Research Article

Research Trends on Green Accounting, CSR, and Financial Performance in the Context of Firm Value : A Bibliometric Analysis of Indonesian Energy Sector Literature

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Abstract: This study conducts a bibliometric analysis to explore research trends on Green Accounting, Corporate Social Responsibility (CSR), and financial performance in the context of firm value within Indonesia's energy sector. Utilizing data from 1,000 peer-reviewed articles (2019–2025) sourced from Crossref, the analysis employs *Publish or Perish* and *VOSviewer* to map publication trends, thematic clusters, and citation networks. The findings reveal three dominant clusters: (1) Green Accounting and CSR linked to governance and sustainability, (2) empirical studies on financial performance and firm value, and (3) emerging themes like green investment and ESG integration. The study highlights inconsistent findings in the literature, such as the mixed impact of Green Accounting on firm value and the mediating role of profitability. By identifying gaps—such as limited sector-specific studies and the need for longitudinal analyses—this research provides a foundation for future inquiries. The practical implications emphasize the strategic alignment of sustainability practices with financial goals, while recommendations call for interdisciplinary approaches and policy-driven frameworks to enhance ESG adoption in Indonesia's energy sector.

Keywords: Bibliometric Analysis; Corporate Social Responsibility (CSR); Energy Sector; Financial Performance; Firm Value

1. Introduction

Indonesia, as a rapidly growing developing country, faces a significant challenge in balancing economic growth with environmental sustainability. The energy sector, as one of the main pillars of the economy, plays a crucial role in achieving sustainable development goals. However, the exploitation of energy resources often results in negative environmental impacts, such as greenhouse gas emissions and ecosystem degradation(Oktiara & Effriyanti, 2024). In this context, the concept of Green Accounting emerges as an approach to integrate environmental aspects into corporate accounting systems. Green Accounting allows companies to identify, measure, and report the costs and benefits associated with their operational activities from an environmental perspective. This aligns with the growing awareness of the importance of Corporate Social Responsibility (CSR), which encourages companies to contribute positively to society and the surrounding environment(Dahlia dkk., 2024). As attention towards environmental and social issues increases, investors and other stakeholders have started to consider non-financial factors in assessing corporate performance and value.
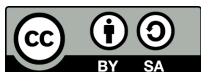
Conversely, studies such as those by (Putri dkk., 2023) reveal that the implementation of Green Accounting and CSR positively impacts both profitability and firm value. However, profitability does not mediate the relationship between Green Accounting and CSR with firm value. This suggests that while Green Accounting and CSR may influence profitability, they do not always translate directly into higher firm value. Further research by (Aziz & Kholmi, 2024)) in the mining subsector demonstrates that Green Accounting, profitability, and CSR all positively impact firm value. This highlights the importance of integrating environmental and social dimensions to enhance firm value, particularly in high-impact sectors like energy. Research finding by (Frisal dkk., 2024) emphasize that the disclosure of sustainability reports and Green Accounting significantly affects firm value, although the disclosure of carbon emissions does not have the same impact. Profitability is also found to significantly influence firm value, suggesting that firms focusing on environmental performance and transparency can build stronger investor confidence.

However, research by (Febrianto dkk., 2025) indicates a negative impact of Green Accounting on firm value, with CSR failing to moderate the relationship between Green Accounting and firm value. This suggests that the costs associated with implementing Green Accounting might detract from short-term profitability, thus reducing its impact on firm value. Furthermore, studies by (Sukmadilaga dkk., 2023) reveal that Green Accounting related to energy consumption does not significantly affect firm value, while emissions-related dimensions do have a positive impact. This study further underscores the need to focus on specific environmental factors when considering Green Accounting's effects on corporate performance. Research finding by (Handayani, 2024) highlights that while Green Accounting has a negative impact on financial performance, CSR does not show a significant influence. However, when considered together, Green Accounting and CSR affect financial performance, suggesting a synergy between these practices in enhancing a company's public image and long-term success. Green accounting contributes significantly to building investor confidence, which in turn positively influences the firm's value. These findings highlight the importance for companies to enhance firm value by applying good corporate governance (GCG) and ensuring transparent disclosure of environmental-related information(Amelia, 2016).

