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Circular economy from an environmental accounting perspective: Strengthening firm performance through green supply chain management and import regulation in Indonesia's plastic recycling industry

Lilis Ardini[a*] and Mochammad Fahlevi[b]

[a]*Sekolah Tinggi Ilmu Ekonomi Indonesia Surabaya, East Java, Indonesia*
[b]*Management Department, BINUS Online, Bina Nusantara University, Jakarta 11480, Indonesia*

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This study investigates the impacts of environmental accounting, green supply chain management (GSCM), and import regulations on firm performance. Using a quantitative research design, this study employs Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine 192 managers from the health equipment industry. The research employs a comprehensive array of measurement items derived from interdisciplinary literature to assess the intricate relationships among the primary variables in a multifaceted manner. This research underscores the favorable effect of environmental accounting on bolstering green supply chain management (GSCM) practices and dexterously navigating import regulations, which ultimately prove to be highly beneficial for a firm's performance. This study validates the potency of a circular economy approach, with resource efficiency emerging as a crucial aspect in maximizing both ecological and financial outcomes. The measurement model developed in this study is a dependable resource for future research and practical applications aimed at promoting sustainability in the industry.

1. Introduction

Research studies have revealed that plastic items have detrimental effects on the environment (Gunaalan et al., 2020), including water and soil pollution (Zhang et al., 2020), endangerment of wildlife and marine creatures (Blettler & Mitchell, 2021), and contribute to climate change (Shen et al., 2020). Improper disposal and inadequate management of plastic waste compounds present these environmental challenges. Although plastics are ubiquitous in our daily lives and widely used in various industries because of their low cost, lightweight nature, moldability, and durability, the surging volume of plastic waste poses a severe threat to ecosystems. According to the Indonesia Solid Waste Association (InSWA) (2023), plastic waste ranks second, with an annual production of 5.4 million tons, accounting for 14 percent of the total waste production. This volume of plastic waste has surpassed paper waste, which previously held the second spot and now ranks third with 3.6 million tons per year, accounting for 9 percent of the total waste production. This shift in waste production highlights the growing problem of plastic waste management in Indonesia.

Table 1
Plastic Waste in Indonesia

Statistic	Data
Annual unmanaged plastic waste production	3.2 million tonnes
Plastic waste ending up in the sea annually	1.29 million tonnes
Plastic carry bags released into the local environment annually	10 billion bags (85,000 tonnes)
Total plastic waste generated annually	7.8 million tons
Mismanaged plastic waste annually	4.9 million tons

Source: (World Bank, 2021)

* Corresponding author
E-mail address lilis@privietlab.org (L. Ardini)

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Table 1 presents a comprehensive summary of the present situation of plastic waste in Indonesia, demonstrating the magnitude of the issue and urgent need for prompt action. These data highlight the significant environmental challenges posed by plastic waste in Indonesia. Addressing this issue requires a multifaceted approach that includes enhancing waste management systems, promoting recycling and waste reduction practices, and implementing policies aimed at reducing the production and consumption of single-use plastics. It is crucial to involve various stakeholders such as government agencies, industry, and the community to develop and implement effective strategies to tackle plastic pollution and safeguard the environment for future generations (Cowan et al., 2021; Fossi et al., 2020).

The global market for medical plastics currently has a value of $22.26 billion, or 2% of the total production of plastics, and is growing at an annual rate of 6.1% (Grand View Research, 2019). The United States is the leading producer of medical devices, accounting for approximately 40% of the global total, followed by Europe and Japan (Sastri, 2021). The growth of this sector is expected to be driven by the increasing demand for healthcare in developing countries such as Brazil, Russia, India, and China, with the highest compound annual growth rate (6.9%) in the Asia-Pacific region (Modjarrad & Ebnesajjad, 2013). Plastic products, including gloves, tubing, and blood sample tubes, significantly contribute to carbon emissions from the National Health Service in England (Sustainable Development Unit, 2017). Inappropriate disposal of these products leads to plastic fragments constituting 50%-80% of shoreline debris, although the extent to which this is medical waste is unknown (Thompson et al., 2009).

One potential solution to address the issue of plastic use is to establish a circular economy, which involves minimizing the use of plastics and maximizing resource utilization through the reuse of items or the recycling of plastics into new products, thereby reducing reliance on virgin plastic (Rizan et al., 2020). This approach contrasts with the traditional linear economic model, which is not sustainable given finite resources. Transitioning to a circular economy is a crucial strategy for addressing the plastic waste problem in Indonesia (Kurniawan et al., 2022). This approach entails reconsidering the present linear model of production and consumption, which is characterized by a take-make-dispose pattern, and shifting towards a more sustainable system in which resources are utilized for as long as possible, with the intention of minimizing waste and environmental impacts (Hahladakis et al., 2020; Payne et al., 2019).

In the context of plastic waste, transitioning to a circular economy involves redesigning products that are easily recyclable, promoting the use of recycled materials in manufacturing processes (Cruz Sanchez et al., 2020), and creating efficient systems for collecting, sorting, and recycling plastic waste (Van Eygen et al., 2018). This approach not only addresses the environmental challenges posed by plastic waste but also presents economic opportunities by reducing dependence on virgin materials, creating new jobs in recycling and remanufacturing activities, and fostering innovation in sustainable product design and material recovery. As firms adopt sustainable and circular manufacturing practices, they can streamline their operations to minimize waste generation and resource consumption (Cruz Sanchez et al., 2020). Thus, companies can reduce their production costs, improve operational efficiency, and enhance their overall competitiveness in the marketplace (Fahlevi, Ahmad, et al., 2023; Fahlevi, Hasan, et al., 2023).

Embracing a circular economy approach can lead to the development of new business models centered on product recovery and recycling (Urbinati et al., 2017). Firms can explore opportunities in the recycling and remanufacturing sectors, creating a new avenue for revenue generation and tapping into growing market demand for sustainable products and materials. It is imperative for businesses to recognize shifting consumer preferences and regulatory landscapes where sustainable practices and environmental responsibility are increasingly valued (Ahmad et al., 2023; Santoso et al., 2022; Shah, Al-Ghazali, et al., 2023). By aligning their operations with circular economy principles, firms can improve their public image (Kevin van Langen et al., 2021), strengthen stakeholder relationships (Demartini et al., 2023), and ensure compliance with evolving environmental regulations (Payne et al., 2019), thereby safeguarding their long-term market relevance (Kumar et al., 2019) and mitigating reputational risk (Goovaerts & Verbeek, 2018). The transition to a circular economy may also pose certain challenges for firms, including the need for substantial investment in technology, infrastructure, and workforce retraining. Addressing these challenges will require strategic planning, targeted investment, and adoption of a long-term perspective that recognizes the potential returns and benefits of embracing a circular economy model (Urbinati et al., 2017).

It is crucial to consider the broader implications of implementing a circular economy model in the context of environmental accounting (Larrinaga & Garcia-Torea, 2022; Scarpellini et al., 2020), green supply chain management (GSCM) (Kazancoglu et al., 2018; Liu et al., 2018), and import regulations (Qu et al., 2019; Syberg et al., 2021). Adopting a circular economy model aligns with the principles of environmental accounting, in which firms account for the environmental impact of their operations and integrate environmental costs into their decision-making processes. This holistic approach allows firms to evaluate the long-term benefits of sustainable practices and manage their environmental risks effectively. Furthermore, the adoption of circular manufacturing practices contributes to the development of GSCM, where firms prioritize environmentally responsible sourcing, production, and distribution processes. By integrating circularity into supply chain management, firms can enhance their environmental performance, reduce their carbon footprint, and create a competitive advantage in a market that increasingly values sustainable and ethically sourced products. Import regulations also play a pivotal role in shaping firm performance in a circular economy. As the Indonesian government continues to emphasize environmental sustainability and waste management, import regulations are likely to evolve to incentivize the importation of recycled materials and promote the use of environmentally friendly production inputs. Firms that have proactively embraced circularity in their operations are better positioned to comply with these evolving import regulations, gaining a strategic advantage in accessing and utilizing recycled materials and components in their production processes.

