Novatio: Journal of Management Technology and Innovation
E-ISSN : 3030-8674
Volume. 3, Issue 3, July 2025
Page No: 170-180

Green Technology Innovation and Sustainable Performance: A Resource-Based Mediation Model of Circular Economy Adoption

Henny Noviany[1], Safri[2]
[1]Universitas An Nasher, Indonesia
[2]Universitas Dirgantara Marsekal Suryadarma, Indonesia
Correspondent : hennynoviany@universitasannasher.ac.id[1]

Received : June 3, 2025
Accepted : July 26, 2025
Published : July 31, 2025

Citation: Noviany, H., Safri. (2025). Green Technology Innovation and Sustainable Performance: A Resource-Based Mediation Model of Circular Economy Adoption. Novatio: Journal of Management Technology and Innovation, 3(3), 170-180..

ABSTRACT: This study investigates how Green Technology Innovation (GTI) enhances Sustainable Business Performance (SBP) through the mediating role of Circular Economy (CE) practices, offering an integrative framework that addresses firm-level sustainability strategy. A quantitative, cross-sectional survey was conducted among 250 manufacturing firms. Using validated instruments, data were collected on GTI activities, CE implementation, and SBP outcomes. Structural Equation Modeling–Partial Least Squares (SEM-PLS) was employed to test direct and indirect relationships, with bootstrapping applied to assess mediation effects.Findings reveal that GTI positively influences both CE adoption ($\beta = 0.64$, $p < 0.001$) and SBP ($\beta = 0.32$, $p < 0.01$). CE also directly enhances SBP ($\beta = 0.58$, $p < 0.001$) and partially mediates the GTI–SBP relationship (indirect $\beta = 0.37$, $p < 0.001$). Sectoral and geographic variations in adoption were noted, with larger and high-tech firms demonstrating higher engagement. The results validate the Natural Resource–Based View (NRBV), indicating that firms with integrated GTI–CE strategies gain competitive and environmental advantages. CE was found to serve as both a performance enabler and a resilience mechanism. GTI and CE are complementary strategies for achieving SBP. Firms should embed CE into their innovation strategies to maximize outcomes. Policymakers are encouraged to promote supportive regulatory and fiscal environments. Future studies should explore longitudinal effects and sector-specific dynamics.

Keywords: Green Technology Innovation; Circular Economy; Sustainable Business Performance; NRBV; Structural Equation Modeling; Mediation.

INTRODUCTION

As environmental degradation and climate volatility escalate, businesses face increased urgency to strategically integrate sustainability into core innovation activities, particularly through Green Technology Innovation (GTI) and Circular Economy (CE) practices. Global challenges—such as climate change, resource depletion, and rising social inequality—are reshaping corporate strategy by compelling firms to embed sustainability into innovation and value creation processes. As Chen et al. (2023) argue, climate change remains one of the most pressing issues, compelling firms to reassess their operational frameworks to remain viable and competitive in the long term. This environmental imperative is further underscored by Oduncular et al. (2024), who note that rising global temperatures and the frequency of extreme weather events necessitate proactive corporate responses that integrate sustainability as a core strategic objective. These concerns are echoed by Ağan & Balcılar (2023), who emphasize the role of macroeconomic variables and technological innovation particularly in green domains in fostering resilience and mitigating ecological threats.

In response to these challenges, businesses are increasingly embracing eco-innovation, driven by both regulatory requirements and evolving market expectations. Teng et al. (2023) highlight the increasing importance of regulatory pressure, noting that environmental frameworks such as the European Green Deal which aims for net-zero emissions by 2050 are reshaping corporate environmental commitments. In parallel, financial institutions and investors are incorporating environmental, social, and governance (ESG) indicators into their valuation models (Shi & Shao, 2024), creating additional incentives for firms to adopt green practices. The rapid expansion of green finance has also made funding for sustainable projects more accessible, positioning green innovation as both a strategic imperative and a competitive advantage (Magalhães-Timotio et al., 2024).

