

## ENVIRONMENTAL SUSTAINABILITY: EVIDENCE OF ENVIRONMENTAL PRACTICES AND ENVIRONMENTAL BEHAVIOR IN MICRO AND SMALL ENTERPRISES

### SUSTENTABILIDADE AMBIENTAL: EVIDÊNCIAS DAS PRÁTICAS E DO COMPORTAMENTO AMBIENTAL EM MICRO E PEQUENAS EMPRESAS

### SOSTENIBILIDAD AMBIENTAL: EVIDENCIAS DE LAS PRÁCTICAS Y DEL COMPORTAMIENTO AMBIENTAL EN MICRO Y PEQUEÑAS EMPRESAS



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#### ABSTRACT

Environmental sustainability has assumed increasing relevance in the organizational context. Despite this prominence, the incorporation of environmental sustainability in micro and small enterprises (MSEs) occurs unevenly, marked by structural, operational, and managerial limitations that hinder the consolidation of systematic environmental practices. In MSEs, the engagement with environmental practices tends to occur in a fragmented manner, indicating the need for empirical approaches that consider learning processes, organizational routines, and structural capacities within the organizational process of internalization. In this context, the objective of this study is to analyze the environmental practices adopted by Brazilian MSEs, considering the articulation between organizational culture, environmental engagement, and environmental behavior as a process of incorporating environmental sustainability. Methodologically, the research is characterized as empirical, quantitative, and descriptive, with a cross-sectional design, operationalized through a survey applied to 225 Brazilian MSEs. Data were collected using a structured questionnaire with Likert-scale items and analyzed using descriptive statistics and Spearman correlation. The results indicate greater consolidation of practices associated with organizational culture and environmental engagement, while practices of a strategic nature show lower integration and greater heterogeneity among firms. The associations observed among the analyzed dimensions were predominantly weak and non-linear, indicating that advances in operational practices do not necessarily imply strategic institutionalization. These findings demonstrate that the incorporation of environmental sustainability in MSEs occurs gradually and incrementally, reinforcing its understanding as an organizational process conditioned by learning, routines, and structural capacities.

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**Keywords:** Environmental Sustainability. Organizational Culture. Environmental Engagement. Environmental Behavior.

## RESUMO

A sustentabilidade ambiental tem assumido crescente relevância no contexto organizacional. Apesar desse protagonismo, a incorporação da sustentabilidade ambiental nas Micro e pequenas empresas (MPEs), ocorre de forma desigual, marcada por limitações estruturais, operacionais e gerenciais que dificultam a consolidação de práticas ambientais sistemáticas. Percebe-se que, nas MPEs, o engajamento das práticas ambientais ocorre de maneira fragmentada, indicando a necessidade de abordagens empíricas que considerem processos de aprendizagem, rotinas organizacionais e capacidades estruturais no processo organizacional de internalização. Diante desse cenário, o objetivo deste estudo é analisar as práticas ambientais adotadas pelas MPEs brasileiras, considerando a articulação entre cultura organizacional, engajamento ambiental e comportamento ambiental como processo de incorporação da sustentabilidade ambiental. Metodologicamente, a pesquisa caracteriza-se como empírica, quantitativa e descritiva, com delineamento transversal, operacionalizada por meio de um survey aplicado a 225 MPEs brasileiras. O instrumento de coleta consistiu em um questionário estruturado com questões em escala Likert, e os dados foram analisados por meio de estatística descritiva e correlação de Spearman. Os resultados indicam maior consolidação das práticas associadas à cultura organizacional e ao engajamento ambiental, enquanto práticas de natureza estratégica apresentam menor integração e maior heterogeneidade entre as empresas. As associações observadas entre as dimensões analisadas foram predominantemente fracas e não lineares, evidenciando que avanços em práticas operacionais não implicam, necessariamente, na institucionalização estratégica. Esses achados demonstram que a incorporação da sustentabilidade ambiental nas MPEs ocorre de forma gradual e incremental, reforçando sua compreensão como um processo organizacional, condicionado por aprendizagem, rotinas e capacidades estruturais.

**Palavras-chave:** Sustentabilidade Ambiental. Cultura Organizacional. Engajamento Ambiental. Comportamento Ambiental.

## RESUMEN

La sostenibilidad ambiental ha adquirido una relevancia creciente en el contexto organizacional. A pesar de este protagonismo, la incorporación de la sostenibilidad ambiental en las micro y pequeñas empresas (MPE) ocurre de manera desigual, marcada por limitaciones estructurales, operativas y gerenciales que dificultan la consolidación de prácticas ambientales sistemáticas. En las MPE, el compromiso con las prácticas ambientales tiende a manifestarse de forma fragmentada, lo que indica la necesidad de enfoques empíricos que consideren los procesos de aprendizaje, las rutinas organizacionales y las capacidades estructurales dentro del proceso organizacional de internalización. En este contexto, el objetivo de este estudio es analizar las prácticas ambientales adoptadas por las MPE brasileñas, considerando la articulación entre cultura organizacional, compromiso ambiental y comportamiento ambiental como un proceso de incorporación de la sostenibilidad ambiental. Metodológicamente, la investigación se caracteriza como empírica, cuantitativa y descriptiva, con un diseño transversal, operacionalizada mediante un survey aplicado a 225 MPE brasileñas. El instrumento de recolección consistió en un cuestionario estructurado con ítems en escala Likert, y los datos fueron analizados mediante estadística descriptiva y correlación de Spearman. Los resultados indican una mayor consolidación de las prácticas asociadas a la cultura organizacional y al compromiso ambiental, mientras que las prácticas de naturaleza

estratégica presentan menor integración y mayor heterogeneidad entre las empresas. Las asociaciones observadas entre las dimensiones analizadas fueron predominantemente débiles y no lineales, lo que evidencia que los avances en las prácticas operativas no implican necesariamente una institucionalización estratégica. Estos hallazgos demuestran que la incorporación de la sostenibilidad ambiental en las MPE ocurre de forma gradual e incremental, reforzando su comprensión como un proceso organizacional condicionado por el aprendizaje, las rutinas y las capacidades estructurales.