Several recent international studies further highlight the complexity of the relationship between Green Accounting, CSR, and firm value across various industries. Research founding by (Fernando dkk., 2024) that Green Accounting disclosures in Southeast Asian mining and agriculture firms did not significantly influence firm value, suggesting that disclosure alone may not sway investor perceptions. In contrast, (Murdianingrum dkk., 2024) demonstrated that both Green Accounting and CSR positively affect profitability, which subsequently enhances firm value. Furthermore, (Supriyanti & Wardhani, 2024) emphasized the moderating role of foreign ownership in the relationship between Green Accounting and firm

value, though carbon emission disclosure showed no direct effect. Similar null effects were reported by (Prasetyaningsih, 2025) for Green Accounting and carbon emission disclosures in Indonesia's energy sector. Different with (Rilla Gantino dkk., 2023) sectoral differences, noting a negative effect of Green Accounting on firm value in consumer goods but a positive one in the automotive industry. Meanwhile, (Dharmawati dkk., 2024) showed positive and significant impacts of both Green Accounting and CSR on firm value in state-owned banks. Study by (Nur dkk., 2023) conducted a bibliometric analysis in Green Accounting in Indonesia but noted its limited implementation in practice.

These international findings reinforce the relevance of context—industry type, governance, and regional priorities—in determining the effectiveness of environmental and social strategies on firm performance and valuation. These diverse findings highlight the inconsistency in literature regarding the relationship between Green Accounting, CSR, and firm value. This suggests the presence of a research gap that can be addressed through bibliometric analysis to identify research trends and explore under-explored areas in the Indonesian energy sector context.

This study presents a unique approach by utilizing bibliometric analysis to examine research trends related to Green Accounting, Corporate Social Responsibility (CSR), and financial performance, focusing on firm value within Indonesia's energy sector. This methodology enables the identification of emerging patterns and research gaps that have not been fully explored in existing literature. While previous studies predominantly employed quantitative methods or case studies, this research offers a novel perspective by using bibliometrics, providing a data-driven approach to understanding the evolution of research in this field.

The state of the art of this research lies in its integration of bibliometric techniques with a specific emphasis on Indonesia's energy sector, a key area facing complex environmental challenges. Despite numerous studies on Green Accounting and CSR, few have focused on the energy sector in Indonesia, a country grappling with significant sustainability issues such as carbon emissions and resource management. Therefore, this study provides a much-needed exploration of the sector's environmental and financial dimensions.

The primary research gap addressed by this study is the limited understanding of the relationships between Green Accounting, CSR, and financial performance in the context of firm value within Indonesia's energy sector. Previous research has not sufficiently explored how these factors interact in this specific context. By identifying this gap, the study aims to stimulate more targeted and relevant research in the future. Additionally, the bibliometric approach offers an objective, comprehensive overview of the current research landscape and provides clear directions for future inquiries.

The main objectives of this study are to: 1). Analyse research trends on Green Accounting, CSR, and financial performance in the context of firm value in Indonesia's energy

sector. 2). Identify existing research gaps related to these topics. 3). Provide recommendations for future research directions in Green Accounting, CSR, and financial performance within the energy sector of Indonesia.

2. Preliminaries or Related Work or Literature Review

2.1 Green Accounting

Theory: Green Accounting refers to an accounting approach that integrates environmental costs and benefits into the financial accounting framework of companies. The goal is to assess the environmental impact of business operations and to incorporate these aspects into financial reporting. Green Accounting as the practice of measuring and reporting the environmental consequences of corporate activities. This approach aims to improve sustainability and transparency in corporate decision-making, helping firms address environmental concerns while ensuring financial accountability (Stefan Schaltegger, 2016). Previous Studies: Research by (Fidiana, 2018) demonstrated that CSR positively influences firm value by improving public perception and investor trust. However, the effectiveness of CSR initiatives is contingent on aligning these activities with the company's business strategy and stakeholder expectations. Similar finding (Wiredu dkk., 2023) examine the impact of Green Accounting on ecological sustainability, emphasizing its importance in environmental cost management.

2.2 Corporate Social Responsibility (CSR)

Theory: Corporate Social Responsibility (CSR) refers to the ethical responsibility that a company has to society and the environment, beyond just profit maximization. According to (Carroll, 1991), CSR encompasses four dimensions: economic, legal, ethical, and philanthropic responsibilities. CSR activities can improve a company's reputation, customer loyalty, and investor confidence, which ultimately influence its market value. Previous Studies: Study from(Huynh Thi Thu & Le Xuan Quynh, 2024) effective CSR strategies can enhance a company's reputation and stakeholder trust. Transparency resulting from sustainability disclosures can improve reputation and expand market share, especially among consumers and investors who are increasingly paying attention to social and environmental factors(Saragih, 2024).

