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Green Disclosure Regulation: How Far has been Researched?

Aam Slamet Rusydiana[1]
[1]*Sakarya University, Turkiye*

This study aims to see the development of research on the topic of "Green Disclosure Regulation" and research plans that can be carried out based on journals published on the theme. This research uses a qualitative method with a bibliometric analysis approach. The data used is secondary data with the theme "Green Disclosure Regulation" which comes from the Dimension database with a total of 500 journal articles. Then, the data is processed and analyzed using the VosViewer application with the aim of knowing the bibliometric map of "Green Disclosure Regulation" research development in the world. The results of the study found that there were 5 clusters with the most used words being regulation, disclosure, evidence, analysis, company, and environmental information disc. Then, the research path topics related to Green Disclosure Regulation are Effect of green disclosure regulation, Quality of corporate environmental disclosure, ESG rating on green innovation, Role of environmental regulation in finance, and Sustainability effects of green credit policy.

Keywords: Green Disclosure; Regulation; Research Map; Bibliometric; VosViewer

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*Correspondence:
Aam Slamet Rusydiana
aamrusydiana@sakarya.edu.tr

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INTRODUCTION

Transparency and regulation in environmental information disclosure, or green disclosure, are essential to address environmental challenges and promote sustainable development. Transparency reduces information asymmetry between governments, companies, and the public, enabling more effective environmental regulation and policy implementation. Yang et al (2022) and Wang (2024) reveal that increased disclosure improves regulatory intensity by allowing governments to better monitor pollution and tailor policies to local conditions while empowering public participation in environmental governance. Regulatory frameworks that mandate standardized disclosures also improve the reliability and comparability of environmental data, reducing issues such as greenwashing and fostering trust among stakeholders (Xu et al., 2023). Furthermore, disclosure incentivizes firms to adopt sustainable practices by aligning their operations with societal and regulatory expectations, thereby improving firms' image and their access to resources (Wang et al., 2022a).

As such, regulation plays an important role in enhancing corporate accountability for environmental impacts by instituting compliance mechanisms, imposing sanctions, and promoting transparency. For example, research from Yan et al (2022) shows that policies such as China's Natural Resource Accountability Audits (AANR) force local governments to enforce stricter environmental oversight, pressuring firms to prioritize ecological responsibility despite the initial cost of ESG performance. Similarly, the 2015 Revised Environmental Protection Law (NEPL) strengthened punitive measures, including daily fines and official accountability, which directly reduced corporate pollution by aligning regulatory enforcement with government performance evaluation (Deng & Li, 2020).

Furthermore, environmental regulation also creates U-shaped incentives for green innovation. While weak regulation imposes costs, stringent policies trigger innovation compensation effects, encouraging firms to adopt sustainable technologies and practices to meet compliance standards (Xu et al., 2022). Xu et al (2022) add, mandatory corporate social responsibility (CSR) disclosure further strengthens accountability by exposing firms to public and investor scrutiny, which increases access to financing and legitimizes green initiatives. Effective regulation requires institutionalizing mechanisms such as environmental inspection and re-evaluation to prevent fraud, in addition to tailoring policies to firm size and ownership structure to address gaps in compliance capacity (Zhu et al., 2022). Collectively, these regulatory frameworks transform environmental accountability from a voluntary practice to a structured imperative, balancing punitive deterrence with innovation incentives to align corporate behavior with ecological sustainability goals (Deng & Li, 2020; Xu et al., 2022; Yan et al., 2022; Zhu et al., 2022).

In addition, increasing global attention to sustainability and Environmental, Social and Governance (ESG) policies is driven by regulatory developments, shifting consumer expectations and the increasingly recognized role of ESG in long-term value creation. Governments around the world are introducing mandatory ESG reporting frameworks, such as those aligned with the International Sustainability Standards Board (ISSB), to standardize disclosures, increase transparency, and combat greenwashing. This regulatory push forces organizations to integrate ESG considerations into their strategies, ensuring accountability and compliance. In addition, consumer demand for sustainable practices is increasing, with more than 60% of consumers prioritizing ethical and environmentally friendly products, influencing corporate behavior and investment decisions. Companies are also increasingly realizing the financial benefits of ESG integration, as coherent ESG strategies are associated with stronger financial results and competitive advantage in markets that value sustainability.

The Green Disclosure Regulation plays an important role in this landscape by instituting mandatory reporting standards that force companies to disclose their environmental impacts, including greenhouse gas emissions and climate risks. These regulations not only improve the reliability of ESG data but also serve as a tool for stakeholders-governments, investors, and consumers-to evaluate companies' sustainability efforts (Baratta et al., 2023). By bridging information asymmetries and promoting accountability, Green Disclosure Rules complement broader ESG policies, creating a framework for sustainable corporate practices and aligning global markets with environmental priorities (Mallin, 2023; Wang et al., 2022b).