In recent years, Green Technology Innovation (GTI) has emerged as a cornerstone of corporate sustainability. GTI encompasses the development and application of technologies that reduce environmental impacts while maintaining or improving economic output. These include renewable energy systems, low-carbon production processes, and eco-friendly product designs (Alshammari & Alshammari, 2023). These innovations not only help organizations meet regulatory demands but also enable cost efficiency and enhanced product differentiation. Moreover, as Li et al. (2022) contend, technological innovation is reshaping the dynamics of sustainable finance and green markets, enabling novel solutions and improved organizational performance.

Simultaneously, the concept of the Circular Economy (CE) has gained considerable traction as a complementary strategy to GTI. CE promotes sustainable resource use through practices such as reuse, recycling, remanufacturing, and modular design, reducing dependency on virgin materials and minimizing waste. Sarkodie et al. (2021) observe that CE has increasingly been integrated into corporate sustainability agendas, with firms adopting circular strategies to strengthen environmental performance. The interaction between GTI and CE offers a synergistic pathway to enhance firm-level sustainability. As noted by Huo et al. (2023), the convergence of these strategies fosters operational efficiency, innovation, and market differentiation.

From a strategic perspective, integrating GTI and CE is perceived by firms as a pathway to enhance long-term value. Chen et al. (2024) argue that sustainability-oriented strategies contribute not only to environmental stewardship but also deliver measurable economic benefits such as cost reduction, process efficiency, and brand loyalty. This is especially relevant in the manufacturing sector, where the intersection of digitalization and sustainability has led to the reduction of carbon footprints through advanced green technologies (L. Chen et al., 2022).

Despite the acknowledged importance of GTI and CE, empirical understanding of their joint effects on sustainable business outcomes remains fragmented. Existing research often isolates these concepts rather than examining their synergistic potential. Stephenson (2016) and Wang et al. (2022) point to the scarcity of integrative studies exploring how GTI enables CE and how, in turn, CE contributes to improved Sustainable Business Performance (SBP). This gap highlights the need for multidisciplinary research that elucidates the mechanisms linking green innovation and circular strategies.

Furthermore, policy dynamics and consumer expectations are exerting additional pressure on firms to innovate sustainably. According to Li et al. (2023), more stringent environmental policies correlate positively with green investment, suggesting that regulatory environments can catalyze innovation. Cumming et al. (2024) add that rising consumer demand for sustainable products is shaping business behavior, compelling firms to integrate sustainability deeper into their core innovation frameworks. This evolving business context underscores the necessity of embedding GTI and CE not as peripheral strategies, but as integral components of corporate identity and competitive advantage.

The convergence of GTI and CE within the broader context of sustainability strategy is thus not only timely but essential. Firms that strategically align their innovation and circularity initiatives are better positioned to manage environmental risks, satisfy stakeholder expectations, and realize enhanced financial performance. This research aims to investigate how GTI influences SBP and the mediating role played by CE in this relationship. The findings are expected to offer critical insights for theory development and practical applications in sustainability-driven innovation. In doing so, the study responds to an urgent call for integrated frameworks that address both environmental imperatives and economic performance, thereby contributing to the future of responsible business practice.

METHOD

This study adopts a quantitative, cross-sectional design to investigate the influence of Green Technology Innovation (GTI) on Sustainable Business Performance (SBP), mediated by Circular Economy (CE) practices. The research employs survey-based data collection from manufacturing firms and applies Structural Equation Modeling (SEM), particularly the Partial Least Squares (PLS-SEM) approach, to test the proposed mediation model.

A structured questionnaire was developed to collect primary data from sustainability managers, innovation officers, and environmental compliance professionals within manufacturing firms. This approach allows the empirical testing of relationships between GTI, CE, and SBP constructs, as derived from the Natural Resource–Based View (NRBV) theoretical framework. The cross-sectional design captures firm-level practices at a single point in time, suitable for examining structural relationships.

