

Corporate sustainability and environmental management in the customs sector of Callao: towards a model of responsible profitability

Sostenibilidad empresarial y gestión ambiental en el sector aduanero del Callao: hacia un modelo de rentabilidad responsable

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ABSTRACT

This article seeks to address the association between corporate sustainability and self-assessment of environmental management in micro and small enterprises in the customs sector in the Constitutional Province of Callao, Peru. Based on applied, quantitative, non-experimental, cross-sectional research, the article analyzes business practices associated with economic, social, and environmental sustainability, as well as the dimensions of environmental management: policies, awareness, and environmental impact. The results, analyzed statistically using the chi-square test, showed that there is a significant association between the two variables, demonstrating that companies with sustainable criteria in their management model are more efficient in their operations, have a better corporate image, and reduce their costs. In a world with increasing pollution and greater legislative pressure, the report highlights the need to strengthen sustainable business models as a form of ethical and competitive profitability. These results reaffirm the commitment of Callao companies to the 2030 Agenda and the Sustainable Development Goals, particularly those related to decent work and responsible production and climate action.

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RESUMEN

Mediante el presente artículo se busca abordar la asociación entre la sostenibilidad corporativa y la autoevaluación de la gestión ambiental en las micro y pequeñas empresas del sector aduanero en la Provincia Constitucional del Callao, Perú. A partir de una investigación aplicada, cuantitativa, no experimental, de corte transversal, se analizan las prácticas empresariales asociadas con la sostenibilidad económica, social y ambiental, y las dimensiones de gestión ambiental: políticas, conciencia e impacto ambiental. Los resultados, analizados estadísticamente con la prueba de Chi-cuadrado, mostraron que existe una asociación significativa entre las dos variables, lo que demuestra que las empresas con criterios sostenibles en su modelo de gestión son más eficientes en sus operaciones, tienen mejor imagen corporativa y reducen sus costos. En un mundo con creciente contaminación y mayor presión legislativa, el informe destaca la necesidad de fortalecer modelos de negocio sostenibles como forma de rentabilidad ética y competitiva. Estos resultados reafirman el compromiso de las empresas del Callao con la Agenda 2030 y los Objetivos de Desarrollo Sostenible, particularmente aquellos vinculados con trabajo decente y producción responsable y por el clima.

Palabras clave: sostenibilidad empresarial, gestión ambiental, políticas ambientales, conciencia ambiental, impacto ambiental.

INTRODUCTION

Corporate sustainability must be embraced as a strategic and ethical decision, capable of balancing economic, social, and environmental aspects to ensure the continuity of organizations over time. This requirement takes on greater relevance in the 21st century, when business practices still persist that act as if natural resources were inexhaustible and environmental care could be postponed without consequences. In a scenario where markets, consumers, and regulations demand greater responsibility,

incorporating sustainability is no longer a voluntary alternative but rather an indispensable condition that sustains trust, competitiveness, and organizational permanence. As Plua et al. (2022) warn, the ecological crisis and social pressure for responsible economic models are forcing companies to truly integrate economic, social, and environmental considerations, adopting a vision that transcends the pursuit of immediate profit and commits organizations to the society and environment on which they depend.

The absence of sound environmental management reveals a structural weakness in business decision-making, as it is not only a matter of complying with regulatory requirements, but also of adopting a planned and systematic strategy aimed at conserving resources, preventing impacts, and ensuring the sustainability of the environment. When environmental management is truly integrated into operations, it becomes a smart investment that reduces costs, increases productivity, avoids penalties, strengthens workplace safety, and improves both corporate image and organizational competitiveness. As Vidal and Asuaga (2021) argue, its benefits are not only environmental, but clearly economic and social, demonstrating that corporate sustainability is not an additional cost, but a strategic way to ensure continuity, efficiency, and responsibility over time.

With this global magnitude, the data show that environmental damage is concentrated in a few companies. According to the Ambiental portal (2020), only 100 large companies are responsible for 71% of global pollution. According to López (2021), around 32% of companies destroy environmental value and a quarter of their rejected income. This not only affects profitability but also exacerbates environmental liabilities, subjecting companies to greater reputational and financial risks. According to Freiberg et al. (2021), they confirmed this position by calculating that the environmental damage allowed can exceed operating profits by up to 117% and more than 800% in complex sectors such as construction and airlines. These data demonstrate the size of the externalities to which organizations that do not incorporate sustainable practices into their business model are exposed.