**Palabras clave:** Sostenibilidad Ambiental. Cultura Organizacional. Compromiso Ambiental. Comportamiento Ambiental.

## 1 INTRODUCTION

Environmental sustainability has consolidated itself as a central theme in the management of organizations, going beyond a strictly normative approach and assuming a strategic character associated with business performance and competitiveness (Barbieri, 2022; Chen et al., 2022; Khizar et al., 2023). International standards, such as ISO 14001 and ISO 26000, reinforce the systematic incorporation of environmental practices into organizational processes, emphasizing the integration between management, culture and behavior. (ISO, 2015; ISO, 2010). In addition, institutional and regulatory pressures increase the demand for coherence between environmental discourse and effective practices (Hatmanu et al., 2019; OECD, 2021).

In the context of Micro and Small Enterprises (MSEs), environmental sustainability assumes specific relevance due to the significant economic participation of this segment and the cumulative environmental impacts associated with its activities (IBGE, 2022; SEBRAE, 2022). However, these organizations face structural, managerial, and operational limitations that make it difficult to consolidate systematic and formalized environmental practices (Calisto et al., 2021; Rosa et al., 2022; OECD, 2021). As a consequence, internalization of environmental sustainability tends to occur incrementally, fragmented, and heterogeneously.

Therefore, the incorporation of environmental sustainability depends on the articulation between organizational culture, environmental engagement, and environmental behavior in the daily lives of organizations (Valdez-Juárez et al., 2019; Jabbour & Santos, 2021; Chen et al., 2023). Studies indicate that cultural values and sustained engagement processes guide recurrent environmental practices related to the use of resources, impact reduction, and internal awareness, according to ISO 26000 guidelines (ISO, 2010). In this way, these practices configure the environmental behavior associated with sustainability in the organizational context (Gao & Yang, 2022; Saez-Martínez et al., 2016; Rosa et al., 2022).

However, in the context of MSEs, there is a gap in terms of the integrated understanding of these elements. Empirical evidence indicates that the articulation between organizational culture, environmental engagement, and environmental behavior is still little explored in a systematic and empirically structured way in this size of companies (Calisto et al., 2021; Chen et al., 2022; Khizar et al., 2023). In particular, the analyses that allow us to understand how these dimensions are articulated in the organizational daily life of MSEs remain limited, in the light of normative references of environmental sustainability (ISO, 2018; ABNT, 2021; OECD, 2021).

In this context, the research question that guides this study is: how do the environmental practices adopted by MSEs articulate between organizational culture,

environmental engagement and environmental behavior in the process of incorporating environmental sustainability? Thus, the objective of this study is to analyze the environmental practices adopted by Brazilian MSEs, considering the articulation between organizational culture, environmental engagement and environmental behavior as a process of incorporating environmental sustainability. To meet this objective, the study adopts the empirical procedure and the quantitative approach, using an instrument aligned with international standards and institutional guidelines, as detailed in the methodological section.

## 2 THEORETICAL FRAMEWORK

### 2.1 ENVIRONMENTAL SUSTAINABILITY IN THE CONTEXT OF ORGANIZATIONS

Environmental sustainability has consolidated itself as a strategic factor for competitiveness and organizational performance, going beyond a merely normative approach (Barbieri, 2022; Chen et al., 2022). This position stems from the need to integrate environmental issues into business management, guiding decisions and organizational behaviors (Khizar et al., 2023). Standards such as ISO 14001 and ISO 26000 reinforce this logic by emphasizing the systematic incorporation of sustainability into internal processes (ISO, 2015; ISO, 2010).

In addition to technical standards, organizations have been increasingly pressured by regulatory, social, and market requirements that condition their corporate responsibility (OECD, 2021). In this context, such pressures stimulate organizational responses that go beyond legal compliance, requiring transparency, institutional coherence, and legitimacy before the market (Hatmanu et al., 2019). In the Brazilian case, the National Environmental Policy (PNMA), as well as the guidelines of the *Global Reporting Initiative* (GRI) and ABNT PR 2030, reinforce the need to structure and communicate environmental practices in a systematic and reliable way (Brasil, 1981; GRI, 2021; ABNT, 2021).

In addition, environmental sustainability is linked to global agendas, especially the 2030 Agenda, proposed by the United Nations (UN) (UN, 2015). In this sense, the Sustainable Development Goals (SDGs) reinforce the need for integrated, measurable environmental practices incorporated into the management of organizations (UN, 2015). In a complementary way, the ABNT PR 2030 standard contributes to operationalizing these commitments by translating global guidelines into normative references applicable to the business context (ABNT, 2021).

In this way, the articulation between global agendas, technical standards and institutional guidelines condition organizational performance and create an environment in

which cultural values, engagement processes and environmental behaviors begin to be structured internally, in the context of MSEs (UN, 2015; ABNT, 2021; OECD, 2021).

In this sense, environmental sustainability assumes specific relevance due to the significant economic participation of this segment and the cumulative environmental impacts associated with its activities (IBGE, 2022; SEBRAE, 2022). However, small business organizations face structural and managerial limitations that make it difficult to consolidate systematic environmental practices (Calisto et al., 2021; OECD, 2021). Therefore, these restrictions compromise the formalization of operational practices and the incorporation of environmentally sustainable routines into the organizational culture (Rosa et al., 2022).