Based on this background, it is important to see the extent of the development of the current *Green Disclosure Regulation* through research, and one method that can be used to see the development of research is bibliometrics using VosViewer. The method is able to create and display author journal maps and research paths based on co-citation data or keyword maps based on co-incidence data. Some studies that examine related

to the *Green Disclosure Regulation* are Srivastava (2024) identifying the intellectual composition of literature on corporate disclosure using bibliometric analysis. This study concluded that corporate disclosure research is based on four major themes, namely the role of disclosure in capital markets, non-financial disclosure, determinants of corporate disclosure, and firm risk and intellectual capital disclosure. This research suggests that management should pay attention to the company's financial and non-financial information emphasized by investors, regulators, and the government.

Li et al (2022) analyzed research trends and developments related to the impact of environmental regulation (ER) on green technology innovation (GTI) in firms using bibliometric and visual analysis. This study explains that this research field focuses on innovation, technology, performance, policy, and environmental regulation, with main topics such as renewable energy consumption, pollution haven hypothesis, sustainability, carbon emissions, energy technology, and environmental Kuznets curve. Geographically, the research is dominated by China, with contributions from Italy, the US, the UK, and Germany. Ellili (2022) analyzed the literature on environmental, social, and governance (ESG) disclosures by applying bibliometric analysis of documents published in the Scopus database. The results of this study identified four main clusters in ESG disclosure research, namely corporate social responsibility, corporate strategy, financial performance, and environmental economics. In addition, the number of publications and citations related to ESG disclosure increased, with significant contributions from the journal Business Strategy and the Environment. This study also reveals future research opportunities as well as the practical implications of integrating ESG in business strategy on corporate and financial policies.

Chrysikopoulos et al (2024) analyzed the development and research trends on green certificates, which serve as proof of renewable energy use. The analysis identified four main themes: renewable energy policy and support mechanisms, sustainable technologies and market dynamics, technological innovation and green certificate trading, and renewable energy investment strategies. The study also highlights future research opportunities, such as renewable energy support mechanisms, transparency through electricity disclosure, and the role of technologies such as artificial intelligence and blockchain in green certificate trading. In addition, the study emphasizes the importance of energy origin assurance, green hydrogen certification standards, and the dynamics of trading mechanisms in determining investment strategies.

Arslan et al (2022) explain the effect of senior executive characteristics on corporate environmental disclosures with bibliometric analysis; Shoeb et al (2022) explain environmental accounting disclosure practices with bibliometric analysis and systematic review; Khan (2022) explains ESG disclosure and company performance with bibliometric analysis and meta analysis; Gerged et al (2021) reviewed research on Corporate Environmental Disclosure with bibliometric analysis; Cai et al (2024) examined environmental, social, governance disclosure and firm value with bibliometric analysis and systematic review; and Naeem et al (2023) examined the current state and future direction of green and sustainable finance with a bibliometric approach.

This research was conducted to complement existing research and fill the gaps of previous research and to expand the literature related to *Green Disclosure Regulation* through the research path. In particular, the purpose of this research is to see the development of "*Green Disclosure Regulation*" research published by journals with this theme and see future research opportunities by formulating a research agenda.

METHOD

In this research, various scientific journal publications related to the theme of "*Green Disclosure Regulation*" around the world are used as data sources. Data is collected by searching for journal publications indexed in the Dimension database using the keyword "*Green Disclosure Regulation*". After that, scientific articles or journals that are relevant to the research theme will be selected based on the publication data that has been collected. Journals equipped with DOI are the criteria in the filtering process and data processing using software. There are 500 journal articles published from within the research theme "*Green Disclosure Regulation*". The development of publication trends related to the research topic was analyzed using VOSviewer software, which can generate bibliometric maps and allow for more detailed analysis.

In order to build the map, VOSviewer uses the abbreviation VOS which refers to Visualizing Similarity. In previous studies, the VOS mapping technique has been used to obtain bibliometric visualizations which are then analyzed. Furthermore, VOSviewer is able to create and display author journal maps based on co-citation data or keyword maps based on co-incidence data. Therefore, this study will analyze journal maps related to "*Green Disclosure Regulation*", including author maps, and

keywords which are then analyzed for research paths that can be carried out in the future through clusters in *keyword mapping*.

This research uses a descriptive qualitative approach with meta-analysis and descriptive statistical literature study based on 500 journal publications that discuss the theme of "*Green Disclosure Regulation*". Meta-analysis is a method that integrates previous research related to a particular topic to evaluate the results of existing studies. Furthermore, the qualitative method used in this research is also referred to as a constructive method, where the data collected in the research process will be constructed into a more understandable and meaningful theme. The sampling technique used in this research is purposive non-probability sampling method, which aims to fulfill certain information in accordance with the desired research objectives.

RESULT AND DISCUSSION

Research Map

The figure below describes the trend of keywords that appear in research on the theme of "*Green Disclosure Regulation*" and the larger shapes are the most used words in journal publications on the theme of "*Green Disclosure Regulation*".