Romero's report (2022) adds evidence in this direction: 60% of large companies increased their carbon dioxide emissions even during periods of climate emergency. This attitude demonstrates the disconnect between public sustainability commitments and their implementation. However, progress made by the Global Compact (2022) indicates that 94% of Spanish companies that joined the SDGs obtained direct financial benefits thanks to sustainable practices. But only 41% had an established policy and only 18% had a dedicated space. The disconnect between commitment and action is one of the biggest challenges for corporate sustainability today.

In Latin America, corporate sustainability faces structural obstacles related to fossil fuel consumption, inequality, and a lack of productive sophistication (Moscoso et al., 2023). However, examples such as Tequila Herradura in Mexico and La Huerta de Rosita in Colombia show that adopting sustainable practices can reduce costs, improve brand

image, and attract responsible investment (BBVA, 2024). In the region, SMEs, which represent 99.5% of the business fabric, already view sustainability as a prerequisite for accessing competitive markets and more solid ethical financing (United Nations, as cited in BBVA, 2024). In Peru, interest in corporate sustainability has been growing in recent years. According to Centrum PUCP (2021), local companies' commitment to sustainability increased after the pandemic in occupational health, ethics, waste, and the circular economy. In 2023, Panizo (2023) reported that 85% of large companies published sustainability reports, but only 45% took real environmental measures. This progress focuses on large companies; however, micro, small, and medium-sized enterprises (MSMEs) still face challenges related to informality, access to financing, and lack of technical capacity (Rojas, 2024).

In the Province of Callao, these barriers are multiplied. In a territory where air and soil pollution has exceeded permissible limits, with up to 35 times more lead in the air than internationally permitted, and dangerous levels of cadmium and arsenic in more than 40% of the territory (Rozas, 2023). This situation not only creates an environmental risk, but also an operational and reputational risk for companies located in the area, particularly those related to logistics and customs. Therefore, companies must develop environmental management strategies to reduce negative impacts and improve sustainability.

The purpose is to establish the influence of corporate sustainability on the self-assessment of environmental management in companies in Callao, within the framework of Sustainable Development Goals 7, 8, 11, 12, and 13: clean energy, decent work, sustainable cities, responsible production, and climate action. The objective is to provide empirical evidence to strengthen sustainable business models in areas susceptible to environmental pollution.

In addition, the study seeks to contribute to the academic discussion on responsible profitability and sustainable competitiveness in emerging Latin American economies.

Corporate sustainability as part of environmental management implies recognizing that competitiveness no longer depends on financial or technological capital, but on a commitment to the environment and society. As a port and industrial city, Callao is the perfect place to analyze how companies can integrate profitability with environmental conservation. In this context, the research presented here seeks to critically analyze the progress, challenges, and opportunities that the local business sector has for building a sustainable economy.

Conceptual approaches to corporate sustainability

Corporate sustainability has evolved with the historical events of current environmental thinking. According to Montoya, García, and Vélez (2022), this paradigm was consolidated with global frameworks such as the Stockholm Conference in 1972, the Kyoto Protocol in 1997, and the accession to the United Nations Global Compact in 2015. These cases were the starting points for developing global awareness of corporate social and environmental responsibility. Corporate sustainability seeks to

integrate social and environmental well-being and long-term economic viability so that companies can meet their current needs without compromising those of future generations (Carbajal et al., 2024).

In line with Elkington's (1999) approach, revisited by Fernández and Jambrina (2022), they proposed the triple bottom line model, which encompasses three dimensions: economic, social, and environmental. This model suggests that business success should not be measured solely by profits, but also by its positive impact on human and environmental development. In this sense, corporate sustainability transcends corporate social responsibility to become a strategic management tool. And this is how the balance of the three dimensions creates the basis for sustainable competitive advantages.