## 2.2 ORGANIZATIONAL CULTURE AS THE BASIS OF ENVIRONMENTAL PRACTICES

Organizational culture constitutes the structuring basis for the incorporation of environmental sustainability in organizations, by guiding values, beliefs, and patterns of behavior shared among employees (Valdez-Juárez et al., 2019; Jovanovic et al., 2017). According to Khizar et al., (2023), organizations with internalized environmental values tend to have greater consistency between discourse and practice. These cultural elements influence how environmental practices are perceived, prioritized, and legitimized internally (Chen et al., 2022).

The dissemination of environmental values occurs when training, qualification, and educational materials reinforce technical standards and institutional guidelines in the organizational routine (Valdez-Juárez et al., 2019; Chen et al., 2022). In addition, standards such as ISO 14001 and ISO 26000 highlight awareness and the development of skills as pillars for the consolidation of environmental practices in organizations (ISO, 2015; ISO, 2010). Consequently, environmental culture is not established by one-off or isolated actions, but by continuous organizational learning processes that guide workers' behavior over time (Gao & Yang, 2022).

In MSEs, organizational culture plays an even more relevant role due to the proximity between leadership and employees, and less formalization of internal processes (Calisto et al., 2021). In this context, managers' perceptions influence the prioritization of environmental practices and the way these practices are interpreted internally (Valdez-Juárez et al., 2019; Rosa et al., 2022). However, structural and operational limitations can make it difficult to consolidate these values in organizational routines (Gao & Yang, 2022). In this way, organizational culture is a necessary basis for the development of environmental engagement in MSEs (Chen et al., 2022).

In addition, organizational culture acts as a mediation mechanism between institutional guidelines and the environmental behavior observed in organizations (Chen et al., 2023). When environmental values are shared, practices tend to be reproduced more consistently, reducing reliance on formal and regulatory controls (Khizar et al., 2023). In the context of MSEs, this cultural mediation becomes decisive for the continuous internalization of environmental sustainability (Calisto et al., 2021). Thus, organizational culture establishes the conceptual link that sustains environmental engagement as an organizational process.

### 2.3 ENVIRONMENTAL ENGAGEMENT AS AN ORGANIZATIONAL PROCESS

Environmental engagement should be understood as an organizational process, rather than an individual disposition (Gao & Yang, 2022). This process operates as a mediation between cultural values and the institutionalization of environmental practices in everyday business (Saez-Martínez et al., 2016). Chen et al., (2022). They indicate that engagement is sustained when the organization structures conditions for recurrent participation of workers and collective learning. In this way, environmental engagement connects cultural values to the company's strategic actions (Gao & Yang, 2022; Chen et al., 2022).

In this context, internal campaigns and systematic awareness actions guide daily choices and operational routines, by encouraging practices aligned with the responsible use of natural resources (Rosa et al., 2022; Gao & Yang, 2022). In addition, the monitoring of energy and water consumption, as well as the adoption of procedures for separating and properly disposing of waste, reinforce the internalization of environmentally sustainable behaviors in the organizational environment (ISO, 2015; Chen et al., 2022). In this way, environmental engagement ceases to assume a one-off character and starts to structure recurring actions integrated with the SDGs (Khizar et al., 2023). As a result, these initiatives contribute to the construction of shared meanings, by aligning individuals' understanding of environmental sustainability (Veronica et al., 2020).

In addition, recent studies show that engagement is consolidated when initiatives, such as educational campaigns, environmental goals, and operational guidelines, are accompanied by consistent and continuous internal communication (Khizar et al., 2023). Rosa et al., (2022) reinforces that these attitudes strengthen environmental engagement by expanding the collective involvement of employees. In this way, environmental engagement ceases to be episodic and begins to assume an organizational and procedural character, supported by recurrent practices (Gao & Yang, 2022; Chen et al., 2022). Which are associated with the sustainable use of natural resources, pollution prevention, mitigation of climate impacts and protection of biodiversity, according to the guidelines of ISO 26000 (ISO, 2010).

In less formalized organizational contexts, environmental engagement faces relevant structural limitations (Calisto et al., 2021; OECD, 2021). In particular, the scarcity of financial, human, and technical resources, coupled with low process standardization, constrains the organizational capacity to sustain ongoing environmental practices (Gao & Yang, 2022; SEBRAE, 2022). These limitations make it difficult to consolidate recurrent environmental actions in the organizational daily life (Veronica et al., 2020). Calisto et al. (2021) highlight that, under these conditions, engagement tends to depend heavily on specific initiatives and relational proximity between managers and teams. Consequently, the engagement process becomes more susceptible to discontinuity and fragmentation of environmental practices over time (Rosa et al., 2022; Khizar et al., 2023).

Therefore, leadership and internal communication play a central role in the institutionalization of environmental engagement in MSEs (Gao & Yang, 2022). In this sense, the clarity of the messages and the coherence between managerial discourse and the practices adopted directly influence the collective mobilization around environmental issues (Veronica et al., 2020). When this alignment is fragile, organizational involvement tends to be restricted to isolated actions, without operational continuity (Khizar et al., 2023). Thus, environmental engagement is a necessary organizational condition for cultural values to become standards for environmental behavior, constituting the empirical basis of environmental practices in organizations (Saez-Martínez et al., 2016; Chen et al., 2022).