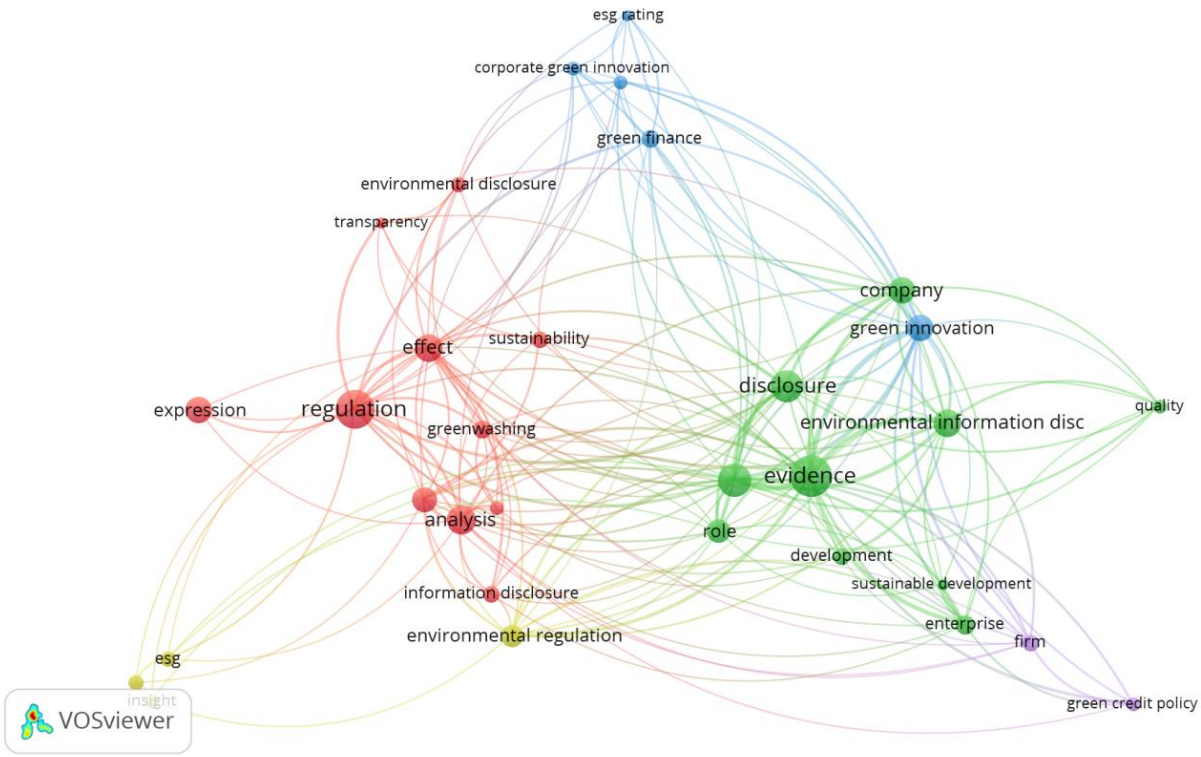

Figure 1. Research map

As for the mapping, the keywords that appear most in the publication "*Green Disclosure Regulation*" include regulation, disclosure, evidence, analysis, company, and environmental information disc, which are then divided into 5 clusters, as follows:

Cluster 1: Effect of green disclosure regulation

This cluster has 11 keyword items, namely analysis, effect, environmental disclosure, expression, green, greenwahing, information disclosure, policy, regulation, sustainability, transparency. A number of studies relevant to the topics in this cluster include Zhen & Lu (2024) exploring the relationship between green finance, financial regulation, and corporate carbon information disclosure. The study concludes that green finance can encourage corporate carbon disclosure, financial regulation plays a positive moderating role between green finance and corporate carbon information disclosure, and green finance plays a stronger role in corporate carbon information disclosure among state-owned enterprises (SOEs) compared to non-SOEs.

Xiang et al (2020) investigated environmental disclosure and assessed its impact on green innovation activities and the mechanism of influence. Environmental disclosure plays an important role in

promoting the sustainable development of enterprises by enhancing environmental awareness. The results of this study show that environmental disclosure has significantly stimulated green innovation by highly polluting listed companies in China. Moreover, environmental disclosure stimulates green innovation of highly polluting listed companies by expanding their financing channels, promoting their product sales, and increasing media attention.

Zhang et al (2020) analyzed environmental regulation and its impact on urban green innovation. The results show that market-based and voluntary regulations are more efficient in stimulating green innovation than command-and-control environmental regulations. Environmental regulation and green innovation efficiency also have a non-linear inverted U-shape relationship. Shi et al (2021) investigated the effectiveness of environmental information disclosure (EID) in reducing emissions among industrial firms. The findings of this study reveal significant reductions in SO2 emissions, particularly among private and large-scale firms, and highlight the role of local governments in enhancing the impact of EID through improved enforcement of environmental regulations.

Zhang et al (2022) investigated how increased transparency of environmental information through China's air quality monitoring and disclosure program affects corporate green innovation. The research findings revealed that the program significantly increased green innovation, particularly in state-owned enterprises and highly polluting industries, driven by local government regulations and public attention. This research emphasizes the importance of real- time disclosure of environmental information in improving environmental governance. Wang et al (2021) investigated how environmental regulation, particularly pollution costs, affects green technology innovation in Chinese manufacturing firms, highlighting the mediating role of corporate environmental responsibility. The research findings suggest that stronger environmental regulation enhances corporate responsibility and innovation, especially when supported by increased R&D and environmental investment, while emphasizing the importance of appropriate local regulatory and governance objectives.