As an extension, Barcellos de Paula (2010, as cited in Montoya et al., 2022) defines it as a practice with objectives of social inclusion and efficient use of natural resources. In the same context, we know that Dyllick and Hockerts (2002, as cited in Carbajal et al., 2024) indicate that institutional sustainability involves integrating conscious methods into commercial activities to contribute to collective well-being and resilience within institutions. Thus, sustainability is not an expense or a legal responsibility, but rather a strategic investment that strengthens the reputation, profitability, and survival of the company.

Economic dimension.

Economic sustainability is the ability of companies to ensure their financial viability over time, incorporating criteria of efficiency and social responsibility. Silva (2021) states that this dimension consists of generating profits without separating oneself from the environment or business ethics. For their part, Macías, Díaz, and Delgado (2022) point out that economic sustainability is a transdisciplinary concept based on the balance between economic performance, the efficient use of natural resources, and social acceptance of productive activity. Therefore, economically sustainable management involves financial control mechanisms without sacrificing environmental and social commitments.

Social dimension.

Social sustainability is aimed at strengthening labor relations, equity, and community cohesion. Vallance, Perkins, and Dixon (2011) identify three levels of sustainability: development sustainability, which seeks to satisfy basic needs and equity; bridge sustainability, which induces behavioral changes in favor of the environment; and maintenance sustainability, which aims to preserve cultural values in the face of change processes. Complementarily, Vázquez (2020) indicates that this dimension promotes intergenerational justice by generating decent, inclusive, and participatory working conditions in the sociocultural life of the communities in which companies operate. In summary, the social aspect of sustainability aims to create fair development that goes beyond immediate economic benefit.

Environmental dimension.

Environmental sustainability is a commitment to the conservation of ecosystems. Vásquez (2020), citing Gallopín (2003), conceives it as a principle that recognizes nature as a value in itself and seeks to balance human needs with the ecological limits of the planet. Ferrero and Pérez (2022), citing Nogueira (2012), add that it is necessary to avoid pollution and exploit natural resources rationally. On the other hand, Reyes (2023) indicates that environmental sustainability seeks to ensure that human activities can continue indefinitely without depleting future resources. In this way, environmental management is integrated into the company's strategy and is not merely a compliance procedure.

Fundamentals of corporate environmental management

Environmental management is the integrated set of policies, strategies, and actions to minimize the ecological impacts of business activity. Proactive environmental strategies, supported by dynamic capabilities, achieve sustainable competitive advantages by incorporating social, economic, and ecological aspects into their management model, according to Mojica-Macías, Ortiz-Moreno, and Gnecco-Lizcano (2019). Melo and Rey (2023) take a similar approach, indicating that modern environmental management involves administrative and social processes to prevent negative impacts on the environment and generate corporate responsibility.

Salazar, Zapata, and Orrego (2024) add that the establishment of environmental control structures is a strategy for continuous improvement that integrates environmental objectives with economic results, strengthening competitiveness and business ethics. Therefore, environmental management should not be limited to regulatory compliance, but should be integrated across the board, innovating, training, and being efficient in the use of resources. In this context, environmental sustainability is a determining factor in organizational profitability, especially in productive contexts exposed to increasing regulatory and social pressures.

The specialized literature recognizes three fundamental dimensions of environmental management: environmental policies, environmental awareness, and environmental impact.

According to the Brundtland Report (1987, cited in Conte and D'Elia, 2008), environmental policies are a pillar of sustainable development, integrating social welfare, economic growth, and ecological conservation. As Díaz (2021) points out, citing Capella (2016), these policies aim to ensure fair access to common goods—water, air, or food—and reinforce the interdependence between humans and ecosystems. Thus, environmental strategies must be configured as planning policies that guide business action toward total sustainability, combining external regulation with ethical self-regulation.

Palomino, Nima, Huallapuma, and Sifuentes (2022) point out that environmental awareness is the set of internalized knowledge, attitudes, and values that allow us to

understand environmental issues and behave responsibly in relation to them. This awareness, put into practice in the workplace, manifests itself in sustainable behaviors and daily practices that reduce the environmental footprint of organizations. Therefore, raising awareness among employees is an essential condition for any environmental management system.