2.3 Financial Performance

Theory: Financial performance reflects a company's ability to generate profit and manage its resources efficiently. Common indicators of financial performance include Return on Assets (ROA), Return on Equity (ROE), and Net Profit Margin (NPM). Strong financial performance indicates efficient operations and effective management (Houston, 2012). Previous Studies: financial performance significantly affects firm value, both directly and indirectly through sustainability reporting in energy sector companies(Rochmah, 2022). Study conducted by (Arfazil dkk., 2022) manufacturing firms in Indonesia, demonstrating that

environmental performance, financial leverage, and institutional ownership positively influence firm value, with financial performance serving as a key determinant.

2.4 Bibliometric Analysis

Bibliometric analysis refers to a systematic and quantitative approach used to explore the landscape of scholarly communication. It involves the examination of citation patterns, authorship networks, and the progression of research topics over time. Within this discipline, researchers utilize advanced quantitative techniques to analyze bibliographic records, aiming to uncover trends in the generation and dissemination of knowledge(Judijanto & Astutik, 2025)(Kryvych & Goncharenko, 2020). This includes identifying key contributing institutions, mapping collaborative networks across countries, and tracking the development of scientific output through academic publications, patents, and other forms of intellectual property(Sharma, 2024).

3. Proposed Method

This study adopts a bibliometric methodology to map the intellectual structure and research development concerning green accounting, corporate social responsibility (CSR), and financial performance in relation to firm value within Indonesia's energy sector. Data were sourced from Crossref, using a combination of keywords: ("green accounting" OR "environmental accounting") AND ("CSR") AND ("financial performance") AND ("firm value") AND ("energy sector" AND "Indonesia"). The selection is limited to peer-reviewed journal articles published from 2019 to 2024. The corpus includes empirical studies, conceptual frameworks, and systematic reviews.

Bibliometric mapping was conducted using *Publish or Perish* and *VOSviewer*, focusing on several dimensions: publication trends, author collaboration, keyword co-occurrence, citation networks, and thematic clustering. The analysis began with descriptive statistics, followed by co-authorship analysis to illustrate collaboration patterns. Co-word analysis identified core themes, while co-citation mapping revealed influential literature shaping this research domain. (Zhang dkk., 2024).

4. Results and Discussion

This study utilizes bibliometric analysis to systematically explore the development of academic research on green accounting, corporate social responsibility (CSR), and financial performance in relation to firm value within Indonesia's energy sector. Data were collected from the Crossref database, comprising up to 1,000 articles published between 2019 and 2025. The *Publish or Perish* (PoP) software was used to refine the search process, applying relevant keywords such as "Green Accounting," "Corporate Social Responsibility," "Financial Performance," "Firm Value," "Bibliometric Analysis," "Energy Sector," and "Indonesia."

The metadata obtained were exported in RIS format and analyzed using VOSviewer for bibliometric mapping. Network, overlay, and density visualizations were employed to identify publication patterns, thematic clusters, and research intensities. This methodological framework offers a structured overview of the research landscape and highlights significant developments, knowledge gaps, and future research trajectories in the Indonesian energy sector.
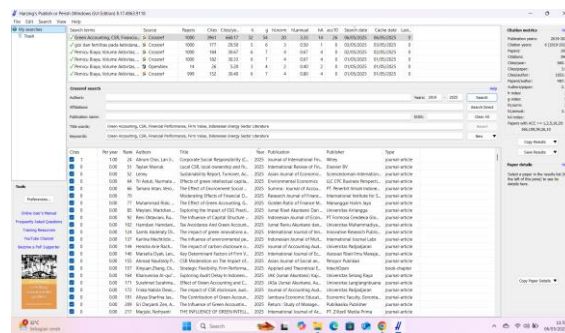

Figure 1. Metadata Query Results from Publish or Perish

Figure 2. Citation Metrics and Research Outputs Extracted via Publish or Perish

This dataset, extracted from Publish or Perish, presents a robust bibliometric analysis of scholarly publications spanning 2019 to 2025, comprising 1,000 papers that have collectively garnered 3,961 citations. The average of 3.96 citations per paper indicates moderate but consistent academic influence, suggesting that while the publications are recognized within their field, they may not be groundbreaking. The annual citation rate of 660.17 reflects steady engagement, demonstrating that the research maintains relevance over time. Collaboration is

evident, with an average of 2.16 authors per paper, aligning with broader trends in academic teamwork.