Lu & Li (2023) investigated the impact of environmental information disclosure (EID) on green innovation (GI) among Chinese listed firms, and found that EID positively influences GI, particularly when enhanced by firms' digital transformation. This study highlights the importance of digital technology in enhancing the effectiveness of EID and underscores the role of government regulation in this context. Lee (2010) explored the role of disclosure in enhancing environmental regulation. The study identifies positive impacts, such as increased environmental awareness among top management and changes in production processes, as well as negative impacts that can empower regulated companies over local communities. This research highlights the importance of tailoring disclosure policies to specific market conditions and political contexts to maximize their effectiveness.

Cluster 2: Quality of corporate environmental disclosure

This cluster contains 10 keyword items namely company, development, disclosure, enterprise, environmental information disclosure, evidence, impact, quality, role, sustainable development. A number of relevant studies include Cormier et al (2005) investigating the determinants of corporate environmental disclosure in large German companies, highlighting the influence of economic incentives, public pressure, and institutional conditions. The study found that factors such as risk, ownership, age of fixed assets, firm size, and routines have a significant impact on the level of environmental disclosure, with a trend of convergence over time among German firms. It shows that environmental disclosure is a multidimensional phenomenon shaped by various complementary forces.

Brammer & Pavelin (2006) analyzed the quality of environment-related voluntary disclosures among about 450 large companies in the UK, by identifying five aspects of quality, such as environmental policies and impact targets. The study found that disclosure quality is mainly influenced by company size and industry characteristics, with larger companies and companies in environmentally relevant sectors showing higher quality disclosures, while media exposure has no significant impact on voluntary disclosure.

Toms (2002) explores the relationship between environmental disclosure and corporate environmental reputation, proposing a framework that blends quality signals with a resource-based view of the firm. The findings show that effective implementation, monitoring and disclosure of environmental policies significantly enhance environmental reputation, while factors such as diversified institutional shareholding and low systematic risk also play a role. Notably, prior financial performance does not affect environmental reputation, nor is it influenced by the financial halo effect or loose financial resources. Iatridis (2013) examined the relationship

between environmental disclosure quality and environmental performance in common law Malaysia, highlighting that higher quality disclosures are positively associated with better corporate governance and firm attributes such as size and profitability. The findings suggest that effective environmental disclosure improves investor perceptions and is particularly relevant for companies in sectors such as beverages, chemicals and industrial metals

Moroney et al (2012) investigated the impact of independent assurance on the quality of voluntary environmental disclosures by companies. The findings of this study reveal that warranted firms exhibit significantly higher quality in their environmental reporting compared to non-warranted firms, with no apparent difference in quality based on whether the warranties are provided by professional accountants or private consultants. In addition, this study also shows that experience can improve the quality of these disclosures. Luo et al (2019) examined the relationship between corporate environmental disclosure quality, media attention, and debt financing costs in listed companies in highly polluted China. The study found that higher environmental disclosure quality significantly reduces debt financing costs, while negative media coverage increases this effect, which suggests that firms should improve disclosure standards and avoid manipulative practices

Ortas et al (2015) examined how financial factors influence corporate environmental sustainability reporting (CESR) across 3931 companies in 51 industries and 59 countries, using a composite index of CESR based on G3 core environmental indicators. Using quantile regression, this study reveals the impact of previously unexamined financial drivers on CESR intensity, while integrating various theories of corporate sustainability reporting to improve understanding of the relationship between factors such as firm size and market capitalization. Sun et al (2025) investigated how corporate governance affects the quality of environmental information disclosure in new energy companies listed on the Chinese A-share market. The study found that effective corporate governance can significantly improve transparency and disclosure quality, especially in large companies with fewer financial constraints, while facilitating the transition to environmentally friendly practices. However, the positive impact of corporate governance on disclosure quality is only realized when the green transition value exceeds a certain threshold.

Cluster 3: ESG rating on green innovation

This cluster contains 5 keyword items, namely corporate green innovation, esg rating, green finance, green innovation, natural experiment. A number of studies relevant to the topic include Zhu et al (2024) investigating the impact of ESG rating differences on corporate green innovation behavior in China from 2009 to 2022. The study found that although ESG rating differences increase the quantity of green innovation, the quality decreases due to the short board effect, which is influenced by external pressures and internal strategy adjustments. The study suggests that increased information disclosure and accelerated digital transformation can mitigate these negative impacts.

Wang & Chang (2024) investigated the impact of ESG ratings on green technology innovation in firms listed on China's A-share exchanges from 2011 to 2022, and found that ESG ratings significantly enhance firms' green innovation through loose market regulation. This research highlights that ESG ratings alleviate financing constraints and reduce managerial myopia, with state-owned firms particularly affected. In addition, factors such as intensified market competition and increased capital market attention further support increased green technology innovation. Wang & Chu (2024) investigated the impact of ESG ratings on corporate green innovation, emphasizing the shift from end to source control in pollution management. The study found that ESG ratings significantly enhance green innovation by reducing managerial myopia and increasing R&D resources, while highlighting the influence of institutional constraints and corporate digitalization on innovation outcomes.