## 2.4 ENVIRONMENTAL BEHAVIOR AS ORGANIZATIONAL EMPIRICAL EVIDENCE

Organizational environmental behavior corresponds to the concrete expression of cultural values as the process of engaging environmental practices in business routines (Chen et al., 2022). Unlike institutional discourses, behavior is manifested by recurrent actions in the productive daily life of companies (Jabbour & Santos, 2021). Khizar et al., (2023); Rosa et al., (2022); Chen et al., (2022) reinforce that these actions reflect on the incorporation of practices related to the rational use of resources, impact reduction, and environmental awareness into corporate sustainability (ISO, 2015).

These behaviors tend to emerge when engagement is sustained by recurrent internal processes, capable of guiding workers in operational processes and work routines (Saez-Martínez et al., 2016; Gao & Yang, 2022). Gao & Yang, (2022; Khizar et al., (2023) indicate that isolated or one-off initiatives do not reinforce structured environmental behavior. Thus, environmental behavior results from the systematic repetition of practices associated with environmental issues, central dimensions of the empirical investigation of this study (Rosa et al., 2022; ISO, 14004, 2016).

In the context of MSEs, environmental behavior is strongly conditioned by organizational and operational constraints (Calisto et al., 2021; OECD, 2021). In these organizations, behaviors related to the use of energy, water, and other resources vary according to the internal context, communication, and managerial priorities (Veronica et al., 2020; Gao & Yang, 2022). This variability reinforces the need to empirically observe how these practices manifest themselves in the organizational daily life of MSEs (IBGE, 2022; SEBRAE, 2022).

In this way, environmental behavior allows us to empirically examine how organizational culture and engagement processes translate into effective and recurring practices (Chen et al., 2023; Jabbour & Santos, 2021). The observation of these behaviors makes it possible to identify patterns, operational limitations, and levels of consistency between environmental discourse and action (Khizar et al., 2023; Hatmanu et al., 2019). For this, it is necessary to use instruments capable of capturing practices of environmental issues in a systematic, comparable and aligned way with the normative references of environmental sustainability (ISO, 2018; ABNT, 2021). This analytical chain underlies the methodological options adopted in this study and guides the empirical operationalization of environmental practices.

### **3 METHODOLOGY**

#### **3.1 STAGES OF THE RESEARCH**

The research is characterized as empirical, quantitative and descriptive, with a cross-sectional design, an approach widely used in organizational studies that seek to examine business practices based on structured data collected at a single time (Creswell, 2014; Gil, 2019; Hair et al., 2009; Severo; Guimarães, 2017; Barbieri, 2022; Jabbour; Santos, 2021). This type of design is recommended when the objective is to identify patterns, trends, and variability of attitudes, without the intention of establishing causal relationships (Gil, 2019; Hair et al., 2009; Marôco, 2014).

The methodological design was structured in three complementary stages. The first stage consisted of the theoretical foundation on organizational culture, environmental engagement, and environmental behavior, based on empirical and conceptual studies consolidated in the international literature (Valdez-Juárez et al., 2019; Gao & Yang, 2022; Rosa et al., 2022; Chen et al., 2022; Khizar et al., 2023; Jabbour; Santos, 2021). The second stage involved the construction of the empirical instrument, guided by recognized standards and guidelines for environmental management and performance (ABNT, 2021; ISO, 2018; ISO, 2010; Barbieri, 2022).

The third stage comprised the collection and statistical treatment of data, following procedures consolidated in the methodological literature for quantitative, descriptive and inferential research (Creswell, 2014; Gil, 2019; Hair et al., 2009; Marôco, 2014; Damásio, 2012; Severo; Guimarães, 2017). This chain ensured the coherence between the research problem, the theoretical framework, the empirical instrument and the analytical techniques adopted.

### 3.2 DATA COLLECTION AND COLLECTION

The data collection instrument was developed based on the guidelines of ABNT PR 2030 and ISO 14031, which orbited the analysis of the environmental practices adopted by Brazilian MSEs, considering the articulation between organizational culture, environmental engagement, and environmental behavior as a process of incorporating environmental sustainability (ABNT, 2021; ISO, 2018; Barbieri, 2022; Jabbour; Santos, 2021; Chen et al., 2023; OECD, 2021). In a complementary way, the principles of ISO 26000 were considered, which deals with the main issues as the main SDGs (ISO, 2010; Hatmanu et al., 2019).

The questionnaire was structured in 15 questions. Questions Q1 to Q3 characterize the profile of respondents and companies, while questions Q4 to Q13 assess environmental practices associated with organizational culture, environmental engagement, and environmental behavior, using a five-point Likert scale, suitable for ordinal data (Creswell, 2014; Hair et al., 2009; Marôco, 2014; Damásio, 2012; Severo; Guimarães, 2017). The open questions Q14 and Q15 complement the analysis by capturing aspects related to transparency, communication, and institutional articulation (Veronica et al., 2020; Rosa et al., 2022; Hatmanu et al., 2019).

Data collection took place between October and December 2024, through the *Google Forms* platform, using non-probabilistic convenience sampling, a technique indicated for heterogeneous and hard-to-reach populations (Gil, 2019; Creswell, 2014; Hair et al., 2009; Marôco, 2014). The final sample was composed of 225 MSEs certified or in the process of certification by Sistema B Brasil. The final structure of the instrument, with the link between the questions, the theoretical axes and the authors on which it was based, is presented in Table 1.