The population comprises medium to large manufacturing firms that have adopted, or are in the process of adopting, sustainability-oriented practices. A stratified sampling method was applied to ensure diversity across industries (e.g., electronics, textiles, chemicals). The targeted sample size was 250 firms, based on SEM-PLS minimum sample recommendations. The sampling frame included companies listed in environmental databases or those reporting ESG metrics.

Green Technology Innovation (GTI)

GTI was measured using multiple indicators adapted from recent literature. These include:

- Number of green patents granted
- Percentage reduction in carbon emissions due to technological upgrades
- Energy efficiency improvements linked to new systems
- R&D expenditure allocated specifically to green initiatives
- Share of sustainable products within total product offerings
- Frequency and scale of employee training in environmental innovation These indicators align with Chen et al. (2023), Islam et al. (2024), and Li et al. (2022), providing both quantitative and qualitative insights into green innovation efforts.

Circular Economy Practices (CE)

CE practices were operationalized using indicators that reflect firms' engagement with reuse, recycling, remanufacturing, and waste reduction. Metrics included:

- Volume of materials reused and recycled annually
- Adoption of modular product design
- Implementation of reverse logistics systems
- Reduction in landfill waste as a percentage of total waste
- Resource recovery efficiency

These items were adapted from Sarkodie et al. (2021), capturing the extent and sophistication of CE implementation.

Sustainable Business Performance (SBP)

SBP was assessed through a dual focus on environmental and economic dimensions:

- Emission reductions per production unit
- Reduction in industrial waste output
- Return on investment (ROI)
- Revenue growth attributed to sustainability measures
- Resource cost savings

These indicators were developed from MDPI (2024) sources and reflect common SBP metrics used in ESG reporting.

Data Collection Procedures

Surveys were distributed electronically with multiple follow-ups to maximize response rates. Confidentiality and anonymity were ensured. Non-response bias was assessed and controlled by comparing early and late respondents, revealing no significant differences.

Analytical Method

PLS-SEM was selected for its robustness in exploratory studies and capacity to model complex mediation paths. It supports non-normal data and smaller samples, which aligns with the research design. Bootstrapping with 5,000 resamples was used to assess mediation effects. Reliability (Cronbach's Alpha, Composite Reliability) and validity (Average Variance Extracted, discriminant validity) were also tested. The model specification followed guidelines for testing indirect effects and interaction terms.

Ethical Considerations

The study complied with ethical research standards, including informed consent, voluntary participation, and secure data handling.

In summary, this methodological framework integrates contemporary sustainability metrics and advanced statistical techniques to examine the dynamic interactions between GTI, CE, and SBP. The combination of firm-level indicators and SEM allows for a nuanced analysis of how technological and circular practices jointly drive sustainable outcomes.

RESULT AND DISCUSSION

Descriptive statistics summarize the extent of adoption for GTI, CE, and SBP across firms, indicating meaningful engagement and sectoral differences. The results reveal moderately high engagement with these practices among manufacturing companies. GTI scores averaged 5.3 (SD = 1.1), CE practices averaged 5.6 (SD = 0.9), and SBP averaged 5.1 (SD = 1.2) on a 7-point Likert scale.

These findings are consistent with prior studies indicating increasing GTI adoption among large manufacturers in developed economies (Mulindwa et al., 2024; Wang et al., 2021), though adoption is relatively lower among smaller firms or those in emerging markets (Wang, 2022). CE practices were adopted by 50–60% of firms, especially those in sectors such as electronics and automotive, aligning with trends reported by Goyal et al. (2016). Larger, more established firms demonstrated stronger adoption due to resource availability and experience (Lutfi et al., 2023), while high-tech industries achieved better SBP outcomes than traditional sectors (Siregar et al., 2023).

Environmental benchmarks showed that leading firms achieved CO2 reductions of over 30%, while others lagged at 10–15% (Jain, 2023). These statistics reflect performance variation based on sector and organizational maturity.

To validate the measurement model, internal consistency reliability was assessed using Cronbach's alpha and composite reliability (CR). All constructs exceeded the 0.70 threshold ((Wang et al., 2021), indicating acceptable reliability.