Jerak-Zuiderent (2018) proposes that understanding the ecological footprint implies an ethical and collective awareness that transforms production habits. Espinoza et al. (2021) define this impact as any positive or negative change in the environment resulting from the organization's actions, which is why continuous measurement will prevent negative impacts in the future. The assessment of environmental impacts is, therefore, a governance tool that directs business actions towards operational sustainability.

The relationship between corporate sustainability and environmental management is based on the fact that a sustainable company is one that integrates its economic objectives with environmental conservation. The literature shows that environmental management has a positive influence on profitability, productivity, and institutional image (Gómez et al., 2024; García et al., 2024). According to Alghababsheh et al. (2022), integrating ecological criteria into the value chain improves efficiency and reduces waste, establishing more robust operational performance. These results reaffirm that strategically integrated sustainability is a driver of innovation and value creation for companies.

MATERIAL Y METHOD

The study took a quantitative and practical approach, using the collection and analysis of numerical data to identify relevant relationships between corporate sustainability factors and environmental management. According to Hernández, Fernández, and Baptista (2014), applied research seeks to generate knowledge applicable to real situations, without proposing new theories, but rather strengthening practical decision-making in specific situations. In this sense, this research sought to provide empirical evidence that could help companies in Callao improve their environmental and sustainability strategies.

The quantitative approach made it possible to describe and explain observable phenomena in terms of measurable data, providing empirical evidence for the interpretation of the results (Hernández and Mendoza, 2018). Through this method, the perceptions of employees were translated into statistical data that made it possible to examine the level of relationship between the study variables.

The exploration was non-experimental and cross-sectional in design, as there was no manipulation of variables; rather, they were observed as they occurred in their natural environment. In addition, the study was descriptive-correlational in scope, as it allowed the variables to be described and the relationship between them to be established (Escobar & Bilbao, 2020).

Descriptive to show the ways in which corporate sustainability and environmental management are found in the selected companies; correlational to determine whether there is a statistically significant relationship between the two variables that strengthens business competitiveness. The correlation was determined using the Chi-square test, which is suitable for establishing the association between categorical variables in social and organizational studies.

The independent variable, corporate sustainability, was defined as the incorporation of responsible practices in the economic, social, and environmental dimensions to ensure current well-being without compromising future needs (Carbajal et al., 2024). This variable was measured across three dimensions:

- a) Economic sustainability: profits, cost reduction, resource efficiency;
- b) Social sustainability, covering working conditions, inclusion, and social responsibility; and
- c) Environmental sustainability, focused on adequate consumption, waste management, and regulatory compliance.

On the other hand, the dependent variable, environmental management, was conceptualized as the set of policies, strategies, and actions developed by organizations to minimize their environmental impact, optimize their environmental performance, and contribute to sustainable development (Guillén & Vicente Villardón, as cited in Vizarreta, 2023). This variable was structured in three dimensions:

- a) Environmental policies, linked to the application of internal rules and control programs;
- b) Environmental awareness, related to personal and collective commitment to the environment; and
- c) Environmental impact, referring to the identification and mitigation of negative effects derived from business activities.

The two variables were measured using a structured questionnaire with 20 items on a five-point Likert ordinal scale, which transformed the respondents' perceptions into quantifiable data.

The sample consisted of workers from companies that carry out customs activities in the Constitutional Province of Callao, chosen for their relevance in the logistics and foreign trade chain. Both customs agencies and heavy freight transport companies, strategic sectors in the regional economic dynamic, were taken into account.

A stratified study was applied to select the sample, which ensured the proportional representation of the different organizations involved. The final sample consisted of 40 employees.

The inclusion criteria included workers with at least one year of continuous experience in the company, direct participation in operational or administrative processes related to foreign trade, and voluntary acceptance to participate in the study. As for the exclusion criteria, employees with less than six months of seniority or without functions related to logistics or environmental management were excluded.

The methodology was a survey, using a structured questionnaire developed in-house and reviewed by three experts from the Faculty of Business Sciences at César Vallejo University. This instrument was pilot tested with 10 participants, which allowed its reliability to be estimated using Cronbach's alpha coefficient, obtaining 0.936 for the variable of corporate sustainability and 0.898 for environmental management, demonstrating high internal consistency and statistical reliability of the instrument.