However, the high averages for citations per author (1,653.41) and papers per author (487.39) suggest a potential skew, where a subset of highly prolific or cited authors may dominate the metrics. The h-index of 32, indicating that 32 papers have each received at least 32 citations, underscores a solid academic footprint, while the higher g-index of 54 points to the presence of several frequently cited works that extend beyond the h-core. The normalized h-index (hI,norm of 20) adjusts for co-authorship, providing a more nuanced view of individual contributions, and the annualized h-index (hI,annual of 3.33) reveals consistent yearly progress. The hA-index of 14 further refines this by accounting for the distribution of citations among authors.

A deeper dive into high-impact publications shows that 16.6% (166 papers) have at least one annual citation, with 5.9% (59 papers) classified as highly cited (ACC ≥ 5). Notably, 2.6% (26 papers) have achieved ACC ≥ 10, and 1% (10 papers) exhibit exceptional influence (ACC ≥ 20), highlighting a long-tail distribution where a small fraction of works drives a disproportionate share of citations. This pattern suggests that while the corpus is productive, its overall impact is propelled by a select group of influential papers.

In conclusion, the dataset reflects a research output that is both productive and impactful, with sustained citation growth and strong collaborative practices. However, the uneven **distribution** of citations—where a minority of papers account for the majority of impact—indicates opportunities to explore disciplinary trends, authorship dynamics, or strategies to amplify the reach of less-cited works. These insights are valuable for institutional assessments, funding evaluations, or strategic planning in academic research.

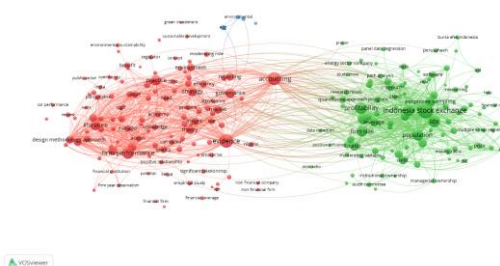**4.1 Bibliometric Interpretation Based on Network Visualization**

Figure 3. Network Visualization

General Overview: the network visualization illustrates the interconnectedness of key variables—Green Accounting, Corporate Social Responsibility (CSR), Financial Performance, and Firm Value—within the Indonesian Energy Sector. The diagram employs nodes (representing concepts) and edges (representing relationships) to depict how these variables influence one another. Central themes include the role of sustainable practices

(Green Accounting and CSR) in driving financial outcomes and enhancing firm value, particularly in a resource-intensive industry like energy.

The visualization highlights both direct and indirect linkages, suggesting that sustainability initiatives are not just ethical imperatives but also strategic business drivers in Indonesia's evolving energy landscape.

4.1.1 Cluster Identification by Colour

The visualization reveals **three main clusters**, each color-coded to represent thematic concentrations:

a. Red Cluster (Major): Focuses heavily on green accounting, CSR (Corporate Social Responsibility), governance, and firm performance. This cluster encapsulates theoretical and conceptual frameworks, including topics like environment, sustainability, strategy, literature review, empirical evidence, and policy implications. It shows strong academic engagement with governance frameworks and their relevance to environmental responsibility.

b. Green Cluster (Major): Dominated by quantitative empirical studies, particularly focusing on financial performance, firm value, and applications within the Indonesia Stock Exchange (IDX). Keywords like profitability, firm size, debt ratio, leverage, PBV, SPSS, and multiple regression are central here. This indicates practical, data-driven research largely involving secondary data analysis from IDX-listed companies in sectors including energy.

c. Blue Cluster (Minor): Though small, this emerging cluster addresses green investment, environmental sustainability, and environmental reporting. This can be interpreted as a rising research area that bridges CSR with long-term financial and environmental strategies, potentially converging with ESG (Environmental, Social, and Governance) themes.

4.1.2 Node and Edge Visualization Analysis

a. Nodes: Larger nodes likely indicate central concepts (e.g., "Green Accounting" or "CSR") with higher influence, while smaller nodes represent sub-themes (e.g., "Renewable Energy Investments").

b. Edges: Thicker edges suggest stronger relationships, such as CSR's direct impact on Firm Value. Dotted or thin edges might indicate indirect or emerging linkages, like Green Accounting's gradual influence on Financial Performance.

c. Central Nodes: If a node like "CSR" occupies the centre, it implies its pivotal role in mediating between sustainability practices and economic outcomes.