Understanding managers' perceptions within a company is crucial when transitioning to a circular economy. The buy-in and support of top-level management are essential for successful implementation of sustainable and circular manufacturing practices. Managers play a key role in decision-making processes and resource allocation (Watto et al., 2023), and their perceptions of the importance of transitioning to a circular economy can influence the entire organizational strategy (Fahlevi, Moeljadi, et al., 2023). Managers who are aware of the environmental challenges posed by plastic waste and perceive the potential benefits of circular economy principles are more likely to allocate resources, invest in technology, and support workforce retraining (Maskuroh et al., 2023; Mushtaq et al., 2022; Shah, Fahlevi, et al., 2023). Their perceptions can influence the overall commitment of a company to embrace sustainability and circularity in its operations. Using managers' perceptions as a guiding force, it is essential to leverage secondary data and reports to build a comprehensive model for transitioning to a circular economy.

Despite the widespread implementation of sustainability practices worldwide and growing awareness of their importance, there is a significant research gap in understanding the multifaceted effects of these practices on firm performance, particularly in developing countries such as Indonesia, which face severe environmental challenges. This study aims to address this gap by examining the interactions among environmental accounting, GSCM, and import regulations on firm performance in the plastic recycling industry in Indonesia. The novelty of this study lies in its comprehensive analysis of these variables and the construction of a model that not only elucidates the interrelations between them but also identifies the most critical dimensions that drive firm performance in the context of Indonesia's plastic waste management efforts. By addressing this research gap, this study contributes to the body of knowledge on sustainability practices and their impact on firm performance, particularly in developing countries. The originality of this study lies in its meticulous examination of each variable's dimensions, which enables a granular analysis of the unique ways in which specific aspects of environmental accounting practices, GSCM strategies, and compliance with import regulations contribute to enhancing firm performance. This study addresses a significant gap in the literature, which often treats these variables as monolithic constructs without adequate attention to their internal dynamics. The objectives of this study were multifaceted. Initially, the aim was to devise an inclusive model that encompasses the intricate interplay among environmental accounting, GSCM, and import regulations while simultaneously assessing their joint influence on firm performance. Additionally, the purpose is to pinpoint practical areas within each aspect that businesses can target to enhance their ecological and economic consequences, in light of stringent plastic waste management policies.

2. Theoretical Foundation

2.1. Triple Bottom Line (TBL)

The Triple Bottom Line (TBL) framework, which encompasses the dimensions of "people, planet, and profit", serves as a comprehensive approach for promoting sustainable business practices (Molina & Rajagopal, 2023). By extending their responsibility beyond financial metrics to include social and environmental impacts, firms can adopt TBL principles to document their broader contributions to society and ecological stewardship (Tate & Bals, 2018). This also enhances their capacity for innovation, fosters stakeholder relations, and strengthens their resilience to sustainability challenges (Awad & Martín-Rojas, n.d.). The alignment of TBL with the circular economy and sustainable practices principles enriches our model by offering a comprehensive view of how businesses can transition towards more sustainable operations. Integrating TBL into our research model allows for a nuanced analysis of sustainability that considers its environmental, social, and economic aspects. This approach is particularly relevant in light of circular economy initiatives, which emphasize resource efficiency, waste reduction, and the creation of value through the recovery and recycling of materials. By employing the TBL framework, our model seeks to evaluate the multifaceted impacts of such a transition, considering not only financial viability, but also social and environmental implications. This comprehensive examination is essential for understanding the broader implications of adopting circular economic practices, including their potential to promote sustainable development within the Indonesian context. The TBL framework provides a strong foundation for our model, facilitating the integrated assessment of environmental accounting, GSCM, and import regulations. This enables us to explore how these variables interact within the circular economy landscape and influence firm performance.

The concept of TBL is closely linked to environmental accounting by advocating the measurement and reporting of environmental and social performance alongside financial performance (Wiedmann & Lenzen, 2008). This approach enables firms to identify and mitigate environmental impacts, which is crucial for effective plastic waste management (Solovida & Latan, 2021). GSCM practices aim to minimize the environmental impact of the supply chain and align with the environmental bottom line of the TBL (Maskuroh et al., 2023). By incorporating TBL into the analysis, it can be demonstrated how GSCM contributes not only to environmental sustainability, but also to social well-being and economic gains. Regulations aim to protect the environment and promote social welfare by controlling the import of harmful materials or incentivizing the use of sustainable materials. The TBL framework can help analyze how compliance with these regulations affects a firm's triple bottom line, providing a comprehensive view of their impact on firm performance.

TBL encourages firms to innovate and develop sustainable solutions for environmental challenges. This drive for innovation is particularly important for businesses dealing with plastic waste management, as it can lead to the development of new business models, products, or processes that reduce waste and minimize environmental impacts, thereby providing a competitive advantage in the market. The TBL framework offers a structured approach for firms to integrate environmental and social considerations into their decision-making process. This is crucial for our research because it examines how firms can make informed decisions regarding environmental accounting, GSCM, and compliance with import regulations to enhance overall sustainability and performance.

3. Methodology

3.1. Research Design and Approach

This study utilizes a quantitative research design, specifically Partial Least Squares Structural Equation Modeling (PLS-SEM) (Ringle et al., 2020), to examine the influence of environmental accounting, GSCM, and import regulations on firm performance in the Indonesian health equipment manufacturing sector. The selection of PLS-SEM is intentional, as it is an effective method for analyzing complex models and is well suited for exploratory studies in emerging research areas (Hair et al., 2019; Sarstedt et al., 2017). By focusing on health equipment companies as the unit of analysis, this research is enhanced, as this sector presents distinct environmental, regulatory, and supply chain challenges and opportunities. Given the significant role of health equipment manufacturers in promoting societal well-being and environmental stewardship, it is crucial to understand the dimensions of each variable in this model to target sustainability practices in this sector.

3.2. Sample Size and Power Analysis

The sample size for the primary investigation was determined using G*Power 3.1 software (Kang, 2021) following the recommendations for PLS-SEM studies (Hair et al., 2021). A power analysis indicated that a sample size of 111 respondents would be sufficient to achieve a power of 0.80, assuming a medium effect size and alpha level of 0.05. To improve the credibility and dependability of our research outcomes and meet the minimum participant requirement, our objective was to recruit 192 individuals, exceeding the specified minimum number of participants. The robustness and reliability of our study will be enhanced through an increased sample size. This ensured an adequate statistical power to detect significant effects within the proposed model. For this study, purposive sampling was specifically utilized to select participants from managerial positions within the Indonesian health equipment manufacturing sector. This targeted approach ensured that respondents had the necessary knowledge and experience in environmental accounting practices, GSCM, and adherence to import regulations, thus enhancing the relevance and validity of the data collected.

3.3. Data Collection and Measurement

This study utilized a structured questionnaire as the primary method of data collection. This questionnaire was created by integrating measurement items drawn from various sources within the academic literature (Dutta et al., 2005; Saunders et al., 2009). By taking this eclectic approach, we hope to gain a broad range of perspectives and insights regarding environmental accounting, GSCM, import regulations, and their impact on firm performance in the Indonesian health equipment manufacturing sector. The inclusion of diverse theoretical frameworks and empirical findings in the questionnaire design was intended to ensure a thorough examination of the variables under investigation.