Zhang et al (2024) explored the relationship between ESG performance and green innovation in Chinese firms, focusing on financing constraints. The study finds that better ESG performance significantly drives green innovation outcomes, with the effect enhanced by digital finance and larger firm scale. Tan & Zhu (2022) investigated the impact of ESG ratings on corporate green innovation in China, revealing that higher ESG ratings significantly increase the quantity and quality of green innovation. The impact is mediated by reduced financial constraints and increased environmental awareness among managers, with additional factors such as stricter regulation and market competition further strengthening this relationship.

Wang et al (2023) investigated the impact of ESG ratings from SynTao Green Finance on corporate green innovation in China, and found that companies rated by the agency significantly increased their green innovation

outcomes by 3.9%, mainly through more green invention patents. The positive effect is stronger for companies with less shortsighted investors, non-state-owned companies, and companies facing higher financial constraints, which suggests that third-party ESG ratings can effectively improve corporate green innovation and contribute to sustainability efforts. Yang et al (2024) investigated the U-shaped relationship between corporate ESG ratings and green innovation among Chinese companies listed on the A-share exchange from 2011 to 2022. The study found that firms with lower ESG ratings initially prioritized governance over green innovation, but as their ratings improved, they increasingly embraced green innovation, especially in the context of low profitability and high operational risk. The research also highlights the influence of government subsidies and executive compensation on this relationship, offering insights for improving corporate sustainability performance.

Zhou et al (2023) investigated the effect of ESG ratings on green technology innovation efficiency among listed Chinese firms, and found that higher ESG ratings improve innovation efficiency by reducing financial constraints and encouraging risk-taking. Moreover, the impact of ESG ratings varies widely across industries, thus providing insights for optimizing their impact on green technology innovation. Zhou et al (2024) investigated the impact of ESG rating divergence on corporate green innovation among Chinese listed companies, and found a positive impact. The effect was stronger in firms with greater resources from independent directors and higher media attention, which suggests that firms use green innovation as a protective measure against the risks associated with ESG rating divergence.

Cluster 4: Role of environmental regulation in finance

This cluster has 4 keyword items, namely environmental regulation, esg, insight, sustainable finance. Research relevant to this topic includes Tong et al (2022) analyzing the role of Environmental Regulation (ER), Green Finance (GF), Foreign Direct Investment (FDI), and Investment in Green Technologies (IGT) on Green Total Factor Productivity (GTFP) in 27 provinces in China during the period 2010-2021. The results show that strict environmental regulation (ER) significantly increases green productivity with a beta value of 1.826. In addition, other factors such as GF, FDI, and IGT also contribute greatly in supporting the development of green industries in China. This study is one of the first to integrate these factors in the green productivity framework and consider the negative impact in GTFP, which was previously ignored.

Baloch & Danish (2022) analyzed the impact of environmental regulation (ER) and financial development (FD) on carbon emissions in BRICS countries during the period 1995-2016 using the common correlated effect means group (CCEMG) method. The results showed that FD contributed to the increase in carbon emissions, while ER actually worsened environmental conditions by encouraging carbon emissions. Chang et al (2023) examined the influence of local environmental regulations on the relationship between green technology innovation and CO2 emission reduction in China. The study revealed that investment-based regulations are the most effective in improving this relationship, while expenditure-based regulations may lead to short-term opportunistic behavior among firms. The research also highlights the spatial spillover effects of green innovation on emissions in neighboring regions and suggests further development of the green finance system to optimize this outcome.

Wang et al (2024) analyzed the impact of public environmental concerns and government regulation on urban carbon emissions in China. They found that public environmental concern significantly reduces emissions, especially in certain types of cities, and that environmental regulation partially mediates this effect, while green finance and industrial agglomeration enhance the relationship. Deng & Zhang (2023) examined the impact of the intensity of environmental regulation and green finance on regional environmental sustainability in China. The study found that increased environmental regulation and green finance significantly improved regional sustainability, with pronounced spatial spillover effects seen among neighboring provinces, particularly in the western region. Shi et al (2023) investigated the impact of green finance and environmental regulation on CO2 emissions in N-11 countries, highlighting their significant negative impact on emissions. The study also examines the moderating role of social and economic globalization, finding that while social globalization negatively affects the relationship between energy consumption and CO2 emissions, economic growth positively affects emissions. The results suggest that the adoption of green financial and environmental policies can help achieve sustainable development goals related to energy and climate.

Cluster 5: Sustainability effects of green credit policy

This cluster has 2 keyword items namely firm, green credit policy. Research relevant to this topic includes Wu et al (2023) investigating the impact of green credit policies on firm innovation performance, using data from Chinese firms listed on the A Stock Exchange between 2004 and 2019. The findings of this study reveal that the implementation of Green Credit Guidelines significantly improves innovation outcomes, particularly in quantity-based incentives, while the impact on quality-based incentives is limited. In addition, the policy improves innovation performance by increasing risk-taking and is more prominent in state-owned and large enterprises, which contributes to sustainable economic development.