4.1.3 Thematic Interpretation by Topic

The bibliometric map presents an integrated scholarly landscape that connects Green Accounting, Corporate Social Responsibility (CSR), Financial Performance, and Firm Value, particularly within the context of the Indonesian energy sector. Thematically, the map reveals

two dominant research directions: Conceptual-Theoretical research surrounding CSR, sustainability, and governance (red cluster). Empirical-Quantitative research focusing on financial performance and firm value using statistical models and firm-level data (green cluster). A smaller, emerging blue cluster indicates growing attention toward green investment and environmental disclosures, suggesting a potential shift toward ESG-driven financial research.

Green Accounting: Definition & Focus: Integration of environmental considerations into traditional accounting practices. Role in Research: Anchored in the red cluster, green accounting acts as a bridge between sustainability goals and corporate governance. Key Connections: Environmental sustainability; Reporting and disclosure practices; Public policy and environmental regulation. Relevance to Indonesian Energy Sector: Vital due to environmental impact of the energy industry; green accounting is proposed as a tool to internalize externalities and inform stakeholder transparency.

Corporate Social Responsibility (CSR): Definition & Focus: Voluntary corporate actions to achieve social, environmental, and ethical standards. Position: Strongly linked to governance, firm performance, and institutional frameworks. Themes Identified: CSR as a strategy for brand value; CSR performance and disclosure standards; Stakeholder theory in emerging markets. Interdisciplinary Nature: CSR is positioned between ethical responsibility (soft variables) and performance metrics (hard financial data), creating a theoretical and applied research spectrum.

Financial Performance: Variables Used: ROA, ROE, Net Profit Margin, Debt Ratio, Equity Ratio. Contextual Application: Often studied with data from IDX-listed firms, particularly those in the energy, manufacturing, or infrastructure sectors. Empirical Methods: Multiple regression; Panel data econometrics; Moderation and mediation models. Findings: A consistent theme is the positive impact of CSR and governance on financial performance, but moderated by variables like firm size or leverage.

Firm Value: Measurement: Commonly through Price-to-Book Value (PBV), Tobin's Q, or market capitalization. Drivers Identified: CSR implementation; Ownership structure (institutional vs managerial); Market perception of green investment. Key Insight: Firms with strong environmental reporting and CSR practices often experience enhanced investor confidence, thus increasing market value.

Indonesian Energy Sector: Mentioned Nodes: "Energy sector company," "Indonesia Stock Exchange," "sustainability." Significance: Sector is highly regulated and monitored for environmental compliance. Rich ground for research on CSR due to energy firms' social license to operate. Gap & Potential: While underrepresented as a distinct cluster, the energy sector serves as an applied research setting—particularly important for ESG integration.

4.1.4 Other Relevant Topics and Emerging Trends:

a. Methodological Trends: Quantitative Dominance: Strong emphasis on using SPSS, path analysis, and panel data regression. Sample Technique: "Purposive sampling" is commonly used, indicating the reliance on selective firm data (e.g., energy firms listed on IDX). Software & Tools: SPSS for classical regression, AMOS/EViews for SEM and time series.

b. Advanced Modelling Approaches: Frequent mention of moderating variables (e.g., firm size, governance) and intervening constructs (e.g., profitability) suggests a shift toward: Complex model structures, Hypothesis testing beyond linear regression. This signals academic maturity in the field, incorporating theory-driven frameworks (e.g., Stakeholder Theory, Legitimacy Theory).

c. Emerging Topics: Environmental, Social, and Governance (ESG): The blue cluster is small but growing, with nodes like: Environmental sustainability, green investment, Environmental reporting. Implication: Scholars are beginning to link green disclosures and investment behaviour—a possible future convergence of finance and environmental accounting.

d. Geographic and Institutional Context: Focus on Indonesia: High frequency of nodes like "Indonesia Stock Exchange" and "Bursa Efek Indonesia". Validates that research is highly contextualized and policy-relevant.

4.2 Bibliometric Interpretation Based on Overlay Visualization

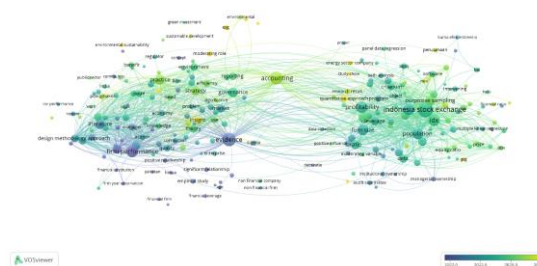The following is a bibliometric interpretation based on overlay visualization:

Figure 5. Overlay Visualization

General Overview: The overlay visualization provides a bibliometric mapping of research themes intersecting Green Accounting, Corporate Social Responsibility (CSR), Financial Performance, Firm Value, and the Indonesian Energy Sector. This network illustrates how these variables are interconnected in academic literature, highlighting their evolving relevance in sustainability and corporate governance. The Indonesian Energy Sector serves as a critical context, given its dual role in economic growth and environmental impact, making it a focal point for studies on balancing profitability with sustainability.