Table 2
Measurement

Dimension	Measurement Item Source
Environmental Accounting	(Global Reporting Initiative, 2011; International Federation of Accountants, 2005)
Green Supply Chain Management (GSCM)	(King & Lenox, 2001; Zhu et al., 2013)
Import Regulations	(Anderson & van Wincoop, 2004; Looi Kee et al., 2009)
Firm Performance	(Orlitzky et al., 2003; Sen & Bhattacharya, 2001)

Given the importance of understanding the specific context of Indonesian healthcare equipment manufacturers, a pilot study is a critical component of the research methodology. This study involved 35 respondents and aimed to evaluate the initial version of the questionnaire for clarity, relevance, and reliability. It is essential to identify and address any discrepancies, ambiguities, or misalignments between the theoretical constructs and the practical realities experienced by managers in the sector. By implementing the feedback received from the pilot study participants, adjustments could be made to refine the measurement items, ensuring their accuracy in capturing the nuances of the constructs under investigation. The results of this pilot study will be invaluable for refining the research methodology and ensuring the reliability and validity of the findings. The post-pilot study adjustments included a revised questionnaire that featured sections dedicated to each research variable. These sections employed Likert-scale items to assess respondents' levels of agreement or experience regarding each statement.

This approach ensured that the findings of the study were precise and statistically significant. Additionally, the use of a formal tone in the questionnaire ensured that the respondents took the study seriously and provided honest and accurate feedback. The objective of the pilot study was to customize the questionnaire based on the unique characteristics of the health equipment manufacturing industry in Indonesia. By refining the measurement items based on the findings of the pilot study, this research aims to improve the validity and reliability of the data collected.

3.4. Data Analysis

The data gathered from the primary study will be assessed using PLS-SEM software (Hair et al., 2021). This analysis involves evaluating the measurement model for both reliability and validity, followed by an examination of the structural model to test the proposed relationships. Bootstrapping was employed to generate standard errors and t-values for hypothesis testing (Ringle et al., 2020). Employing this comprehensive analysis approach will facilitate an in-depth understanding of the impact of environmental sustainability practices on firm performance in Indonesia's health equipment manufacturing industry.

4. Result and Discussion

4.1. Characteristic Respondent

The information presented below offers an overview of the respondents' demographics, including location, gender, managerial position, and years of experience, which is essential for comprehending the context from which the data originates.

Table 3
Profile Respondent

Demographics	No. of Respondents	Percentage (%)
Location:		
Jakarta	80	41.67
Surabaya	60	31.25
Balikpapan	52	27.08
Gender:		
Male	108	56.25
Female	84	43.75
Manager Position:		
Finance	45	23.44
Operations	70	36.46
Marketing	77	40.10
Years of Experience:		
<5 years	58	30.21
5-10 years	87	45.31
>10 years	47	24.48

The demographics outlined in Table 3 reveal a higher proportion of male managers (56.25%) than of female managers (43.75%), which could reflect broader industry or regional trends in leadership roles. Nonetheless, the representation of female managers is substantial and significant, indicating an inclusive managerial environment that can contribute diverse perspectives to this study. The distribution of managerial positions reveals that the largest group is marketing (40.10%), followed by operations (36.46%), and finance (23.44%). This distribution suggests a strong presence of strategic decision makers who are likely to be directly involved with the company's market-facing initiatives, operational efficiencies, and financial management, all of which are critical to implementing and sustaining environmental accounting and GSCM practices. The years of experience among the managers surveyed are spread across three ranges, with the largest segment having 5-10 years of experience (45.31%), which is indicative of a mature understanding of the industry. The next sizable group had less than 5 years of experience (30.21%), bringing fresh perspectives and possibly more recent education on sustainable practices. Managers with more than 10 years of experience (24.48%) provided seasoned insights that may include historical views on the evolution of sustainability within the sector.

4.2. Descriptive Statistics

The descriptive analysis consisted of the mean and standard deviation for each construct, which served as measures of central tendency and dispersion, respectively, of the respondents' answers. The information presented in Table 4 reveals a diverse range of perceptions and practices among the managers who responded to the survey. Environmental Accounting measures such as 'EC' and 'IGT' consistently demonstrate a high mean, suggesting that these measures are highly regarded and can be incorporated into managerial practices. GSCM related items like 'SE' and 'EDP' indicate a moderate to high mean, which suggests that sustainable supply chain initiatives are becoming increasingly adopted. However, the lower mean for Import Regulation constructs like 'CC' and 'RI' can indicate that regulatory adherence in these areas may present challenges or be perceived as less impactful by the respondents. The range of Firm Performance constructs, including 'EP,' 'OP,' 'MP,' and 'IP,' suggests that there is variability in the perceived impact of environmental and managerial initiatives on firm outcomes.

Table 4
Descriptive Statistics

Construct	Mean	Standard Deviation
Environmental Accounting		
EC	3.203 - 3.401	1.177 - 1.204
IGT	3.286 - 3.594	0.999 - 1.030
CF	3.016 - 3.510	0.940 - 1.028
RE	3.021 - 3.396	1.000 - 1.047
GSCM		
SE	3.057 - 3.432	0.907 - 1.036
EDP	2.943 - 3.698	0.879 - 1.095
RL	3.000 - 3.573	0.944 - 1.132
GP	2.953 - 3.141	1.003 - 1.108
Import Regulation		
CC	2.901 - 3.016	1.175 - 1.281
RI	2.828 - 3.031	1.156 - 1.261
TNB	2.766 - 2.984	1.138 - 1.317
Firm Performance		
EP	3.089 - 3.349	1.040 - 1.207
OP	3.073 - 3.115	0.999 - 1.073
MP	3.062 - 3.385	0.982 - 1.154
IP	2.792 - 3.016	1.258 - 1.262

4.3. Validity and Reliability

Tables 5 illustrate the results of our comprehensive statistical analysis of the data collected through the survey. This examination is crucial for validating and verifying the measurements of the constructs that are the focus of our research. We adhered to rigorous standards of validity and reliability in our analysis. To determine the suitability of individual items for their respective constructs, we utilized factor loadings of 0.7 or higher (Hair et al., 2021). We also evaluated the internal consistency of the constructs using Cronbach's alpha (CA) and Composite Reliability (CR), with a benchmark of 0.7 for adequate reliability (Lind et al., 2018). Additionally, we set the Average Variance Extracted (AVE) at a minimum threshold of 0.5 to ensure that each construct captures more variance among its items than due to measurement error (Ringle et al., 2020).

Table 5
Validity and Reliability

Construct	Items	Factor Loading Range	Cronbach's Alpha (CA)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Environmental Cost (EC)	EC1-4	0.933 - 0.965	0.968	0.968	0.911
Investment in Green Technologies	IGT1-4	0.874 - 0.935	0.924	0.926	0.815
Carbon Footprint (CF)	CF1-4	0.861 - 0.923	0.910	0.916	0.787
Resource Efficiency (RE)	RE1-4	0.888 - 0.954	0.967	0.968	0.938
Supplier Environmental Performance	SE1-4	0.868 - 0.914	0.907	0.911	0.782
Eco-Design Practices	EDP1-4	0.824 - 0.909	0.888	0.894	0.747
Reverse Logistics	RL1-4	0.876 - 0.919	0.918	0.924	0.802
Green Procurement	GP1-4	0.938 - 0.941	0.953	0.953	0.876
Compliance Costs	CC1-3	0.906 - 0.962	0.935	0.941	0.885
Regulatory Impact	RI1-3	0.964 - 0.972	0.967	0.968	0.938
Tariff and Non-tariff Barriers	TNB1-3	0.966 - 0.978	0.970	0.970	0.944
Economic Performance	EP1-3	0.944 - 0.947	0.941	0.941	0.894
Operational Performance	OP1-3	0.929 - 0.961	0.944	0.944	0.899
Market Performance	MP1-3	0.929 - 0.960	0.935	0.935	0.885
Innovation Performance	IP1-3	0.953 - 0.978	0.965	0.965	0.935

The data presented in Tables 5 demonstrate a robust factorial structure and internal consistency within our constructs. The strong factor loadings across the board suggest that the survey items were well formulated and resonated accurately from respondents' perspectives. The high CA and CR values, exceeding our 0.7 benchmark across most constructs, indicate a high level of reliability, confirming that our items consistently measure the constructs. The AVE values surpassing the 0.5 mark establish that our constructs have a satisfactory level of convergent validity.