**Table 1**

*Data Collection Instrument*

No.	Issue:	Theoretical axis	Reference authors
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Q1	What is your greatest academic training completed?	Organizational culture	Valdez-Juárez et al. (2019); Chen et al. (2022); Rosa et al. (2022)
Q2	What is your relationship, knowledge or experience on environmental issues?	Organizational culture	Gao & Yang (2022); Chen et al. (2022); Valdez-Juárez et al. (2019)
Q3	What is the company's field of activity?	Environmental behavior	Calisto et al. (2021); Veronica et al. (2020); OECD (2021)
Q4	Does the company conduct environmental training (e.g., recycling, safe disposal)?	Organizational culture	Calisto et al. (2021); Valdez-Juárez et al. (2019); Chen et al. (2023)
Q5	Does the company promote training of managers in sustainability?	Organizational culture	Gao & Yang (2022); Chen et al. (2023); Jabbour & Santos (2021)
Q6	Does the company use renewable or clean energy sources?	Environmental engagement	Nguyen & Tran (2020); Rosa et al. (2022); Khizar et al. (2023)
Q7	Does the company promote campaigns on the rational use of energy or natural resources?	Environmental engagement	Gao & Yang (2022); Veronica et al. (2020); Rosa et al. (2022)
Q8	Does the company provide educational materials on sustainability and climate change?	Organizational culture	Valdez-Juárez et al. (2019); Chen et al. (2022); Rosa et al. (2022)
Q9	Does the company integrate environmental practices into corporate policies?	Environmental behavior	Chen et al. (2023); Calisto et al. (2021); Jabbour & Santos (2021)
Q10	Does the company make employees aware of biodiversity preservation?	Environmental engagement	Rosa et al. (2022); Gao & Yang (2022); Saez-Martínez et al. (2016)
Q11	Does the company raise awareness about reducing the consumption of natural resources?	Environmental engagement	Nguyen & Tran (2020); Valdez-Juárez et al. (2019); Khizar et al. (2023)
Q12	Does the company raise awareness for the rational use of water?	Environmental engagement	Rosa et al. (2022); Calisto et al. (2021); Nguyen & Tran (2020)
Q13	Does the company adopt environmental policies integrated with the SDGs?	Environmental behavior	Chen et al. (2023); Veronica et al. (2020); OECD (2021)

Q14	Does the company publicly report on its environmental actions?	Environmental behavior	Hatmanu et al. (2019); Veronica et al. (2020); GRI (2021)
Q15	Does the company develop environmental actions in partnership with institutions?	Environmental behavior	Gao & Yang (2022); Rosa et al. (2022); Saez-Martínez et al. (2016)

Source: Prepared by the author (2025).

### 3.3 DATA ANALYSIS

The collected data were organized and analyzed with the aid of the *R software*, using *RStudio 2025.09.2*. The analysis followed methodological recommendations for the treatment of ordinal data and for the application of statistics in the social sciences (Hair et al., 2009; Marôco, 2014; Damásio, 2012; Field, 2013; Barbetta, 2017; Gil, 2019). Thus, all analyses respected the nature of the data and the empirical design of the research.

The initial analysis focused on descriptive statistics, with the use of absolute and relative frequencies to characterize the profile variables of the respondents and the companies. As well as median and Interquartile Range (IQR) for environmental issues on the *Likert scale*, adequate measures for ordinal data (Hair et al., 2009; Marôco, 2014; Damásio, 2012; Barbetta, 2017; Severo; Guimarães, 2017). This information allowed the sample to be contextualized in terms of individual and organizational characteristics, without inferential purpose, according to the methodological literature on descriptive statistics in social research (Barbetta, 2017; Gil, 2019).

The internal consistency of the instrument was assessed using Cronbach's alpha coefficient, applied to the set of questions Q4 to Q13, according to recommendations for Likert-type scales (Hair et al., 2009; Gliem; Gliem, 2003; Marôco, 2014; Nunnally; Bernstein, 1994; Damásio, 2012). The value obtained indicated adequate internal consistency, validating the joint use of the items.

In addition, inferential analyses were performed using *Spearman's* correlation between questions Q4 and Q13, a technique indicated for ordinal variables and adequate to identify monotonic associations between environmental practices (Hair et al., 2009; Marôco, 2014; Field, 2013; Damásio, 2012; Gil, 2019). The correlations were interpreted as to the direction and intensity of the associations, without presupposition of causality. Thus, the procedure made it possible to identify patterns of association between the environmental practices analyzed, in line with the descriptive design of the study (Hair et al., 2009; Marôco, 2014).

### 3.4 RELIABILITY AND VALIDITY

The reliability of the instrument was evaluated using Cronbach's alpha coefficient, widely used to verify the internal consistency of Likert-type scales (Hair et al., 2009; Gliem; Gliem, 2003; Marôco, 2014; Nunnally; Bernstein, 1994; Damásio, 2012). The procedure was applied to the set of questions Q4 to Q13, according to methodological recommendations for psychometric instruments. The coefficient obtained presented a value equal to or greater than the threshold of 0.70, considered a reference for acceptable reliability in the literature (Nunnally; Bernstein, 1994; Hair et al., 2009; Marôco, 2014). In this way, the questions could be used together in the analysis of environmental practices (Gliem; Gliem, 2003; Damásio, 2012).

Content validity resulted from the alignment between the theoretical constructs adopted, the international standards that guided the elaboration of the questions, and empirical studies on environmental practices in MSEs (Barbieri, 2022; Jabbour; Santos, 2021; ABNT, 2021; ISO, 2018; Chen et al., 2023; OECD, 2021). This alignment ensured that the items adequately represented the concepts investigated in the study. Thus, the instrument maintained conceptual coherence with the theoretical and normative framework used.