Convergent validity was supported through Average Variance Extracted (AVE), where all constructs had AVE values above 0.50 (Miao & Zhao, 2023). Discriminant validity was established using the Fornell-Larcker criterion, confirming the uniqueness of constructs (Acquah et al., 2021). These results validate the multidimensional structure of GTI, CE, and SBP and support their use in further modeling.

Path analysis using PLS-SEM evaluated direct and indirect effects between constructs. The model explained a substantial portion of variance in CE ($R^2 = 0.41$) and SBP ($R^2 = 0.52$), demonstrating strong explanatory power.

Table 1. Path Coefficients and Significance

Path	β	t-value	p-value	Result
GTI → CE	0.64	7.45	<0.001	Supported
CE → SBP	0.58	6.10	<0.001	Supported
GTI → SBP	0.32	3.25	<0.01	Supported
GTI → CE → SBP	0.37	4.80	<0.001	Mediation Confirmed

These findings support previous evidence on strong links between GTI and CE, with correlation coefficients typically exceeding 0.60. CE was found to simultaneously enhance environmental and economic outcomes. This dual impact supports the value-creation role of CE in corporate sustainability.

The partial mediation effect of CE aligns with earlier work emphasizing GTI's role in enabling CE and subsequently improving SBP (Jesus et al., 2024). Moderating factors such as regulatory incentives and sector-specific competitiveness may further influence these relationships. These findings highlight the importance of internal innovation and external context in shaping sustainable outcomes.

The empirical results of this study underscore the significant roles that Green Technology Innovation (GTI) and Circular Economy (CE) practices play in driving Sustainable Business Performance (SBP). The findings confirm that CE partially mediates the relationship between GTI and SBP, aligning with broader global trends and theoretical frameworks such as the Natural Resource–Based View (NRBV).

Cross-national comparisons reveal substantial disparities in the adoption and impact of GTI and CE. Developed economies especially those in Europe tend to lead in GTI implementation due to well-established regulatory infrastructures and policy incentives (Xue et al., 2019; Xie et al., 2019). In contrast, emerging economies such as China exhibit sector-specific advancements driven by compliance with environmental regulations (Mulaessa & Lefen, 2021). Similarly, industry-wise, technology-intensive sectors such as automotive and pharmaceuticals show more robust GTI and CE engagement than resource-intensive sectors like textiles and agriculture (Tian et al., 2023).

The mediating role of CE is strategically transformative. CE practices integrate sustainability goals directly into operational frameworks, thereby acting as enablers of resilience, innovation, and value creation (Fernando et al., 2016). CE not only facilitates environmental compliance but also enhances competitive advantage by embedding resource efficiency into product and process design. Firms that leverage CE principles report improved operational efficiency, increased stakeholder satisfaction, and stronger market positions (Wicki & Hansen, 2019).

In today's volatile global markets, CE also provides strategic buffering. Circular supply chains reduce dependency on finite resources, allowing firms to navigate disruptions with greater agility (Leoncini et al., 2017). This dual function as both performance enhancer and risk mitigator reinforces CE's importance as a mediator in the GTI–SBP nexus.

These findings are strongly supported by NRBV theory, which posits that sustainable competitive advantage stems from the intelligent management of unique environmental resources (Liu & Wang, 2024). GTI and CE, when aligned, generate resource-based capabilities that yield long-term financial and environmental dividends (Becker, 2023). NRBV's emphasis on resource uniqueness and environmental stewardship is echoed in the demonstrated synergy between GTI and CE in this study. By internalizing CE strategies, firms extend the impact of GTI, amplifying gains in both economic and environmental performance (Qing et al., 2022; Tao et al., 2023).

From a practical standpoint, the integration of GTI and CE into Environmental, Social, and Governance (ESG) frameworks should be approached methodically. Firms are advised to adopt standardized and transparent indicators for their green innovation and circular economy practices, allowing stakeholders to evaluate sustainability efforts more objectively (Du & Wang, 2022). In tandem, firms should supplement quantitative metrics with qualitative disclosures that contextualize their strategic intentions and highlight broader impacts (Tang et al., 2017).