4.4. Discriminant Validity

The Fornell-Larcker test was implemented to assess discriminant validity in this study (Hair et al., 2021). Several rounds of testing were conducted by eliminating specific items that met the criteria established by Fornell and Larcker.

Table 6
Fornell-Larcker

	CC	CF	EC	EDP	EP	GP	IGT	IP	MP	OP	RE	RI	RL	SE	TNB
CC	**0.975**														
CF	-0.015	**0.909**													
EC	-0.033	0.853	**0.955**												
EDP	-0.046	0.846	0.775	**0.907**											
EP	0.012	0.846	0.842	0.806	**0.945**										
GP	-0.037	0.755	0.830	0.729	0.846	**0.984**									
IGT	-0.044	0.857	0.857	0.819	0.834	0.752	**0.902**								
IP	0.953	-0.023	-0.034	-0.044	0.010	-0.033	-0.035	**0.967**							
MP	-0.025	0.875	0.864	0.837	0.923	0.864	0.857	-0.023	**0.941**						
OP	-0.005	0.820	0.841	0.758	0.914	0.867	0.823	0.004	0.934	**0.948**					
RE	0.045	0.851	0.886	0.794	0.890	0.836	0.849	0.039	0.921	0.905	**0.929**				
RI	0.886	-0.012	-0.055	-0.018	0.001	-0.058	-0.041	0.900	-0.034	-0.024	0.005	**0.969**			
RL	0.008	0.809	0.824	0.751	0.906	0.779	0.813	0.024	0.886	0.900	0.904	-0.001	**0.978**		
SE	-0.017	0.871	0.861	0.848	0.820	0.827	0.858	-0.003	0.862	0.848	0.868	0.005	0.809	**0.884**	
TNB	0.923	-0.011	-0.029	-0.041	0.002	-0.029	-0.039	0.934	-0.020	-0.012	0.035	0.940	0.017	0.001	**0.973**

In Table 6, it is evident that all the constructs in this study successfully fulfilled the prerequisites of the Fornell-Larcker test. During the test sequence, several items had to be eliminated, necessitating adjustments to the model. This was done to ensure that the constructs could proceed to the next stage of testing despite the deletion of certain items.

4.4. Structural Model

The bootstrapping technique depicted in Fig. 1 is highly effective in the context of PLS-SEM because of its ability to operate without assuming the normality of the data (Hair et al., 2019), thereby rendering it a dependable approach in situations characterized by limited sample sizes or when the normal distribution of the data cannot be presumed.

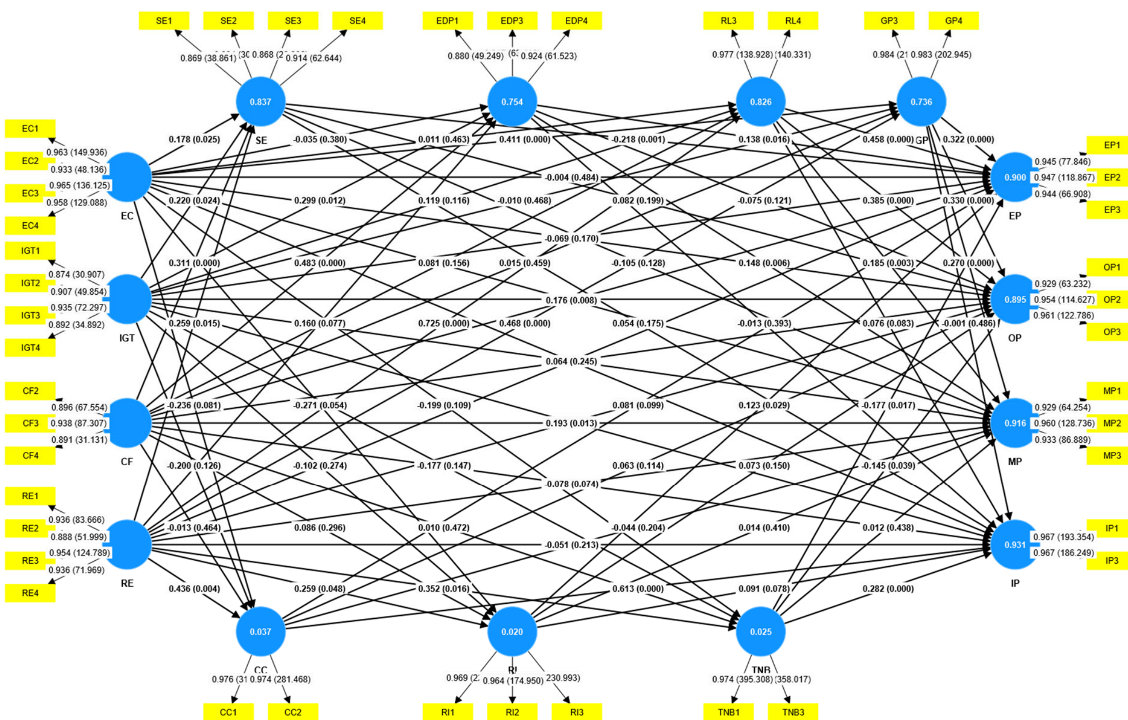

Fig. 1. Bootstrapping

This study provides path coefficients along with the corresponding t-values (in parentheses) to assess the statistical significance of the relationships. Significance levels are indicated by asterisks. The path coefficients in the original sample show the strength and direction of each relationship, and the t-values offer statistical support for these findings. Moreover, the R-squared values provide insight into the model's explanatory power, revealing how effectively the independent variables explain the variance in dependent variables. The adjusted R-squared values refined this insight by accounting for the number of predictors.

Table 7
Path Analysis of Environmental Accounting on GSCM

Path	SE	EDP	RL	GP
EC	0.178** (1.966)	-0.035 (0.954)	0.011 (0.094)	0.411*** (3.355)
IGT	0.220** (1.978)	0.299** (2.256)	0.119 (1.195)	-0.010 (0.080)
CF	0.311*** (3.513)	0.483*** (4.406)	0.081 (1.011)	0.015 (0.103)
RE	0.259** (2.160)	0.160* (1.423)	0.725*** (7.689)	0.468*** (3.708)
R-square	**0.837**	**0.754**	**0.826**	**0.736**
R-square adjusted	**0.834**	**0.748**	**0.822**	**0.730**

Table 7 shows the diverse impact of constructs such as Environmental Cost (EC), Investment in Green Technologies (IGT), Carbon Footprint (CF), and Resource Efficiency (RE) across various dimensions of Green Supply Chain Management (GSCM), namely Supplier Environmental Performance (SE), Eco-design Practices (EDP), Reverse Logistics (RL), and Green Procurement (GP). Notably, the analysis revealed the EC's significant positive influence on GP, emphasizing the critical role of environmental cost management in promoting sustainable procurement practices. Additionally, IGT's notable impact of IGT on EDP highlights the importance of green technological investment in enhancing eco-design initiatives. Moreover, the analysis demonstrated CF's pronounced effect of CF on EDP, underlining the crucial role of carbon management in sustainable product design. Most notably, RE's substantial contribution of RE to RL underscores resource efficiency as a cornerstone for optimizing reverse logistics, highlighting the multifaceted ways in which environmental accounting practices foster a more sustainable supply chain.