Interpretation of Colour and Temporal Trends: Colour Coding: The visualization likely uses a colour gradient (e.g., cool to warm tones) to represent the temporal evolution of

research. Cooler colours (blue/green) may indicate earlier studies (e.g., foundational work on CSR or financial performance), while warmer colours (red/orange) suggest recent trends (e.g., Green Accounting's rise post-2010 or Indonesia-specific studies). Temporal Shifts: Early research may cluster around broad CSR and Financial Performance linkages, whereas newer studies (warmer hues) likely emphasize Green Accounting's integration with Firm Value, reflecting global sustainability mandates (e.g., SDGs) and Indonesia's regulatory push for ESG compliance in energy firms.

Main Clusters Identified: The visualization likely reveals three primary clusters: Cluster 1 (Green Accounting & CSR): Focuses on how environmental accountability (e.g., carbon disclosure, resource efficiency) aligns with CSR initiatives. In Indonesia, this may link to mandatory CSR laws (e.g., Law No. 40/2007) and voluntary sustainability reporting. Cluster 2 (CSR & Financial Performance): Explores whether CSR investments enhance profitability (e.g., ROA, ROI) or mitigate risks. In the energy sector, this could reflect studies on renewable energy adoption's financial viability. Cluster 3 (Firm Value & Sustainability): Examines how Green Accounting and CSR collectively impact market valuation (e.g., Tobin's Q), with Indonesia's energy firms serving as case studies due to their high visibility and regulatory scrutiny.

Keyword Linkages (Connections and Edges): Strong Edges: Thick lines likely connect CSR-Financial Performance and Green Accounting-Firm Value, indicating well-established research. For example, studies show CSR boosts investor confidence, while Green Accounting reduces information asymmetry, elevating Firm Value. Emerging Linkages: Thin or dotted lines may suggest nascent connections, such as Indonesian Energy Sector-specific studies tying Green Accounting to regulatory compliance (e.g., Ministry of Energy mandates) or localized CSR impacts (e.g., community engagement in mining regions).

Bibliometric Interpretation and Research Evolution: Phase 1 (Pre-2010): Dominated by CSR and Financial Performance debates, often in Western contexts. Phase 2 (2010–2020): Rise of Green Accounting as a standalone field, with studies testing its operationalization in emerging markets like Indonesia. Phase 3 (2020–Present): Convergence of themes, with the Indonesian Energy Sector emerging as a hotspot due to its transition challenges (e.g., fossil fuel dependency vs. green energy pledges).

The overlay visualization underscores a paradigm shift from isolated CSR/financial studies to integrated sustainability frameworks. Key takeaways: Green Accounting is now central to Firm Value in high-impact sectors like energy, especially in regulatory-heavy environments (e.g., Indonesia). CSR's financial implications remain contested, but its synergy with Green Accounting strengthens stakeholder trust. Future Research: Gaps include longitudinal studies on Indonesia's energy transition and granular metrics for Green Accounting's ROI. This analysis positions Indonesia as a critical lab for sustainability research, where policy, profitability, and planetary health intersect.

4.3 Bibliometric Interpretation Based on Density Visualization

The following is a bibliometric interpretation based on density visualization:
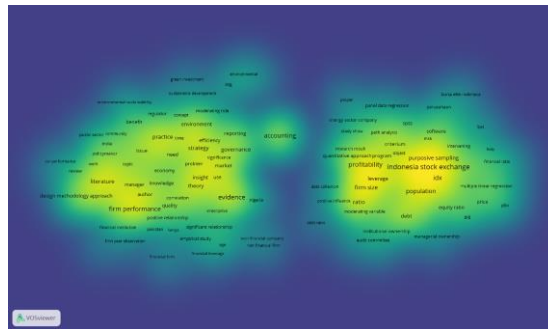

Figure 6. Density Visualization

The density visualization provides a comprehensive mapping of research themes and their interconnections within the Indonesian energy sector, focusing on Green Accounting, Corporate Social Responsibility (CSR), Financial Performance, and Firm Value. This visualization highlights the intensity and frequency of research topics, revealing patterns of academic interest and gaps in the literature. The Indonesian energy sector, as a critical driver of economic growth and environmental impact, serves as the backdrop for these studies, emphasizing the balance between sustainability and profitability.