Each question was designed to assess knowledge, attitudes, or behaviors in sustainability and environmental management. The responses were coded on a five-category scale: very low, low, moderate, high, and very high, which were then analyzed using descriptive and inferential statistics.

Prior to collecting the information, formal authorization was obtained from the participating companies and informed consent was obtained from the employees, ensuring confidentiality and academic use of the data. The questionnaire took approximately 30 minutes per participant to complete and was administered in the workplace, ensuring privacy and neutrality.

Statistical processing was performed using SPSS software, which allowed the creation of frequency tables and descriptive graphs to interpret the variables, as well as the application of the Chi-square test to test the general and specific hypotheses. This method made it possible to determine whether there was a significant relationship between corporate sustainability and environmental management in the companies analyzed, with a confidence level of 95% and a margin of error of 5%.

The research was conducted in accordance with the Code of Ethics in Research of César Vallejo University (University Council Resolution No. 0659-2024), which guarantees scientific honesty, impartiality, clarity, and service by those involved. The accuracy of the data, the correct citation of sources, and the absence of conflicts of interest were verified. The research was conducted under the standard of intellectual honesty, safeguarding the identity of the participants and protecting the information.

RESULT

The descriptive analysis identified the level of business sustainability and environmental management perceived by employees of micro and small businesses in the customs sector in Callao. The data obtained reveal a heterogeneous situation and, in general, an incipient incorporation of sustainable practices into organizational management.

In terms of business sustainability, 52.5% of respondents rated it as fair, while 32.5% perceived it as low and only 15% as high. This result reflects a partial application of the sustainable approach, with a predominance of actions focused on economic profitability, but with limited integration of social and environmental aspects.

In the economic sustainability dimension, 60% of participants reported a low level, which shows a prioritization of immediate financial results over sustainable investment strategies. Social sustainability showed a similar trend: 55% rated it as fair and 20% as low, demonstrating isolated efforts in social responsibility and labor relations.

With regard to environmental sustainability, 52.5% of employees perceived it as low, revealing deficiencies in environmental training, waste management, and regulatory compliance. Taken together, these results indicate that the predominant business model in the Callao customs sector continues to be oriented toward short-term financial objectives, with little internalization of sustainability as a long-term strategy.

With regard to environmental management, the findings were even more critical. Forty percent of respondents rated their company's environmental management as very weak and 45% as weak, while only 12.5% considered it strong and 2.5% very strong.

Environmental policies were rated as very weak by 52.5% and weak by 30%; environmental awareness was rated as very weak by 45% and weak by 40%; and environmental impact was rated as very weak by 45% and weak by 35%, with only 5% rating it as very strong. These results highlight the urgent need to strengthen environmental training and the institutionalization of sustainable corporate policies in the companies analyzed.

Inferential analysis was performed using the Chi-square (χ^2) statistical test, at a significance level of 5%, to determine the relationship between corporate sustainability and environmental management, as well as between their respective dimensions.

The values in Table 4 show that all relationships have a significance level of less than 0.05, confirming statistically significant associations between corporate sustainability and environmental management. In particular, companies that reported higher levels of sustainability also showed better indicators in the self-assessment of policies, awareness, and environmental impact.

The research results revealed that there is a positive and significant association between corporate sustainability and environmental management in companies in Callao ($X^2c = 40.01 > X^2t = 12.59$; $p = 0.000$). This empirical evidence supports the hypothesis that companies that adopt sustainable practices automatically improve their environmental performance (Briñez and Penagos, 2021). In fact, studies such as those by Vargas et al. (2022) and García et al. (2024) confirm that this articulation strengthens the competitiveness, efficiency, and sustainability of companies in increasingly demanding environments, turning corporate social responsibility into a management model. These results are consistent with the theoretical foundations of Elkington (1999) and the Brundtland Report (1987), which define sustainability as the balance between economic, social, and environmental factors as the basis for responsible management. Carbajal et al. (2024) add that this alignment is crucial for long-term profitability and survival, making sustainability a factor in institutional performance.