Table 8
Path Analysis of Environmental Accounting on Import Regulation

Path	CC	RI	TNB
EC	-0.240* (1.469)	-0.247* (1.525)	-0.196 (1.239)
IGT	-0.205 (1.244)	-0.069 (0.445)	-0.173 (1.098)
CF	-0.013 (0.089)	0.086 (0.535)	0.010 (0.070)
RE	0.436*** (2.693)	0.259** (1.665)	0.352** (2.150)
R-square	**0.037**	**0.018**	**0.025**
R-square adjusted	**0.021**	**0.002**	**0.009**

Table 8 examines the intricate relationship between environmental accounting practices and import regulation compliance within the health equipment industry by employing a path analysis that focuses on Environmental Cost (EC), Investment in Green Technologies (IGT), Carbon Footprint (CF), and Resource Efficiency (RE), as they pertain to Compliance Costs (CC), Regulatory Impact (RI), and Tariff and Non-tariff Barriers (TNB). EC displays a slight negative influence on CC and RI, as indicated by the path coefficients of -0.240 and -0.247, respectively, both of which are significant at the 0.1 level. This suggests that increased attention to environmental costs can slightly exacerbate the challenges of navigating compliance costs and regulatory impacts. Although IGT's influence of IGT is not statistically significant, it suggests a subtle negative relationship with CC and TNB, which implies that the complexities associated with green technologies may present challenges in regulatory contexts. Additionally, CF's minimal impact of CF across all three regulatory dimensions suggests that carbon management practices do not significantly alter the regulatory navigation landscape of a firm. RE demonstrates a substantial positive impact on all three regulatory dimensions, particularly with a coefficient of 0.436 on CC, which is statistically significant at the 0.01 level, emphasizing how resource efficiency can not only contribute to environmental objectives, but also alleviate the regulatory burden. The relatively low R-square values across CC, RI, and TNB suggest that although these environmental accounting practices influence import regulation compliance, they only account for a small portion of the variance, indicating that other factors can also play a significant role.

Table 9 provides an extensive path analysis that examines the collective influence of Environmental Accounting (EC, IGT, CF, RE), Green Supply Chain Management (GSCM) components (SE, EDP, RL, GP), and Import Regulation facets (CC, RI, TNB) on Firm Performance, which is divided into four categories: Economic Performance (EP), Operational Performance (OP), Market Performance (MP), and Innovation Performance (IP). The effects of the environmental accounting constructs on firm performance are complex. While CF displays a substantially positive impact on EP and MP, indicating that carbon footprint management can improve financial and market performance, EC's influence of EC is negligible in all performance dimensions. The components of GSCM exhibit varying levels of influence. Remarkably, Reverse Logistics (RL) has emerged as a robust predictor of all performance aspects, particularly Environmental Performance (EP) and Operational Performance (OP), underscoring the efficiency gains and competitive advantages derived from effective reverse logistics practices. Green Procurement (GP) also has a positive impact on EP, OP, and Market Performance (MP), emphasizing the value of sustainable procurement practices. Among the import regulation variables, Compliance Costs (CC) demonstrate a noteworthy positive impact on Innovation Performance (IP), suggesting that managing compliance costs can spur innovation. Tariff and Non-tariff Barriers (TNB) display a complex relationship that negatively affects EP and OP, but positively influences IP, indicating that navigating these barriers may catalyze innovative responses. The exceptionally high R-squared values across all firm performance dimensions demonstrate the model's strong explanatory power. These high values suggest that the variables comprehensively account for variance in firm performance outcomes.

Table 9
Path Analysis of Environmental Accounting, GSCM, and Import Regulation on Firm Performance

Path	EP	OP	MP	IP
EC	-0.004 (0.041)	-0.069 (0.954)	-0.051 (0.698)	-0.015 (0.262)
IGT	0.099 (1.213)	0.076 (0.910)	0.085 (1.083)	0.033 (0.594)
CF	0.176*** (2.411)	0.064 (0.690)	0.193** (2.225)	-0.078* (1.446)
RE	0.057 (0.614)	0.214*** (2.342)	0.311*** (3.640)	-0.051 (0.795)
SE	-0.218*** (3.007)	0.082 (0.844)	-0.105 (1.134)	0.054 (0.936)
EDP	0.138** (2.147)	-0.075 (1.170)	0.148*** (2.499)	-0.013 (0.271)
RL	0.458*** (4.598)	0.385*** (4.433)	0.185*** (2.791)	0.076* (1.388)
GP	0.322*** (4.783)	0.330*** (4.102)	0.270*** (4.195)	-0.001 (0.036)
CC	0.081* (1.288)	0.063 (1.207)	-0.044 (0.827)	0.613*** (12.298)
RI	0.123** (1.900)	0.073 (1.036)	0.014 (0.226)	0.091* (1.419)
TNB	-0.177** (2.120)	-0.145** (1.760)	0.012 (0.156)	0.282*** (3.559)
R-square	**0.900**	**0.895**	**0.916**	**0.931**
R-square adjusted	**0.894**	**0.889**	**0.911**	**0.927**

4.5. Discussion

The increasing accumulation of plastic waste in Indonesia poses a significant environmental challenge with far-reaching consequences, as revealed by Neo et al. (2021), Sari et al. (2022) and Vriend et al. (2021). The perils of this pervasive waste have been established, emphasizing the pollution of vital water and soil resources, threats to wildlife, and exacerbation of climate change, as argued by Gunaalan et al. (2020), Zhang et al. (2020), Blettler & Mitchell (2021), and Shen et al. (2020). The data provided by the InSWA (2023) and World Bank (2021) underline the urgency of strategic interventions. The escalating demand for healthcare, particularly in emerging economies, is likely to further drive the growth of the medical plastics market, which has already grappled with substantial environmental footprints (Grand View Research, 2019; Sastri, 2021; Modjarrad & Ebnesajjad, 2013; Sustainable Development Unit, 2017; Thompson et al., 2009). The promotion of a circular economy, as posited by Rizan et al. (2020), is a compelling alternative to the unsustainable linear economic model. The circular economy paradigm entails the reduction of plastic use, extension of the lifecycle of materials, and enhancement of resource utilization through the reuse and recycling of products. This transformative approach aligns with the principles of environmental accounting and is crucial for mitigating the challenges posed by plastic waste management in Indonesia (Kurniawan et al., 2022; Hahladakis et al., 2020; Payne et al., 2019).

Firms must navigate a complex regulatory landscape and modify their operations to minimize their environmental impact, an endeavor challenged by the limited influence of environmental costs (EC) on Compliance Costs (CC) and regulatory impacts (RI). The significant positive relationship between Resource Efficiency (RE) and all three regulatory dimensions (CC, RI, and TNB) is particularly noteworthy. This finding indicates that focusing on resource efficiency can alleviate some regulatory burdens, lending support to the idea that a circular economy is not only environmentally beneficial, but also advantageous for regulatory compliance and cost management. The study suggests that Green Supply Chain Management (GSCM) and adherence to Import Regulations are critical factors for firm performance. Reverse Logistics (RL) and Green Procurement (GP) have a substantial impact on Economic Performance (EP), Operational Performance (OP), and Market Performance (MP), emphasizing the importance of sustainable practices throughout the supply chain. Additionally, Compliance Costs (CC) exhibited a strong positive relationship with Innovation Performance (IP), indicating that managing the costs associated with import regulations can stimulate innovation within firms.

The transition to a circular economy model addresses not only environmental challenges but also creates economic opportunities such as reduced reliance on virgin materials, job creation in recycling, and innovation in sustainable product design (Cruz Sanchez et al., 2020). Businesses, particularly those in the healthcare sector, should adopt such a model to realign their operations with contemporary consumer preferences and the evolving regulatory landscape, ensuring long-term market viability and diminishing reputational risks (Ahmad et al., 2023; Santoso et al., 2022; Shah, Al-Ghazali, et al., 2023; Kevin van Langen et al., 2021; Demartini et al., 2023; Payne et al., 2019; Kumar et al., 2019; Goovaerts & Verbeek, 2018). Shifting to a circular economy model necessitates strategic planning and investment, as well as a commitment to long-term perspectives that recognize the benefits of sustainable practices (Urbinati et al., 2017).