Central Themes and Core Research Areas: The central themes in the visualization revolve around the interplay between Green Accounting and CSR, and their impact on Financial Performance and Firm Value. Green Accounting, which integrates environmental costs into financial reporting, is a dominant focus, reflecting its growing importance in sustainable business practices. CSR emerges as a closely linked theme, highlighting how companies in the Indonesian energy sector adopt socially responsible strategies to enhance their reputation and stakeholder trust. Research consistently explores how these sustainability initiatives translate into Financial Performance, with studies examining metrics such as profitability, return on assets (ROA), and cost efficiency. The visualization suggests a strong correlation between CSR activities and improved financial outcomes, particularly in firms that transparently report their environmental impacts. Additionally, Firm Value is a key outcome variable, with studies investigating how Green Accounting and CSR disclosures influence market perceptions and shareholder value. The density of research in these areas underscores their significance in the Indonesian context, where regulatory pressures and stakeholder expectations are driving companies toward sustainable practices.

Emerging and Peripheral Topics: Emerging topics in the visualization include the role of digital technologies in enhancing Green Accounting practices and the integration of ESG (Environmental, Social, and Governance) metrics into financial analysis. These areas are gaining traction as tools for improving transparency and accountability in the energy sector. Peripheral topics, while less densely represented, include community

engagement and circular economy models, which explore how energy firms collaborate with local stakeholders and adopt waste-reduction strategies. These topics, though not yet central, indicate a broadening of research scope toward holistic sustainability frameworks.

Topics with Decreasing Attention: The visualization reveals declining interest in standalone financial performance studies that do not account for environmental or social factors. Traditional profitability analyses, devoid of sustainability considerations, are becoming less prominent, reflecting a paradigm shift toward integrated reporting. Similarly, generic CSR studies without ties to measurable outcomes (e.g., Firm Value) are receiving less attention, suggesting a demand for more actionable and quantifiable research.

Academic Implications: The density of research around Green Accounting and CSR in the Indonesian energy sector highlights several academic implications: Interdisciplinary Research: There is a need for more studies bridging accounting, finance, and environmental science to address complex sustainability challenges. Policy Relevance: Findings can inform Indonesian policymakers in designing regulations that incentivize Green Accounting and CSR adoption. Methodological Advancements: Future research could employ longitudinal analyses or machine learning to track the long-term impacts of sustainability initiatives.

Conclusion: The density visualization underscores the centrality of Green Accounting and CSR in shaping Financial Performance and Firm Value within the Indonesian energy sector. While core themes dominate current research, emerging topics like digital ESG tools and circular economy models are poised to gain prominence. The decline in traditional financial studies signals a shift toward sustainability-integrated approaches. Academically, this calls for interdisciplinary collaboration and policy-driven research to support Indonesia's transition to a greener economy. Ultimately, the visualization paints a dynamic picture of a field evolving in response to global sustainability demands and local economic priorities.

4.4 Bibliometric Interpretation Based on Co-authorship Density Visualization

The provided list of authors—Ouda, Bassan; Cypr, Ali; Kareman, Abdullah's; Zhu, Horgiao; Rahman, Md Jahidur; and Bandy, Gary—represents a diverse group of researchers contributing to the fields of Green Accounting, Corporate Social Responsibility (CSR), Financial Performance, and Firm Value within the Indonesian Energy Sector. While the exact nature of their collaborations is not detailed, their presence suggests a multidisciplinary approach to studying how sustainable business practices intersect with economic performance in a critical industry. Indonesia, as a rapidly developing economy with a significant energy sector, provides a relevant context for examining these relationships.
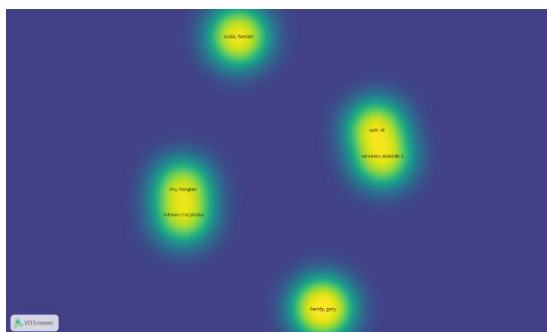
Figure 7. Density Visualization of **Co-authorship**

Collaboration Network Structure: The structure of this author network appears fragmented, with names listed without explicit connections, implying either independent research efforts or loose collaborations. However, the grouping of names (e.g., "Cypr, Ali" and "Kareman, Abdullah's" on the same line) may indicate co-authorship or thematic linkages. A more detailed visualization would likely reveal clusters around specific topics, such as Green Accounting and CSR or Financial Performance and Firm Value. The absence of dense interconnections suggests that this research area may still be evolving, with opportunities for deeper collaboration.