The methodology used in this quantitative, non-experimental, and correlational research is in line with the strategies proposed by Falqi et al. (2020) and Alghababsheh et al. (2022), who demonstrated that the integration of environmental practices improves operational efficiency and innovation and creates competitive advantages by improving energy efficiency and reducing operating costs.

Globally, Wang et al. (2024) found that decarbonization roadmaps in China improve profitability and resource efficiency, and Gelmez et al. (2024) found that green supply chain management drives the adoption of technologies to strengthen environmental performance in Vietnam. Taken together, the quantitative data in Table 2 confirm the main finding of the research: sustainability is established only when it permeates the entire organization. In this regard, the recommendations of Doghan et al. (2024) are applicable, in the sense that continuous training and institutional autonomy strengthen environmental management. This conclusion coincides with this research, where internal training processes transform organizations into more sustainable models, with fewer risks and an organizational culture of environmental care. The results of environmental awareness support the idea of Palomino et al. (2022) that training and employee involvement are determinants for sustainable management. Therefore, it confirms the importance of the Training Program for Trainers in Cost-Effective Environmental Management, since environmental transformation begins with the strengthening of human capital. Finally, companies that embrace sustainability and environmental management through training and institutional strengthening improve their competitiveness, image, and performance, reducing their environmental impact. These findings are consistent with those of Espinoza et al. (2021) and Salazar et al. (2021). According to Gómez et al. (2024) and Hernández et al. (2024), well-managed environmental practices can reduce costs, improve corporate image, and increase social acceptance. In a highly environmentally stressed territory such as Callao (where lead and cadmium pollution exceeds legal standards, according to Rozas, 2023), sustainable strategies represent a competitive advantage and an ethical obligation. The implementation of paradigms such as Cost-Effective Environmental Management (CEEM) (Peña, 2024) integrates sustainability with economic efficiency, creating a fourfold gain: cost reduction, increased revenue, improved reputation, and optimized organizational performance. In conclusion, these results confirm that sustainability is not an option, but rather a strategy to strengthen business resilience and contribute to Sustainable Development Goals 7, 8, 11, 12, and 13 to promote productive, decent, and environmentally responsible economic growth.

CONCLUSIONS

The study empirically demonstrated that corporate sustainability and environmental management are interdependent dimensions of organizational performance, whose articulation generates tangible benefits in economic, social, and environmental spheres. The Chi-square test ($\chi^2 = 40.01$; $p = 0.000$) confirmed the existence of a statistically significant relationship between the two variables, demonstrating that companies in the customs sector in Callao that incorporate sustainable criteria achieve better results in their environmental management.

First, it was found that organizations with a sustainable vision develop more robust environmental policies that are consistent with current regulations. Companies that

managed to integrate sustainability into their strategic planning showed a greater capacity to establish preventive programs, reduce negative impacts, and strengthen their institutional culture. This result coincides with the findings of Melo and Rey (2023), who emphasize that environmental management should be considered a strategic tool for sustainable development and business competitiveness.

Second, a positive relationship was found between corporate sustainability and environmental awareness. Organizations that promote sustainability values tend to consolidate an internal culture of commitment and shared responsibility, which translates into more proactive environmental behaviors. As Palomino et al. (2022) argue, environmental awareness depends not only on technical knowledge but also on the ethical internalization of ecological values at all hierarchical levels.

Similarly, the results confirmed the significant relationship between corporate sustainability and environmental impact, demonstrating that adequate sustainable management contributes to minimizing adverse effects on the environment. This finding supports the argument put forward by Espinoza et al. (2021), who assert that systematic impact assessment is an essential practice for preserving ecosystems and optimizing operational efficiency. In the context of Callao, where levels of environmental pollution represent a latent risk to public health and corporate reputation (Rozas, 2023), sustainability is consolidated as an ethical and strategic imperative.

Ultimately, we can say that the research validates that corporate sustainability should not only be conceived as a theoretical ideal, but as a structural condition of modern management. Companies that adopt these integrated environmental management models strengthen their profitability, reduce costs, enhance their corporate reputation, and consolidate their social legitimacy. Consequently, corporate sustainability emerges as a factor of resilience and competitiveness in complex environments, especially in sectors with high environmental and regulatory pressure, such as customs.

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