5. Conclusion

The significance of environmental accounting, GSCM, and import regulations in the operational and strategic realms of Indonesia's health equipment industry cannot be overstated, particularly considering the intricate challenges posed by plastic waste management. This study provides compelling evidence that integrating environmental accounting practices, such as tracking environmental costs and investing in green technologies, directly enhances a firm's capacity to improve GSCM and effectively navigate import regulations. Moreover, the positive correlation between resource efficiency and various aspects of firm performance underscores the tangible benefits of adopting a circular economic model. In the face of environmental challenges and regulatory pressures, the measurement model employed in this study emerges as a valuable instrument for firms striving to evaluate and enhance their sustainability practices. The insights derived from this study can inform future initiatives geared toward minimizing the environmental impact, optimizing resource utilization, and bolstering firm performance. The robustness of the measurement model, substantiated through extensive validity and reliability assessments, guarantees its dependable application in comparable contexts in the future.

For organizations operating in the healthcare equipment sector and beyond, the insights from this study offer a basis for continuous improvement and innovation. By incorporating environmental accounting into their fundamental strategies, businesses can not only meet regulatory requirements, but also create value that aligns with the growing consciousness of consumers and stakeholders. Future research should build on these findings and examine how the incorporation of sustainable practices can be enhanced across various industrial sectors and regional locations. As Indonesia and other emerging economies face the escalating problem of plastic waste, the techniques and models validated in this study provide a reproducible framework for evaluating and enhancing environmental performance, highlighting the critical balance between economic growth and environmental stewardship.

References

Ahmad, M., Kuldasheva, Z., Nasriddinov, F., Balbaa, M. E., & Fahlevi, M. (2023). Is achieving environmental sustainability dependent on information communication technology and globalization? Evidence from selected OECD countries. *Environmental Technology and Innovation*, *31*. Scopus. https://doi.org/10.1016/j.eti.2023.103178

Anderson, J. E., & van Wincoop, E. (2004). Trade Costs. *Journal of Economic Literature*, *42*(3), 691–751. https://doi.org/10.1257/0022051042177649

Awad, J., & Martín-Rojas, R. (n.d.). Enhancing social responsibility and resilience through entrepreneurship and digital environment. *Corporate Social Responsibility and Environmental Management*, *n/a*(n/a). https://doi.org/10.1002/csr.2655

Blettler, M. C. M., & Mitchell, C. (2021). Dangerous traps: Macroplastic encounters affecting freshwater and terrestrial wildlife. *Science of The Total Environment*, *798*, 149317. https://doi.org/10.1016/j.scitotenv.2021.149317

Cowan, E., Booth, A. M., Misund, A., Klun, K., Rotter, A., & Tiller, R. (2021). Single-Use Plastic Bans: Exploring Stakeholder Perspectives on Best Practices for Reducing Plastic Pollution. *Environments*, *8*(8), Article 8. https://doi.org/10.3390/environments8080081

Cruz Sanchez, F. A., Boudaoud, H., Camargo, M., & Pearce, J. M. (2020). Plastic recycling in additive manufacturing: A systematic literature review and opportunities for the circular economy. *Journal of Cleaner Production*, *264*, 121602. https://doi.org/10.1016/j.jclepro.2020.121602

Demartini, M., Ferrari, M., Govindan, K., & Tonelli, F. (2023). The transition to electric vehicles and a net zero economy: A model based on circular economy, stakeholder theory, and system thinking approach. *Journal of Cleaner Production*, *410*, 137031. https://doi.org/10.1016/j.jclepro.2023.137031

Dutta, S., Narasimhan, O., & Rajiv, S. (2005). Conceptualizing and measuring capabilities: Methodology and empirical application. *Strategic Management Journal*, *26*(3), 277–285.

Fahlevi, M., Ahmad, M., Balbaa, M. E., Wu, T., & Aljuaid, M. (2023). The efficiency of petroleum and government health services to benefit life expectancy during the inefficiencies of hydroelectricity consumption. *Environmental and Sustainability Indicators*, *19*, 100289. https://doi.org/10.1016/j.indic.2023.100289

Fahlevi, M., Hasan, F., & Islam, M. R. (2023). Exploring consumer attitudes and purchase intentions: Unraveling key influencers in China's green agricultural products market. *Corporate and Business Strategy Review*, *4*(3), 74–87. https://doi.org/10.22495/cbsrv4i3art8

Fahlevi, M., Moeljadi, M., Aisjah, S., & Djazuli, A. (2023). Assessing the Sustainability of Firm Value: The Impact of Board Composition, Firm Size, and Earnings Manipulation in the LQ45 Index. *E3S Web of Conferences*, *426*, 02042. https://doi.org/10.1051/e3sconf/202342602042

Fossi, M. C., Vlachogianni, T., Galgani, F., Innocenti, F. D., Zampetti, G., & Leone, G. (2020). Assessing and mitigating the harmful effects of plastic pollution: The collective multi-stakeholder driven Euro-Mediterranean response. *Ocean & Coastal Management*, *184*, 105005. https://doi.org/10.1016/j.ocecoaman.2019.105005

Global Reporting Initiative. (2011). *Sustainability Reporting Guidelines, Version 3.1*. Global Reporting Initiative.

Goovaerts, L., & Verbeek, A. (2018). Sustainable Banking: Finance in the Circular Economy. In F. Flachenecker & J. Rentschler (Eds.), *Investing in Resource Efficiency: The Economics and Politics of Financing the Resource Transition* (pp. 191–209). Springer International Publishing. https://doi.org/10.1007/978-3-319-78867-8_9

Grand View Research. (2019). *Medical Plastics Market Size, Share & Growth Report, 2030*. https://www.grandviewresearch.com/industry-analysis/medical-plastics-market

Gunaalan, K., Fabbri, E., & Capolupo, M. (2020). The hidden threat of plastic leachates: A critical review on their impacts on aquatic organisms. *Water Research*, *184*, 116170. https://doi.org/10.1016/j.watres.2020.116170

Hahladakis, J. N., Iacovidou, E., & Gerassimidou, S. (2020). Chapter 19—Plastic waste in a circular economy. In T. M. Letcher (Ed.), *Plastic Waste and Recycling* (pp. 481–512). Academic Press. https://doi.org/10.1016/B978-0-12-817880-5.00019-0

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)* (3rd ed.). Sage publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*.

Indonesia Solid Waste Association (InSWA). (2023, December 5). Plastic Waste Phenomenon in Indonesia. *InSWA*. https://inswa.or.id/fenomena-sampah-plastik-di-indonesia/

International Federation of Accountants (Ed.). (2005). *Environmental management accounting: International guidance document*. International Federation of Accountants.

Kang, H. (2021). Sample size determination and power analysis using the G*Power software. *Journal of Educational Evaluation for Health Professions*, *18*. https://doi.org/10.3352/jeehp.2021.18.17

Kazancoglu, Y., Kazancoglu, I., & Sagnak, M. (2018). A new holistic conceptual framework for green supply chain management performance assessment based on circular economy. *Journal of Cleaner Production*, *195*, 1282–1299. https://doi.org/10.1016/j.jclepro.2018.06.015

Kevin van Langen, S., Vassillo, C., Ghisellini, P., Restaino, D., Passaro, R., & Ulgiati, S. (2021). Promoting circular economy transition: A study about perceptions and awareness by different stakeholders groups. *Journal of Cleaner Production*, *316*, 128166. https://doi.org/10.1016/j.jclepro.2021.128166

King, A. A., & Lenox, M. J. (2001). Lean and Green? An Empirical Examination of the Relationship Between Lean Production and Environmental Performance. *Production and Operations Management*, *10*(3), 244–256. https://doi.org/10.1111/j.1937-5956.2001.tb00373.x

Kumar, V., Sezersan, I., Garza-Reyes, J. A., Gonzalez, E. D. R. S., & AL-Shboul, M. A. (2019). Circular economy in the manufacturing sector: Benefits, opportunities and barriers. *Management Decision*, *57*(4), 1067–1086. https://doi.org/10.1108/MD-09-2018-1070

Kurniawan, T. A., Dzarfan Othman, M. H., Hwang, G. H., & Gikas, P. (2022). Unlocking digital technologies for waste recycling in Industry 4.0 era: A transformation towards a digitalization-based circular economy in Indonesia. *Journal of Cleaner Production*, *357*, 131911. https://doi.org/10.1016/j.jclepro.2022.131911

Larrinaga, C., & Garcia-Torea, N. (2022). An ecological critique of accounting: The circular economy and COVID-19. *Critical Perspectives on Accounting*, *82*, 102320. https://doi.org/10.1016/j.cpa.2021.102320

Lind, D. A., Marchal, W. G., & Wathen, S. A. (2018). *Statistical Techniques in Business & Economics* (17th ed., p. 897). McGraw Hill Education.