Collaborative frameworks also offer pathways for amplifying sustainability adoption. Partnerships among industry consortia, academic institutions, and government bodies can facilitate knowledge transfer and promote shared best practices (Adomako & Tran, 2024). These collaborations support capacity-building, especially for smaller firms struggling with implementation barriers.

Additionally, linking sustainability performance to executive compensation could serve as a powerful incentive mechanism. Aligning leadership incentives with GTI and CE objectives would institutionalize sustainability and drive cultural change within organizations.

In summary, this study confirms that GTI and CE practices jointly shape firm-level sustainability performance. CE acts not only as a conduit for translating innovation into performance but also as a catalyst for long-term resilience and strategic differentiation. The findings extend NRBV theory and offer actionable recommendations for practitioners aiming to embed sustainability into core business strategy.

CONCLUSION

This study examined the impact of Green Technology Innovation (GTI) on Sustainable Business Performance (SBP), emphasizing the mediating role of Circular Economy (CE) practices. The findings demonstrate that GTI significantly enhances SBP, and its effectiveness is amplified when aligned with CE strategies such as reuse, recycling, and reverse logistics. These results highlight CE's strategic role in translating technological innovation into tangible sustainability outcomes, thereby reinforcing the theoretical underpinnings of the Natural Resource–Based View (NRBV).

The research contributes to sustainability literature by integrating innovation and circularity within a unified framework. Practically, firms are encouraged to institutionalize CE within their innovation agendas to drive both environmental and financial performance. Policy implications include the need for enabling ecosystems through fiscal incentives, regulatory clarity, and ESG standardization. Future research should adopt longitudinal approaches and sectoral analyses to deepen understanding of the GTI–CE–SBP nexus across different industrial contexts.

REFERENCE

Acquah, I. S. K., Dacosta, E., Baah, C., Agyabeng-Mensah, Y., & Afum, E. (2021). Investigating the Efficacy of Isomorphic Pressures on the Adoption of Green Manufacturing Practices and Its Influence on Organizational Legitimacy and Financial Performance. *Journal of Manufacturing Technology Management*, *32*(7), 1399–1420. https://doi.org/10.1108/jmtm-10-2020-0404

Adomako, S., & Tran, M. D. (2024). Exploring the Effect of R&D Support, Green Technology Transfer, Sustainable Innovation. *Sustainable Development*, *32*(5), 4758–4769. https://doi.org/10.1002/sd.2936

Ağan, B., & Balcılar, M. (2023). Unraveling the Green Growth Matrix: Exploring the Impact of Green Technology, Climate Change Adaptation, and Macroeconomic Factors on Sustainable Development. *Sustainability*, *15*(11), 8530. https://doi.org/10.3390/su15118530

Alshammari, K. H., & Alshammari, A. F. (2023). Green Innovation and Its Effects on Innovation Climate and Environmental Sustainability: The Moderating Influence of Green Abilities and Strategies. *Sustainability*, *15*(22), 15898. https://doi.org/10.3390/su152215898

Becker, B. (2023). Green Innovation Strategies, Innovation Success, and Firm Performance—Evidence From a Panel of Spanish Firms. *Sustainability*, *15*(2), 1656. https://doi.org/10.3390/su15021656

Chen, A. Y., Lawson, C., & Massini, S. (2023). *Green Technologies' Reliance on Science: Investigating the Science Knowledge Base via Scholarly Work Cited in Patents*. https://doi.org/10.55835/64428908b8e4087ea927341a

Chen, L., Xin, B., Bi, C., & Wang, J. (2022). Incentives for Green and Low-Carbon Technological Innovation of Enterprises Under Environmental Regulation: From the Perspective of Evolutionary Game. *Frontiers in Energy Research*, *9*. https://doi.org/10.3389/fenrg.2021.793667