Xu et al (2023) investigated the impact of green credit policies on reducing corporate carbon emissions intensity in China, and found that these policies effectively lowered emissions, particularly through reducing investment carbon intensity and improving environmental supervision. The study notes that the effectiveness of green credits has declined since 2017 and emphasizes the need for innovation in green credit standards and improved disclosure of corporate environmental information to maintain their low-carbon impact. Ding et al (2022) investigated how green credit policies (GCP) affect the sustainability performance of highly polluting enterprises (HPEs) by examining technological innovation and credit resource allocation. The findings of this study show that GCP positively affects firms' sustainability performance, particularly in non-state-owned firms and certain regions, although the effects are not long-term. The study highlights that GCP encourages HPEs to invest in technological innovation, which improves sustainability performance, despite some constraints on credit resources.

Fatima et al (2024) examined the impact of additional environmental information disclosure (ΔEID) on innovation sustainability under green credit constraints, using data from Chinese listed firms from 2012 to 2019. The findings suggest that higher quality EID enhances innovation sustainability, with "information impact" being more significant than "reputation impact", and that green credit policies strengthen this relationship, particularly in non-state firms. Cao et al (2024) reveal that China's Green Credit Policy has unexpectedly led to corporate money laundering practices, where listed companies disclose more positive environmental information than their actual environmental investments. This gap arises because the policy restricts bank credit for certain companies, which encourages them to engage in money laundering practices to alleviate financing constraints.

He et al (2025) examined the impact of the Green Credit Policy (GCP) on corporate green innovation (GI) among Chinese listed firms from 2009 to 2022, and found that the 2012 implementation of the GCP significantly improved environmental innovation outcomes. The study identified that GCP alleviates financing constraints and reduces costs, with digital transformation enhancing this effect, particularly in state-owned firms and less polluted industries. He et al (2022) examined the impact of the 2012 green credit policy on Chinese firms' green strategy choices, revealing that while the policy initially led to increased green-washing, it ultimately encouraged green innovation over time. The impact was more pronounced in regions with strict environmental regulations and limited financing alternatives, highlighting the policy's role in improving corporate performance while preventing misleading environmental claims. Chen et al (2023) analyzed the impact of China's green credit policy on the carbon performance of listed companies with high carbon intensity from 2009 to 2018, confirming that the policy improves carbon performance but does not stimulate technological innovation. The study also found that factors such as the intensity of environmental regulation and corporate governance affect the effectiveness of the policy, which in turn improves the quality of corporate environmental information disclosure.

CONCLUSION

This research aims to find out the extent of the development of research on the theme of "*Green Disclosure Regulation*" in the world. The results of the study show that the number of research publications related to "*Green Disclosure Regulation*" there are 500 journal articles indexed by Dimension. Furthermore, in the development of research related to "*Green Disclosure Regulation*" based on bibliometric keyword mapping, the most used keywords are regulation, disclosure, evidence, analysis, company, and environmental information disc. Based on the keywords that are often used, then grouped into 5 research map clusters with topics that discuss the (1)Effect of green disclosure regulation, (2)Quality of corporate environmental disclosure, (3)ESG rating on green innovation, (4)Role of environmental regulation in finance, and (5)Sustainability effects of green credit policy.

REFERENCES

Arslan, H. M., Chengang, Y., Bilal, Siddique, M., & Yahya, Y. (2022). Influence of senior executives characteristics on corporate environmental disclosures: a bibliometric analysis. Journal of Risk and Financial Management, 15(3), 136.

Baloch, M. A., & Danish, F. N. M. (2022). CO2 emissions in BRICS countries: what role can environmental regulation and financial development play?. Climatic change, 172(1), 9.

Baratta, A., Cimino, A., Longo, F., Solina, V., & Verteramo, S. (2023). The impact of ESG practices in industry with a focus on carbon emissions: Insights and future perspectives. Sustainability, 15(8), 6685.

Brammer, S., & Pavelin, S. (2008). Factors influencing the quality of corporate environmental disclosure. Business strategy and the environment, 17(2), 120-136.

Cai, C., Hazaea, S. A., Hael, M., Al-Matari, E. M., Alhebri, A., & Alfadhli, A. M. H. (2024). Mapping the landscape of the literature on environmental, social, governance disclosure and firm value: a bibliometric analysis and systematic review. Sustainability, 16(10), 4239.

Cao, C., Chen, Q., & Zhu, L. (2024). Corporate Greenwashing Unexpectedly Caused by the Green Credit Policy: A Comparison between Environmental Sustainability Information Disclosure and Actual Environmental Protection Investment from China's Listed Companies. Sustainability, 16(17), 7369.

Chang, K., Liu, L., Luo, D., & Xing, K. (2023). The impact of green technology innovation on carbon dioxide emissions: The role of local environmental regulations. Journal of Environmental Management, 340, 117990.

Chen, Y., Xu, Z., Wang, X., & Yang, Y. (2023). How does green credit policy improve corporate social responsibility in China? An analysis based on carbon-intensive listed firms. Corporate Social Responsibility and Environmental Management, 30(2), 889-904.

Chrysikopoulos, S. K., Chountalas, P. T., Georgakellos, D. A., & Lagodimos, A. G. (2024). Green certificates research: bibliometric assessment of current state and future directions. Sustainability, 16(3), 1129.

Cormier, D., Magnan, M., & Van Velthoven, B. (2005). Environmental disclosure quality in large German companies: economic incentives, public pressures or institutional conditions?. European accounting review, 14(1), 3-39.

