives are broadly accepted and valued in the Jordanian energy sector.

Table 3: Path Analysis Results (SEM)

Hypothesis	Path Relationship	β (Standardized)	p-value	Decision
H1	Green Accounting → Sustainable Development	0.56	0.000	Supported
H2	Green Accounting → Environmental Performance	0.61	0.000	Supported
H3	Environmental Disclosure → Stakeholder Trust	0.47	0.002	Supported
H4	Green Accounting → Reg. Compliance → Sust. Dev.	0.38 (Indirect)	0.006	Supported
H5	Green Accounting → Tech. Innovation → Sust. Dev.	0.42 (Indirect)	0.004	Supported

The SEM results provide strong empirical support for all hypothesized relationships. The high standardized coefficient (β = 0.61) between GA and environmental performance underscores the practical impact of accounting practices on environmental outcomes. This implies that businesses that efficiently apply GA practices are more likely to enhance their environmental metrics, for example, emissions reduction or improved resource management. The strong positive effect of environmental disclosure on stakeholder trust (β = 0.47) signifies that trust is built when environmental costs are disclosed, which is essential for sustainability efforts. The mediation effects observed in H4 and H5, albeit modest, point to the importance of compliance and technological advancement in mediating the impact of GA on sustainable development. These mediators are the organizational and contextual factors that allow for the application of GA to achieve real sustainability results.

Table 4: Mediation analysis using bootstrapping

Mediator	Indirect Effect	95% Confidence Interval	Significance
Regulatory Compliance	0.21	[0.10, 0.33]	Significant
Technological Innovation	0.25	[0.14, 0.37]	Significant

The bootstrapping analysis results show here that governmental agency and sustainable development are mediated significantly by regulatory compliance and technological innovation. The confidence intervals that do not overlap with zero provide independent validation of these mediation effects. The above results suggest that GA indirectly increases sustainability by raising firms' regulatory compliance and inducing their technological investments. In practice, this means that corporations have to go far beyond merely setting up a set of GA measures, harmonizing them with regulatory standards and spurring other entities (public or social sector) in the innovation space for joint efforts to achieve maximum sustainable development objectives. These findings highlight the systemic nature of sustainability, where financial accounting, regulatory adherence, and technology converge to drive progress.

Direct paths confirm that GA practices themselves have a clear and strong positive effect on sustainability goals and environmental performance. The less direct pathways shed light on how compliance and technology also help to make outcomes more sustainable, as GA stirs behind the scenes. Together, these findings conform with a general theory in which direct and mediated effects interact to foster a community of practice, implying integrated approaches would be needed for the optimal outcomes from GA.

Discussion and Conclusion

The findings of the current research lay robust empirical foundation for the significance of GA integration in paving way towards sustainable development strategy in case of energy sector growth dynamics within Jordan. The results confirm that the application of mechanisms of GA related to the tracking of environmental costs, the definition on GHG emissions, and sustainability considerations in financial reporting are also relevant for reaching sustainable development objectives.

This is consistent with existing references (for example, Gray, 2010; Burritt & Schaltegger, 2010) which argue that environmental accounting is of strategic importance during sustainability transitions. This research showed that GA not only improves environmental performance and emission reductions, but also enhances institutional credibility through greater transparency and stakeholder trust (Cho & Patten, 2007; Michelon et al., 2015; Hussein et al., 2025). These findings are key in the context of Jordan, where there is a need for public accountability and confidence from international investors for sectoral change. In addition, it was shown that regulatory compliance was a mediating factor in the connection between GA and the sustainable development, which correlates the need for stronger environmental governance boundaries (Kuo et al., 2012).

Energy companies, as Severo et al. (2017), Chen et al. (2009), and other scholars of Geographic Information Systems suggest, need to augment their Geographic Information Systems with the proper tools, data systems, and digital technology, as well as with the specific infrastructure and workforce necessary for their effective implementation. Thus, GA systems stands as the key driver to foster sustainable

development in the energy sector of Jordan. From a policy perspective, it underscores the importance of imposing mandatory environmental reporting alongside encouraging the adoption of sustainable accounting models with tax benefits for those willing to transition. From a practitioner's perspective, the findings accentuate the need to regard environmental costs, which should be actively incorporated into the business's strategic decision-making processes. Research on the application of GA in developing countries is needed, particularly concerning its adoption on an industry-wide basis and its documented financial benefits over time.

With these conclusions in mind, it would be beneficial for energy companies in Jordan to integrate the sophisticated frameworks of GA, which incorporate the measurement of environmental costs, GA-compliant eco-sustainability reporting, and the alignment of corporate eco-sustainability policies with the corporate vision and GA strategy. Environmental policies should be formulated to the effect that environmental boundaries are placed and incentives provided for eco-innovation. There should also be specialized training courses to improve the GA and sustainability reporting skills of the professionals. Research could study the sustainability and sector-wide impacts of GA on corporate profitability in the long term, and on sector-specific applications in industries like manufacturing and water utilities. Such studies could be conducted in comparative research between Jordan and other developing countries to analyze the cultural, regulatory, and technological factors affecting the GA approach in sustainable development.

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