Construct validity was examined based on the coherence of the association patterns observed between the items, considering their adherence to the literature and to the normative references of environmental management (Hair et al., 2009; Damásio, 2012; Marôco, 2014; Chen et al., 2022; Khizar et al., 2023). The observed associations were interpreted in a manner consistent with the defined theoretical constructs. Thus, the procedures adopted ensured coherence between theory, empirical instrument and statistical analysis, in accordance with the descriptive design of the study.

## 4 RESULTS AND DISCUSSIONS

### 4.1 DESCRIPTIVE RESULTS

The descriptive analysis allowed to characterize the distribution of environmental practices adopted by MSEs from questions Q4 to Q13, organized in the axes organizational culture, environmental engagement and environmental behavior. Frequencies, median, and interquartile range (IQR) were used, which are appropriate measures for ordinal data from Likert scales (Hair et al., 2009; Marôco, 2014; Barbetta, 2017). This procedure is recommended when the objective is to describe patterns without assuming normality of the data (Field, 2013). The approach is consistent with empirical studies on environmental practices in small businesses (Barbieri, 2022; Chen et al., 2022; Rosa et al., 2022).

The data in Table 2 show the respondents' academic background (Q1). The results indicate high education of the respondents, with 53.8% having a specialization and 23.1% having a master's degree. The literature points out that higher educational levels are fundamental for organizational learning and greater assimilation of environmental practices (Valdez-Juárez et al., 2019; Chen et al., 2022). This profile reduces comprehension biases in self-report-based research (Creswell, 2014; Gil, 2019). ISO 14001 recognizes training as a structuring element on organizational environmental sustainability (ISO 14001).

**Table 2**

*Respondents' education (Q1)*

Education	Percentage (%)
Specialization (lato sensu / mba)	53,8
Master's Degree	23,1
Graduation	15,4
PhD	1,9
Other	5,8

Source: Prepared by the author (2025).

Regarding environmental knowledge (Q2), most respondents reported medium or high environmental knowledge (Table 3). The results indicate that 48.0% of the respondents declared a high level and 38.5% a medium level, while 13.5% indicated low knowledge. Empirical evidence shows that higher levels of knowledge precede the formalization of practices and influence the consolidation of environmental culture (Valdez-Juárez et al., 2019; Rosa et al., 2022). Gao and Yang (2022) highlight that knowledge applied to organizational daily life strengthens environmental routines. This finding reinforces that these actions reflect on the incorporation of practices related to the rational use of resources, the reduction of impacts and environmental awareness into corporate sustainability (ISO, 2015).

**Table 3**

*Knowledge and experience in environmental issues (Q2)*

Declared level	Percentage (%)
High	48,0
Medium	38,5
Low	13,5

Source: Prepared by the author (2025).

On the other hand, the presence of 13.5% of respondents with low knowledge shows relevant variability among the MSEs analyzed. This variability is recurrent in organizational

studies involving heterogeneous populations (Hair et al., 2009; Marôco, 2014). Rosa et al. (2022) associate this heterogeneity with structural and contextual differences of workers that affect business behavior. Thus, the results indicate that the level of environmental knowledge is not homogeneous among MSEs, constituting a relevant conditioning factor for the incorporation of environmental practices.

As for the sector of activity (Q3), the predominance of the services sector (75%), followed by trade (15.6%) and industry (9.4%) was observed. This pattern is consistent with national institutional data, which indicate a greater concentration of MSEs in the services and trade sectors due to the lower initial capital requirement and greater operational flexibility (IBGE, 2022; SEBRAE, 2022). Thus, the lower participation of the industrial sector is associated with higher regulatory requirements and operating costs, which tend to hinder the institutionalization of environmental sustainability in MSEs in this segment (Calisto et al., 2021; Rosa et al., 2022).

The environmental practices Q4 to Q13 presented medians between 2.0 and 4.0, as shown in Table 4. Operational and educational practices, such as environmental training (Q4; median = 4.0; IQR = 1.0) and rational use campaigns (Q7; median = 4.0; IQR = 2.0), showed greater centrality. Educational actions tend to be the first to be incorporated (Rosa et al., 2022; Gao & Yang, 2022). ISO 14001 highlights training as an initial stage of environmental management. These results highlight training as an initial stage, which reflects engagement in environmental practices.

On the other hand, practices of a strategic nature, such as integration with corporate policies (Q9) and alignment with the SDGs (Q13), showed lower medians and greater dispersion, (Q9; median = 3.0; IQR = 3.0) and SDG-aligned policies (Q13; median = 2.0; IQR = 3.0). The literature points out that strategic institutionalization occurs after the consolidation of operational routines (Calisto et al., 2021; Jabbour & Santos, 2021). ISO 14031 highlights the progressiveness in the evolution of environmental sustainability. These values show low uniformity and lack of strategic homogeneity among the MSEs.

**Table 4**

*Descriptive statistics of environmental practices (Q4–Q13)*

Issue:	Environmental practice	Median	IQR
Q4	Environmental training	4,0	1,0
Q5	Training of managers	3,5	2,0
Q6	Use of renewable energy	3,0	2,5
Q7	Rational use campaigns	4,0	2,0
Q8	Educational materials	4,0	2,0

Q9	Integration with corporate policies	3,0	3,0
Q10	Biodiversity awareness	3,0	2,0
Q11	Reduction of natural resource consumption	3,0	2,5
Q12	Rational use of water	3,0	2,0
Q13	Environmental policies integrated with the SDGs	2,0	3,0

Source: Prepared by the author (2025).