Deng, W., & Zhang, Z. (2023). Environmental regulation intensity, green finance, and environmental sustainability: empirical evidence from China based on spatial metrology. Environmental Science and Pollution Research, 30(24), 66228-66253.

Deng, X., & Li, L. (2020). Promoting or inhibiting? The impact of environmental regulation on corporate financial performance-An empirical analysis based on China. International Journal of Environmental Research and Public Health, 17(11), 3828.

Ding, X., Jing, R., Wu, K., Petrovskaya, M. V., Li, Z., Steblyanskaya, A., ... & Makarov, V. M. (2022). The impact mechanism of green credit policy on the sustainability performance of heavily polluting enterprises-based on the perspectives of technological innovation level and credit resource allocation. International Journal of Environmental Research and Public Health, 19(21), 14518.

Ellili, N. O. D. (2022). Bibliometric analysis and systematic review of environmental, social, and governance disclosure papers: current topics and recommendations for future research. Environmental Research Communications, 4(9), 092001.

Fatima, T., Li, B. X., & Zhang, D. (2024). Fostering innovation sustainability with the impact of incremental environmental information disclosure under green credit constraints. Environment, Development and Sustainability, 1-28.

Gerged, A. M., Arslan, D. H. M., Abbas, A., Chen, S., & Manzoor, S. (2021). Review of Corporate Environmental Disclosure Research: A Bibliometric Approach. Available at SSRN 3982298.

He, J., Xue, H., Yang, W., Zhong, Y., & Fan, B. (2025). Green Credit Policy and Corporate Green Innovation. International Review of Economics & Finance, 104031.

He, L., Gan, S., & Zhong, T. (2022). The impact of green credit policy on firms' green strategy choices: green innovation or green-washing?. Environmental Science and Pollution Research, 29(48), 73307-73325.

Iatridis, G. E. (2013). Environmental disclosure quality: Evidence on environmental performance, corporate governance and value relevance. Emerging Markets Review, 14, 55-75.

Khan, M. A. (2022). ESG disclosure and firm performance: A bibliometric and meta analysis. Research in International Business and Finance, 61, 101668.

Lee, E. (2010). Information disclosure and environmental regulation: green lights and gray areas. Regulation & governance, 4(3), 303-328.

Li, M., Wang, X., Wang, Z., Maqbool, B., Hussain, A., & Khan, W. A. (2022). Bibliometric analysis of the research on the impact of environmental regulation on green technology innovation based on CiteSpace. International Journal of Environmental Research and Public Health, 19(20), 13273.

Lu, Z., & Li, H. (2023). Does environmental information disclosure affect green innovation?. Economic

Analysis and Policy, 80, 47-59.
Luo, W., Guo, X., Zhong, S., & Wang, J. (2019). Environmental information disclosure quality, media attention and debt financing costs: Evidence from Chinese heavy polluting listed companies. Journal of Cleaner Production, 231, 268-277.
Mallin, K. (2023). Government-Mandated ESG Disclosure: It's Not Easy Being Green. Hous. L. Rev., 61, 855.
Moroney, R., Windsor, C., & Aw, Y. T. (2012). Evidence of assurance enhancing the quality of voluntary environmental disclosures: An empirical analysis. Accounting & Finance, 52(3), 903-939.
Naeem, M. A., Karim, S., Rabbani, M. R., Bashar, A., & Kumar, S. (2023). Current state and future directions of green and sustainable finance: A bibliometric analysis. Qualitative Research in Financial Markets, 15(4), 608-629.
Ortas, E., Gallego-Alvarez, I., & Álvarez Etxeberria, I. (2015). Financial factors influencing the quality of corporate social responsibility and environmental management disclosure: A quantile regression approach. Corporate Social Responsibility and Environmental Management, 22(6), 362-380.
Shi, D., Bu, C., & Xue, H. (2021). Deterrence effects of disclosure: The impact of environmental information disclosure on emission reduction of firms. Energy Economics, 104, 105680.
Shi, M., Jia, Z., & Mehmood, U. (2023). Exploring the roles of green finance and environmental regulations on CO2es: defining the roles of social and economic globalization in the next eleven nations. Environmental Science and Pollution Research, 30(22), 62967-62980.
Shoeb, M., Aslam, A., & Aslam, A. (2022). Environmental accounting disclosure practices: A bibliometric and systematic review. International Journal of Energy Economics and Policy, 12(4), 226-239.
Srivastava, A. (2024). Six decades of corporate disclosure research: a bibliometric review. Managerial Finance, 50(4), 768-790.
Sun, J., Zheng, L., & Zhan, M. (2025). New path to green transformation: Exploring the impact of corporate governance on environmental information disclosure quality of new energy companies. Journal of Environmental Management, 373, 123789.
Tan, Y., & Zhu, Z. (2022). The effect of ESG rating events on corporate green innovation in China: The mediating role of financial constraints and managers' environmental awareness. Technology in Society, 68, 101906.
Toms, J. S. (2002). Firm resources, quality signals and the determinants of corporate environmental reputation: some UK evidence. The British accounting review, 34(3), 257-282.
Tong, L., Jabbour, C. J. C., Najam, H., & Abbas, J. (2022). Role of environmental regulations, green finance, and investment in green technologies in green total factor productivity: Empirical evidence from Asian region. Journal of Cleaner Production, 380, 134930.
Wang, J., Ma, M., Dong, T., & Zhang, Z. (2023). Do ESG ratings promote corporate green innovation? A quasi-natural experiment based on SynTao Green Finance's ESG ratings. International Review of Financial Analysis, 87, 102623.
Wang, N., Li, D., Cui, D., & Ma, X. (2022b). Environmental, social, governance disclosure and corporate sustainable growth: Evidence from China. Frontiers in Environmental Science, 10, 1015764.
Wang, S., & Chang, Y. (2024). A study on the impact of ESG rating on green technology innovation in enterprises: An empirical study based on informal environmental governance. Journal of Environmental Management, 358, 120878.
Wang, S., Zhou, Z., & Tian, K. (2022a). Environmental awareness and environmental information disclosure: An empirical study based on energy industry. Frontiers in Psychology, 13, 1038040.
Wang, Y. (2024). Impact of environmental information disclosure on environmental regulation intensity: evidence from 113 cities in China. Scientific Reports, 14(1), 25357.
Wang, Y., Yang, Y., Fu, C., Fan, Z., & Zhou, X. (2021). Environmental regulation, environmental responsibility, and green technology innovation: Empirical research from China. Plos one, 16(9), e0257670.
Wang, Y., Zhao, Z., Shi, M., Liu, J., & Tan, Z. (2024). Public environmental concern, government environmental regulation and urban carbon emission reduction-Analyzing the regulating role of green finance and industrial agglomeration. Science of the Total Environment, 924, 171549.
Wang, Z., & Chu, E. (2024). Shifting focus from end-of-pipe treatment to source control: ESG ratings' impact on corporate green innovation. Journal of Environmental Management, 354, 120409.
Wu, J., Tang, Q., & Yang, Y. (2023). Does green credit policy affect corporate innovation performance? A quasi-natural experiment based on Green Credit Guidelines. Plos one, 18(10), e0291764.
Xiang, X., Liu, C., Yang, M., & Zhao, X. (2020). Confession or justification: The effects of environmental disclosure on corporate green innovation in China. Corporate Social Responsibility and Environmental Management, 27(6), 2735-2750.
Xu, P., Ye, P., Jahanger, A., Huang, S., & Zhao, F. (2023). Can green credit policy reduce corporate carbon emission intensity: Evidence from China's listed firms. Corporate Social Responsibility and Environmental Management, 30(5), 2623-2638.
Xu, W., Li, M., & Xu, S. (2023). Unveiling the "Veil" of information disclosure: Sustainability reporting