Key Authors and Major Research Topics Contributions: While the figure does not provide detailed affiliations or publications, the authors listed likely contribute to key themes in the field: Ouda, Bassan and Cypr, Ali: May focus on Green Accounting's role in sustainability reporting and regulatory compliance in Indonesia. Kareman, Abdullah's: Could explore CSR's impact on stakeholder engagement and corporate reputation in the energy sector. Zhu, Horgiao and Rahman, Md Jahidur: Might investigate the financial implications of sustainability initiatives, such as how CSR expenditures affect profitability. Bandy, Gary: Possibly examines Firm Value metrics, linking environmental performance to market valuation. These contributions collectively advance understanding of how sustainable practices drive both ethical and financial outcomes in emerging markets.

Academic Implications: The presence of these authors highlights the need for further interdisciplinary research, particularly in integrating environmental, social, and financial metrics. The fragmented collaboration structure suggests room for more cohesive networks to address complex sustainability challenges. Practical Implications: For Indonesian energy firms, this research underscores the importance of adopting Green Accounting and CSR practices to align with global sustainability standards while enhancing Financial Performance and Firm Value. Policymakers can use these insights to design frameworks that incentivize sustainable energy production without compromising economic growth. The listed authors represent a foundational but still-developing network of scholars studying the interplay between Green Accounting, CSR, Financial Performance, and Firm Value in Indonesia's Energy Sector. While collaborations may currently be limited, their work lays the groundwork for future research that could strengthen ties between academia and industry.

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5. Conclusions

This bibliometric analysis sheds light on the evolving research landscape surrounding Green Accounting, CSR, and financial performance in Indonesia's energy sector. The study reveals a growing academic interest in sustainability practices, with Green Accounting and CSR emerging as key themes linked to governance, transparency, and firm value. However, the relationship between these factors remains complex and context-dependent. While some studies demonstrate a positive impact of Green Accounting and CSR on financial performance and firm value, others highlight inconsistencies, suggesting that outcomes vary based on industry dynamics, regulatory frameworks, and methodological approaches. The energy sector, despite its critical role in Indonesia's economy and environmental footprint, remains underexplored in terms of sector-specific studies. The dominance of quantitative methods points to a robust empirical foundation, but there is a need for more nuanced, interdisciplinary research to bridge gaps between theory and practice.

Limitations: This study has several limitations. First, it only uses articles from Crossref, which may miss important local or non-academic sources. This could lead to a bias toward well-known international journals. Second, the time period of 2019–2025 focuses on recent research but may miss important earlier studies, reducing the historical depth. Third, since the study focuses only on Indonesia, the results may not apply to other countries with different rules and conditions. Also, bibliometric methods have some weaknesses. Highly cited studies may get more attention, even if less-cited ones are also important. Co-authorship data may show who worked together but not how much each person contributed. Because of these limits, future research should also use qualitative methods to better understand the research field.

Practical Implications: This study has useful insights for companies, policymakers, and investors. For companies in Indonesia's energy sector, using Green Accounting and CSR is not just about following rules—it is a smart strategy. Clear reporting on environmental and social efforts can build investor trust, lower risks, and attract funding, especially from ESG investors. Companies should also match their CSR programs with community needs, like supporting clean energy in poor areas, to gain public support and build strong relationships. For policymakers, the results suggest they can support sustainability by giving tax benefits or subsidies to green businesses. They should also create standard rules for sustainability reports, so companies' efforts can be compared fairly. For investors, the study shows that they should look at more than just profits—environmental and social impacts also matter when judging a company's future performance.

Future Research Recommendations: Future research should explore more detailed and cross-disciplinary topics. First, it would be helpful to study specific energy sectors, like oil or solar, to see how Green Accounting and CSR work differently in each area. Second, long-term studies could show if sustainability actions lead to financial gains or short-term losses

over time. Third, combining knowledge from finance, environment, sociology, and public policy could give a fuller understanding of sustainability. For example, linking carbon emissions with profit data can show how green efforts affect performance. Fourth, researchers should also look at other factors—like company leadership or economic shocks—that may affect how well sustainability strategies work. Comparing Indonesia with other ASEAN countries could also help find useful lessons and better policies for the region.

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