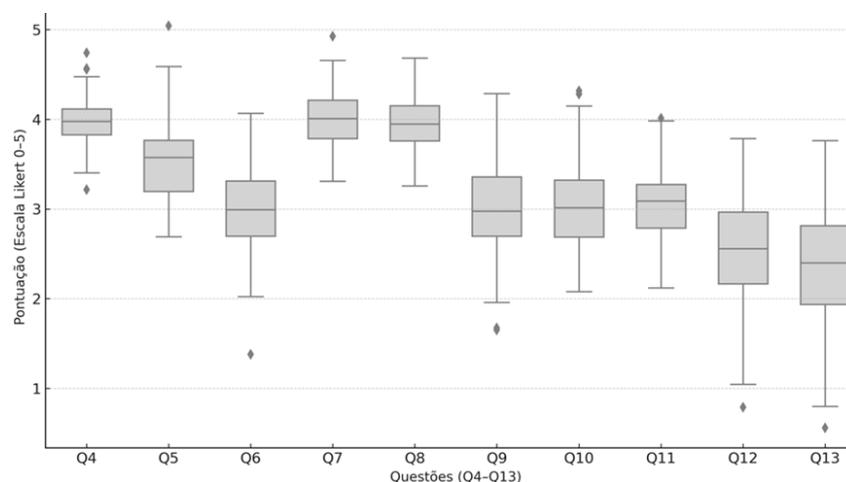
Figure 1 presents the *boxplots* of questions Q4 to Q13, allowing the visualization simultaneously of the central position (median) and the dispersion of the answers (IQR), a recommended procedure for the analysis of ordinal data on *Likert* scales (Marôco, 2014). It is observed that Q13 has lower medians and high IQR, indicating high variability and heterogeneity in practices of a more strategic and institutional nature.

In addition, questions Q9, Q10 and Q11 exhibit intermediate medians ( $\approx 3.0$ ) and comparable dispersion, suggesting moderate adoption of these practices, but with relevant differences between MSEs. This visual pattern corroborates the numerical results presented in Table 3 and reinforces the adequacy of the IQR as a central descriptive measure (Marôco, 2014).

In contrast, questions Q4, Q7 and Q8 have higher medians ( $\approx 4.0$ ) and less dispersion, evidencing greater recurrence and uniformity of educational, awareness and training practices in the organizational routine of MSEs. Institutional evidence indicates that strategic, governance, and alignment practices with SDG Q13 require greater organizational capacity and formalization of processes, which represents a recurring challenge for small businesses (OECD, 2021; SEBRAE, 2022).

## Figure 1

### Boxplots of environmental practices (Q4–Q13)



Source: Prepared by the author (2025).

The practices related to the rational use of energy, water and natural resources, Q6, Q11 and Q12, presented intermediate medians around 3.0, and IQR varying approximately between 3.0 and 2.5, as evidenced in Figure 1. This pattern indicates moderate adoption, but with variability among companies, characteristic of practices that depend on continuous organizational engagement and routines that are still being consolidated (Saez-Martínez et al., 2016; Gao & Yang, 2022). The literature associates this variability with limited resources and less formalization of processes in MSEs (Calisto et al., 2021). ISO 14004 recognizes these practices as operational and strongly dependent on internal engagement, which explains the observed dispersion.

The open questions Q14 and Q15 show the predominance of informal communication and occasional institutional partnerships, a recurrent pattern in MSEs. Institutional evidence shows that this business size uses simplified records and social networks as the main means of environmental communication, due to structural constraints and organizational capacity (UN, 2018; GRI, 2021; OECD, 2021). These findings reinforce the heterogeneity observed in the descriptive results.

In summary, the descriptive results indicate greater consolidation of practices associated with organizational culture and environmental engagement, evidenced by higher medians and less dispersion in Q4, Q7 and Q8 (median  $\approx$  4.0). In contrast, strategic and institutional practices, such as integration with corporate policies (Q9) and alignment with the SDGs (Q13), have lower medians ( $\approx$  3.0 and  $\approx$  2.0) and high IQR, indicating heterogeneity among MSEs (Barbieri, 2022; Chen et al., 2022; Rosa et al., 2022). The guidelines of ISO 14001 and ISO 14031 corroborate this progressive process of consolidation, in which operational practices tend to precede strategic institutionalization. This chain is the basis for the following subsection, dedicated to the inferential analysis of the associations between the items of the instrument.

## 4.2 INFERENCE RESULTS

The inferential analysis examined the associations between the environmental practices of questions Q4 to Q13, aligned with the axes of organizational culture, environmental engagement, and environmental behavior of the instrument (Gil, 2019; Creswell, 2014). To this end, Spearman's correlation was adopted, indicated for ordinal data on a Likert scale and appropriate for investigating monotonic associations without assuming normality or linearity (Hair et al., 2009; Marôco, 2014).

This methodological decision maintained coherence with the descriptive and cross-sectional design and with the measurement logic recommended for environmental practices

in MSEs (Damásio, 2012; Field, 2013). The interpretation of the associations was conducted in line with the normative references of environmental sustainability (ISO, 2018; ABNT, 2021).

The internal consistency of questions Q4 to Q13 was assessed using *Cronbach's alpha*, obtaining  $\alpha = 0.94$ , a value classified as excellent in the psychometric literature and quantitative methods (Nunnally; Bernstein, 1994; Hair et al., 2009). This result indicated high coherence between the items, supporting the joint reading of the practices as an empirical domain related to the internalization and engagement of sustainability in the organizational daily life (Marôco, 2014; Damásio, 2012).

In normative terms, consistency was compatible with the need for systematic instruments to monitor environmental practices, as emphasized by recognized environmental management and assessment guidelines (ISO, 2018; ABNT, 2021). Thus, the reliability observed reinforced the robustness of the instrument by sustaining the inferential discussion in the context of MSEs (Gil, 2019; Barbieri, 2022). Table 4 shows Spearman's matrix of correlations between the questions of the instrument.