Chen, Y., Liu, S., Xiao, Y., & Zhou, Q. (2024). Can Digital Transformation Reduce Enterprise Carbon Intensity? An Empirical Analysis of Chinese Manufacturers. *Sustainability*, *16*(12), 5236. https://doi.org/10.3390/su16125236

Cumming, D. J., Farag, H., & Johan, S. (2024). Sustainability, Climate Change and Financial Innovation: Future Research Directions. *European Financial Management*, *30*(2), 675–679. https://doi.org/10.1111/eufm.12481

Du, Y., & Wang, H. (2022). Green Innovation Sustainability: How Green Market Orientation and Absorptive Capacity Matter? *Sustainability*, *14*(13), 8192. https://doi.org/10.3390/su14138192

Fernando, Y., Wah, W. X., & Shaharudin, M. S. (2016). Does a Firm's Innovation Category Matter in Practising Eco-Innovation? Evidence From the Lens of Malaysia Companies Practicing Green Technology. *Journal of Manufacturing Technology Management*, *27*(2), 208–233. https://doi.org/10.1108/jmtm-02-2015-0008

Goyal, S., Esposito, M., & Kapoor, A. (2016). Circular Economy Business Models in Developing Economies: Lessons From India on Reduce, Recycle, and Reuse Paradigms. *Thunderbird International Business Review*, *60*(5), 729–740. https://doi.org/10.1002/tie.21883

Huo, M., Li, C., & Liu, R. (2023). Climate Policy Uncertainty and Corporate Green Innovation Performance: From the Perspectives of Organizational Inertia and Management Internal Characteristics. *Managerial and Decision Economics*, *45*(1), 34–53. https://doi.org/10.1002/mde.3981

Islam, S., Basheer, N., Silvestri, S., Papastergiou, S., & Ciampi, M. (2024). *Intelligent Dynamic Cybersecurity Risk Management Framework With Explainability and Interpretability of AI Models for Enhancing Security and Resilience of Digital Infrastructure*. https://doi.org/10.21203/rs.3.rs-4796809/v1

Jain, M. (2023). Green Image and Incentives: Unraveling Their Moderating Impact on Green Innovations, Investor Perception and Financial Performance. *Ceccar Business Review*, *4*(6), 47–59. https://doi.org/10.37945/cbr.2023.06.06

Jesus, G. M. K., Jugend, D., Fiorini, P. D. C., & Glauco Henrique de Sousa Mendes. (2024). Open Innovation to Scale Up the Circular Economy: Exploring the Mediating Role of Industry 4.0 Technologies. *Creativity and Innovation Management*, *34*(1), 125–142. https://doi.org/10.1111/caim.12629

Leoncini, R., Marzucchi, A., Montresor, S., Rentocchini, F., & Rizzo, U. (2017). 'Better Late Than Never': The Interplay Between Green Technology and Age for Firm Growth. *Small Business Economics*, *52*(4), 891–904. https://doi.org/10.1007/s11187-017-9939-6

Liu, Y., & Wang, R. (2024). Customer Discourse Power and Green Innovation in Industrial Chain Enterprises: A Theoretical and Empirical Approach. *Plos One*, *19*(5), e0301598. https://doi.org/10.1371/journal.pone.0301598

Lutfi, A., Alqudah, H., Alrawad, M., Alshira'h, A. F., Alshirah, M. H., Almaiah, M. A., Alsyouf, A., & Hassan, M. F. (2023). Green Environmental Management System to Support Environmental Performance: What Factors Influence SMEs to Adopt Green Innovations? *Sustainability*, *15*(13), 10645. https://doi.org/10.3390/su151310645

Magalhães-Timotio, J. G., Vieira, V. E. L., & Oliveira, R. A. d. (2024). An Exploratory Analysis of Green Finance. *Revista De Gestão Social E Ambiental*, *18*(8), e07314. https://doi.org/10.24857/rgsa.v18n8-133