Liu, J., Feng, Y., Zhu, Q., & Sarkis, J. (2018). Green supply chain management and the circular economy: Reviewing theory for advancement of both fields. *International Journal of Physical Distribution & Logistics Management*, *48*(8), 794–817. https://doi.org/10.1108/IJPDLM-01-2017-0049

Looi Kee, H., Nicita, A., & Olarreaga, M. (2009). Estimating Trade Restrictiveness Indices. *The Economic Journal*, *119*(534), 172–199. https://doi.org/10.1111/j.1468-0297.2008.02209.x

Maskuroh, N., Widyanty, W., Nurhidajat, R., Wardhana, I. W., & Fahlevi, M. (2023). Green human resource management and green supply Chain Management on Sustainable performance of nickel mining companies in Indonesia. *Uncertain Supply Chain Management*, *11*(1), 203–212. Scopus. https://doi.org/10.5267/j.uscm.2022.10.006

Modjarrad, K., & Ebnesajjad, S. (2013). *Handbook of polymer applications in medicine and medical devices*. Elsevier.

Molina, A. & Rajagopal. (2023). People, Planet, and Profit: Crossing the Triple Bottom Line. In A. Molina & Rajagopal (Eds.), *Challenge-Based Learning, Research, and Innovation: Leveraging Industry, Government, and Society* (pp. 35–65). Springer International Publishing. https://doi.org/10.1007/978-3-031-29156-2_2

Mushtaq, M., Ahmed, S., Fahlevi, M., Aljuaid, M., & Saniuk, S. (2022). Globalization and employment nexus: Moderating role of human capital. *PLoS ONE*, *17*(10 October). Scopus. https://doi.org/10.1371/journal.pone.0276431

Neo, E. R. K., Soo, G. C. Y., Tan, D. Z. L., Cady, K., Tong, K. T., & Low, J. S. C. (2021). Life cycle assessment of plastic waste end-of-life for India and Indonesia. *Resources, Conservation and Recycling*, *174*, 105774. https://doi.org/10.1016/j.resconrec.2021.105774

Orlitzky, M., Schmidt, F. L., & Rynes, S. L. (2003). Corporate Social and Financial Performance: A Meta-Analysis. *Organization Studies*, *24*(3), 403–441. https://doi.org/10.1177/0170840603024003910

Pathak, G., Nichter, M., Hardon, A., Moyer, E., Latkar, A., Simbaya, J., Pakasi, D., Taqueban, E., & Love, J. (2023). Plastic pollution and the open burning of plastic wastes. *Global Environmental Change*, *80*, 102648. https://doi.org/10.1016/j.gloenvcha.2023.102648

Payne, J., McKeown, P., & Jones, M. D. (2019). A circular economy approach to plastic waste. *Polymer Degradation and Stability*, *165*, 170–181. https://doi.org/10.1016/j.polymdegradstab.2019.05.014

Qu, S., Guo, Y., Ma, Z., Chen, W.-Q., Liu, J., Liu, G., Wang, Y., & Xu, M. (2019). Implications of China's foreign waste ban on the global circular economy. *Resources, Conservation and Recycling*, *144*, 252–255. https://doi.org/10.1016/j.resconrec.2019.01.004

Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2020). Partial least squares structural equation modeling in HRM research. *The International Journal of Human Resource Management*, *31*(12), 1617–1643.

Rizan, C., Mortimer, F., Stancliffe, R., & Bhutta, M. F. (2020). Plastics in healthcare: Time for a re-evaluation. *Journal of the Royal Society of Medicine*, *113*(2), 49–53. https://doi.org/10.1177/0141076819890554

Santoso, S., Widyanty, W., Nurhidajat, R., Ramadhani Marfatah, M., Mahmud, G., Fahlevi, M., Aljuaid, M., Zhghenti, T., & Shahid, D. (2022). System dynamics modeling for developing an agrotourism-creative economy in the framework of the village innovation system. *Frontiers in Environmental Science*, *10*, 962235.

Sari, M. M., Andarani, P., Notodarmojo, S., Harryes, R. K., Nguyen, M. N., Yokota, K., & Inoue, T. (2022). Plastic pollution in the surface water in Jakarta, Indonesia. *Marine Pollution Bulletin*, *182*, 114023. https://doi.org/10.1016/j.marpolbul.2022.114023

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2017). Partial least squares structural equation modeling. *Handbook of Market Research*, *26*(1), 1–40.

Sastri, V. R. (2021). *Plastics in medical devices: Properties, requirements, and applications*. William Andrew.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students* (5th ed.). Prentice Hall.

Scarpellini, S., Marín-Vinuesa, L. M., Aranda-Usón, A., & Portillo-Tarragona, P. (2020). Dynamic capabilities and environmental accounting for the circular economy in businesses. *Sustainability Accounting, Management and Policy Journal*, *11*(7), 1129–1158. https://doi.org/10.1108/SAMPJ-04-2019-0150

Sen, S., & Bhattacharya, C. B. (2001). Does Doing Good Always Lead to Doing Better? Consumer Reactions to Corporate Social Responsibility. *Journal of Marketing Research*, *38*(2), 225–243. https://doi.org/10.1509/jmkr.38.2.225.18838

Shah, S. H. A., Al-Ghazali, B. M., Bhatti, S., Aman, N., Fahlevi, M., Aljuaid, M., & Hasan, F. (2023). The Impact of Perceived CSR on Employees' Pro-Environmental Behaviors: The Mediating Effects of Environmental Consciousness and Environmental Commitment. *Sustainability*, *15*(5), Article 5. https://doi.org/10.3390/su15054350

Shah, S. H. A., Fahlevi, M., Jamshed, K., Aman, N., Rafiq, N., Jermsittiparsert, K., & Aljuaid, M. (2023). Sustaining the Earth: Unraveling the Synergy of Workplace Spirituality, Responsible Leadership, and Pro-Environmental Behavior in Pakistan’s SMEs. *Psychology Research and Behavior Management*, *16*, 3075–3093. https://doi.org/10.2147/PRBM.S413606

Shen, M., Huang, W., Chen, M., Song, B., Zeng, G., & Zhang, Y. (2020). (Micro)plastic crisis: Un-ignorable contribution to global greenhouse gas emissions and climate change. *Journal of Cleaner Production*, *254*, 120138. https://doi.org/10.1016/j.jclepro.2020.120138

Solovida, G. T., & Latan, H. (2021). Achieving triple bottom line performance: Highlighting the role of social capabilities and environmental management accounting. *Management of Environmental Quality: An International Journal*, *32*(3), 596–611. https://doi.org/10.1108/MEQ-09-2020-0202

Sustainable Development Unit. (2017). *Home*. SDU Health And Medical Medico-Legal Report Guide. https://www.sduhealth.org.uk/

Syberg, K., Nielsen, M. B., Westergaard Clausen, L. P., van Calster, G., van Wezel, A., Rochman, C., Koelmans, A. A., Cronin, R., Pahl, S., & Hansen, S. F. (2021). Regulation of plastic from a circular economy perspective. *Current Opinion in Green and Sustainable Chemistry*, *29*, 100462. https://doi.org/10.1016/j.cogsc.2021.100462