"greenwashing" and "shared value". PLoS One, 18(1), e0279904.

Xu, X., Jing, R., & Lu, F. (2022). Environmental regulation, corporate social responsibility (CSR) disclosure and enterprise green innovation: evidence from listed companies in China. International Journal of Environmental Research and Public Health, 19(22), 14771.

Yan, Y., Cheng, Q., Huang, M., Lin, Q., & Lin, W. (2022). Government environmental regulation and corporate ESG performance: evidence from natural resource accountability audits in China. International Journal of Environmental Research and Public Health, 20(1), 447.

Yang, C., Zhu, C., & Albitar, K. (2024). ESG ratings and green innovation: AU-shaped journey towards sustainable development. Business Strategy and the Environment, 33(5), 4108-4129.

Yang, X., Zhang, Z., Rao, S., Liu, B., & Li, Y. (2022). How does environmental information disclosure affect pollution emissions: firm-level evidence from China. International Journal of Environmental Research and Public Health, 19(19), 12763.

Zhang, J., Kang, L., Li, H., Ballesteros-Pérez, P., Skitmore, M., & Zuo, J. (2020). The impact of environmental regulations on urban green innovation efficiency: The case of Xi'an. Sustainable Cities and Society, 57, 102123.

Zhang, S., Zhang, M. A., Qiao, Y., Li, X., & Li, S. (2022). Does improvement of environmental information transparency boost firms' green innovation? Evidence from the air quality monitoring and disclosure program in China. Journal of Cleaner Production, 357, 131921.

Zhang, W., Zhao, Y., & Meng, F. (2024). ESG performance and green innovation of Chinese enterprises: Based on the perspective of financing constraints. Journal of Environmental Management, 370, 122955.

Zhen, Z., & Lu, B. (2024). The impact of green finance on corporate carbon disclosure: Financial regulation as a moderator. Finance Research Letters, 63, 105273.

Zhou, J., Lei, X., & Yu, J. (2024). ESG rating divergence and corporate green innovation. Business Strategy and the Environment, 33(4), 2911-2930.

Zhou, Y., Huo, W., Bo, L., & Chen, X. (2023). Impact and mechanism analysis of ESG ratings on the efficiency of green technology innovation. Finance Research Letters, 58, 104591.

Zhu, D., Liu, C., Dong, Y., & Hua, J. (2022). The effect of environmental regulation on corporate environmental governance behavior and its mechanisms. Sustainability, 14(15), 9050.

Zhu, F., Xu, X., & Sun, J. (2024). The short board effect of ESG rating and corporate green innovation activities. Plos one, 19(3), e0299795