Miao, Z., & Zhao, G. (2023). Impacts of Digital Information Management Systems on Green Transformation of Manufacturing Enterprises. *International Journal of Environmental Research and Public Health*, *20*(3), 1840. https://doi.org/10.3390/ijerph20031840

Mulaessa, N., & Lefen, L. (2021). How Do Proactive Environmental Strategies Affect Green Innovation? The Moderating Role of Environmental Regulations and Firm Performance. *International Journal of Environmental Research and Public Health*, *18*(17), 9083. https://doi.org/10.3390/ijerph18179083

Mulindwa, M. S., Akor, J., Auta, M., Nijman-Ross, E., & Ogutu, M. O. (2024). Assessing the Circularity Status of Waste Management Among Manufacturing, Waste Management, and Recycling Companies in Kigali, Rwanda. *Frontiers in Sustainability*, *4*. https://doi.org/10.3389/frsus.2023.1215554

Oduncular, Ç., Dahın, F., Günay, E. K., & Yenilmez, M. İ. (2024). Mind the Gap Between the Economic Effect of Climate Change and the Reality. *International Journal of Energy Studies*, *9*(1), 43–67. https://doi.org/10.58559/ijes.1409068

Qing, L., Chun, D., Dagestani, A. A., & Li, P. (2022). Does Proactive Green Technology Innovation Improve Financial Performance? Evidence From Listed Companies With Semiconductor Concepts Stock in China. *Sustainability*, *14*(8), 4600. https://doi.org/10.3390/su14084600

Sarkodie, S. A., Ajmi, A. N., Adedoyin, F. F., & Owusu, P. A. (2021). Econometrics of Anthropogenic Emissions, Green Energy-Based Innovations, and Energy Intensity Across OECD Countries. *Sustainability*, *13*(8), 4118. https://doi.org/10.3390/su13084118

Shi, Z., & Shao, T. (2024). The Development Status, Challenges and Problems of Green Finance in Different Countries. *Highlights in Business Economics and Management*, *24*, 2184–2187. https://doi.org/10.54097/j8jyvd42

Siregar, M., Raihan, R., & Cahyono, C. (2023). Application of Circular Economy in Manufacturing Industry in Indonesia. *Amca Journal of Community Development*, *3*(1), 19–24. https://doi.org/10.51773/ajcd.v3i1.211

Stephenson, S. (2016). *Addressing Local Content Requirements in a Sustainable Energy Trade Agreement: June 2013*. 316–348. https://doi.org/10.1017/cbo9781316137048.008

Tang, M., Walsh, G., Lerner, D., Fitza, M., & Li, Q. (2017). Green Innovation, Managerial Concern and Firm Performance: An Empirical Study. *Business Strategy and the Environment*, *27*(1), 39–51. https://doi.org/10.1002/bse.1981

Tao, S., Hai, M., Fang, Z., & Zheng, D. (2023). The Role of Environmental Justice Reform in Corporate Green Transformation: Evidence From the Establishment of China's Environmental Courts. *Frontiers in Environmental Science*, *11*. https://doi.org/10.3389/fenvs.2023.1090853

Teng, C., Wang, B., Ali, S., & Nazar, R. (2023). Investing for a Greener Future: Asymmetric Nexus Between Green Finance and Renewable Energy Technology Innovation. *Energy Technology*, *11*(10). https://doi.org/10.1002/ente.202300343

Tian, S., Cho, S. Y., Jia, X., Sun, R., & Tsai, W. S. (2023). Antecedents and Outcomes of Generation Z Consumers' Contrastive and Assimilative Upward Comparisons With Social Media Influencers. *Journal of Product & Brand Management*, *32*(7), 1046–1062. https://doi.org/10.1108/jpbm-02-2022-3879

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. https://doi.org/10.1371/journal.pone.0257670

Wicki, S., & Hansen, E. G. (2019). Green Technology Innovation: Anatomy of Exploration Processes From a Learning Perspective. *Business Strategy and the Environment*, *28*(6), 970–988. https://doi.org/10.1002/bse.2295