Tate, W. L., & Bals, L. (2018). Achieving Shared Triple Bottom Line (TBL) Value Creation: Toward a Social Resource-Based View (SRBV) of the Firm. *Journal of Business Ethics*, *152*(3), 803–826. https://doi.org/10.1007/s10551-016-3344-y

Thompson, R. C., Moore, C. J., vom Saal, F. S., & Swan, S. H. (2009). Plastics, the environment and human health: Current consensus and future trends. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 2153–2166. https://doi.org/10.1098/rstb.2009.0053

Urbinati, A., Chiaroni, D., & Chiesa, V. (2017). Towards a new taxonomy of circular economy business models. *Journal of Cleaner Production*, *168*, 487–498. https://doi.org/10.1016/j.jclepro.2017.09.047

Van Eygen, E., Laner, D., & Fellner, J. (2018). Circular economy of plastic packaging: Current practice and perspectives in Austria. *Waste Management*, *72*, 55–64. https://doi.org/10.1016/j.wasman.2017.11.040

Vriend, P., Hidayat, H., van Leeuwen, J., Cordova, M. R., Purba, N. P., Löhr, A. J., Faizal, I., Ningsih, N. S., Agustina, K., Husrin, S., Suryono, D. D., Hantoro, I., Widianarko, B., Lestari, P., Vermeulen, B., & van Emmerik, T. (2021). Plastic Pollution Research in Indonesia: State of Science and Future Research Directions to Reduce Impacts. *Frontiers in Environmental Science*, *9*. https://doi.org/10.3389/fenvs.2021.692907

Watto, W. A., Fahlevi, M., Mehmood, S., Asdullah, M. A., & Juhandi, N. (2023). Executive compensation: A justified reward or a mis-fortune, an empirical analysis of banks in Pakistan. *Journal of Open Innovation: Technology, Market, and Complexity*, *9*(3), 100092. https://doi.org/10.1016/j.joitmc.2023.100092

Wiedmann, T., & Lenzen, M. (2008). Unravelling the Impacts of Supply Chains—A New Triple-Bottom-Line Accounting Approach and Software Tool. In S. Schaltegger, M. Bennett, R. L. Burritt, & C. Jasch (Eds.), *Environmental Management Accounting for Cleaner Production* (pp. 65–90). Springer Netherlands. https://doi.org/10.1007/978-1-4020-8913-8_4

World Bank. (2021). *Plastic Waste Discharges from Rivers and Coastlines in Indonesia* [Text/HTML]. World Bank. https://www.worldbank.org/en/country/indonesia/publication/plastic-waste-discharges-from-rivers-and-coastlines-in-indonesia

Zhang, D., Ng, E. L., Hu, W., Wang, H., Galaviz, P., Yang, H., Sun, W., Li, C., Ma, X., Fu, B., Zhao, P., Zhang, F., Jin, S., Zhou, M., Du, L., Peng, C., Zhang, X., Xu, Z., Xi, B., … Liu, H. (2020). Plastic pollution in croplands threatens long-term food security. *Global Change Biology*, *26*(6), 3356–3367. https://doi.org/10.1111/gcb.15043

Zhu, Q., Sarkis, J., & Lai, K. (2013). Institutional-based antecedents and performance outcomes of internal and external green supply chain management practices. *Journal of Purchasing and Supply Management*, *19*(2), 106–117. https://doi.org/10.1016/j.pursup.2012.12.001

Appendix

Constructs	Items	Statement
Environmental Cost	EC1	Our organization regularly identifies and tracks the costs associated with environmental management and compliance
	EC2	We have a detailed breakdown of costs related to waste disposal, emissions, and pollution control
	EC3	The environmental costs are factored into our product pricing and budgeting processes
	EC4	Strategies to reduce environmental costs are a key part of our environmental policy
Investment in Green Technologies	IGT1	Our organization actively invests in green technologies to reduce environmental impact
	IGT2	Investments in sustainable materials and energy-efficient equipment are prioritized in our budget
	IGT3	We regularly assess the return on investment (ROI) of our green technology investments
	IGT4	Our investment in green technologies has increased over the past five years
Carbon Footprint	CF1	We regularly calculate our organization's carbon footprint to monitor our environmental impact
	CF2	Actions are taken to reduce our carbon footprint, based on periodic assessments
	CF3	Our organization sets specific targets for carbon footprint reduction
	CF4	Employee awareness programs are in place to educate about the importance of reducing our carbon footprint
Resource Efficiency	RE1	Resource efficiency is monitored through specific metrics and key performance indicators (KPIs)
	RE2	Improvements in resource efficiency have led to cost savings for our organization
	RE3	We engage in practices such as recycling, reusing, and reducing materials to enhance resource efficiency
	RE4	Our organization has policies to purchase energy-efficient equipment and utilize renewable energy sources

Constructs	Items	Statement
Supplier Environmental Performance	SE1	Our suppliers are required to comply with specific environmental sustainability standards
	SE2	We regularly evaluate our suppliers' environmental performance through audits or assessments
	SE3	Environmental sustainability is a critical criterion in our supplier selection process
	SE4	We actively collaborate with our suppliers to improve their environmental performance
Eco-design Practices	EDP1	Environmental considerations are integrated into the product design process from the beginning
	EDP2	We assess the environmental impact of our products at each stage of their life cycle
	EDP3	Our product design strategies prioritize the use of recycled or renewable materials
	EDP4	We aim to design products that are easy to disassemble for recycling or disposal
Reverse Logistics	RL1	Our organization has an efficient system for managing product returns, recycling, and waste handling
	RL2	We encourage customers to return used products for recycling or proper disposal
	RL3	Reverse logistics operations are optimized to minimize environmental impact
	RL4	We measure the effectiveness of our reverse logistics by tracking key performance indicators related to environmental sustainability
Green Procurement	GP1	Purchasing decisions within our organization prioritize eco-friendly materials and suppliers
	GP2	We have policies in place that specify environmental requirements for our purchases
	GP3	The environmental impact of products and materials is a significant factor in our procurement process
	GP4	We engage in partnerships with our suppliers to develop greener supply chains

Constructs	Items	Statement
Compliance Costs	CC1	Our organization incurs significant expenses to comply with import regulations and standards
	CC2	The cost of meeting import regulatory requirements has increased over the past yea
	CC3	Investments in compliance with import regulations significantly impact our financial planning
Regulatory Impact	RI1	Import regulations have required us to adjust our supply chain operations substantially
	RI2	Our sourcing decisions are heavily influenced by existing import regulations
	RI3	Market entry strategies are designed with careful consideration of import regulations
Tariff and Non-tariff Barriers	TNB1	Tariff barriers significantly affect our strategy for importing recycled materials or products
	TNB2	Non-tariff barriers pose a challenge to our import operations, affecting the cost and time of transactions
	TNB3	Our organization actively monitors changes in tariff and non-tariff barriers to mitigate potential impacts on our business

Constructs	Items	Statement
Economic Performance	EP1	Our organization has seen a steady growth in revenue over the past year
	EP2	We have successfully implemented cost-saving measures that have positively impacted our profit margins
	EP3	Investments in sustainable practices have led to financial benefits for our company
Operational Performance	OP1	Our production processes have become more efficient, leading to higher yields
	OP2	We have made significant strides in reducing waste in our operations
	OP3	Continuous process optimization has enhanced our operational efficiency
Market Performance	MP1	Our market share has increased as a result of our commitment to sustainability
	MP2	Customer satisfaction levels have improved due to our sustainable products and practices
	MP3	Our organization's reputation for sustainability has positively impacted our brand image
Innovation Performance	IP1	We regularly introduce new products that incorporate sustainable materials and technologies
	IP2	Our innovation in sustainability practices has given us a competitive edge in the market
	IP3	Investment in research and development for sustainability has increased in the last year