In the organizational culture axis. Positive and low-magnitude associations were observed between environmental training (Q4) and managers' training (Q5;  $\rho = 0.11$ ), as well as between (Q4) and educational materials (Q8;  $\rho = 0.03$ ) and between Q5 and Q8 ( $\rho = 0.02$ ). These coefficients suggest the coexistence of training practices, but without strong interdependence, consistent with the view of learning and culture as incremental and heterogeneous processes in MSEs (Valdez-Juárez et al., 2019; Gao & Yang, 2022). This evidence dialogues with the role of awareness as a structuring requirement for environmental practices, according to management guidelines and organizational responsibility (ISO, 2015; ISO, 2010).

**Table 5**

*Correlation matrix between the questions in the questionnaire*

Issue:	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Q4	1,00	0,11	—	—	0,03	—	—	—	—	—
Q5	0,11	1,00	—	—	0,02	—	—	—	—	—
Q6	—	—	1,00	0,10	—	—	0,08	-0,13	0,06	—
Q7	—	—	0,10	1,00	—	—	0,05	0,05	-0,01	—
Q8	0,03	0,02	—	—	1,00	—	—	—	—	—
Q9	—	—	—	—	—	1,00	—	—	—	0,04
Q10	—	—	0,08	0,05	—	—	1,00	0,03	0,12	—
Q11	—	—	-0,13	0,05	—	—	0,03	1,00	0,15	—
Q12	—	—	0,06	-0,01	—	—	0,12	0,15	1,00	—
Q13	—	—	—	—	—	0,04	—	—	—	1,00

Source: Prepared by the author (2025).

In the environmental engagement axis, the associations between the use of renewable energy (Q6) and campaigns for the rational use of resources (Q7;  $\rho = 0.10$ ), awareness about biodiversity (Q10;  $\rho = 0.08$ ) and rational use of water (Q12;  $\rho = 0.06$ ) were positive and weak, as shown in Table 4. Negative associations of low magnitude were also observed, such as between Q6 and reduced resource consumption (Q11;  $\rho = -0.13$ ). The empirical literature points out that operational engagement practices tend to be adopted in a punctual and fragmented way in MSEs, due to financial and operational constraints (Nguyen & Tran, 2020; Rosa et al., 2022). This pattern reinforces the adequacy of *Spearman's* correlation to capture nonlinear associations between environmental practices.

In the axis of environmental behavior as organizational empirical evidence, there was practically no association between the integration of practices with corporate policies (Q9) and environmental policies aligned with the SDGs (Q13;  $\rho = 0.04$ ), indicating low co-occurrence between internal formalization and alignment with global agendas in the analyzed sample (Calisto et al., 2021; Chen et al., 2023).

This pattern is compatible with the reading that environmental behavior is manifested by recurrent practices, but does not always automatically translate into strategic integration or SDG-oriented policies (Jabbour & Santos, 2021; Khizar et al., 2023). Institutional evidence reinforces that organizational constraints and low formalization can limit the institutionalization of these practices in MSEs (OECD, 2021; SEBRAE, 2022). From a normative point of view, the need for progressivity in the consolidation of systems, policies and monitoring is consistent with guidelines for management and evaluation of environmental performance (ISO, 2015; ISO, 2018; ABNT, 2021).

In summary, *Spearman's* correlations, which are predominantly weak, indicate that the incorporation of environmental sustainability in MSEs does not occur in a linear or cumulative way (Hair et al., 2009; Marôco, 2014). This result points out that environmental advances develop as an incremental organizational process, in which operational practices can coexist with low levels of strategic formalization (Calisto et al., 2021; Jabbour; Santos, 2021; Khizar et al., 2023).

This pattern shows that daily engagement does not automatically convert into structured environmental sustainability, due to recurrent organizational and managerial limitations in this business size (OECD, 2021; Rosa et al., 2022; SEBRAE, 2022). Thus, the inferential analysis reinforces the interpretation that the incorporation of environmental sustainability in MSEs occurs gradually, conditioned by learning processes, organizational routines and available structural capacities.

## 5 CONCLUSION

The objective of this study was to analyze the environmental practices adopted by MSEs, considering the articulation between organizational culture, environmental engagement and environmental behavior in the process of incorporating environmental sustainability. The results confirmed that this objective was achieved. The analyses showed distinct patterns of consolidation between operational, educational and strategic practices.

The findings indicated that environmental practices are organized in an incremental and non-linear way. There was a greater consolidation of actions associated with organizational culture and daily engagement. In contrast, strategic institutionalization, which remained heterogeneous. Thus, environmental sustainability in MSEs manifested itself as a progressive process, conditioned by routines, learning and organizational capacities.

The main contribution of the study lies in offering integrated empirical evidence on how culture, engagement and environmental behavior are articulated in the context of MSEs, based on an instrument aligned with recognized normative references. From a theoretical point of view, the study contributes by reinforcing environmental sustainability as a gradual organizational process, in which culture, engagement and behavior are articulated in a non-linear way in the context of MSEs. From a practical perspective, the results provided subsidies for managers and entrepreneurs by showing that the strengthening of educational and operational practices precedes the consolidation of environmental sustainability.

Among the limitations of the study, the cross-sectional design stands out, which did not allow us to observe the temporal evolution of environmental practices. In addition, the use of self-reported data, which could reflect individual perceptions of the respondents, and the sample restricted to MSEs, which limits the generalization of the results. These limitations, however, are compatible with the descriptive and exploratory objective of the research.

As an agenda for future research, it is recommended to carry out longitudinal studies that allow monitoring the maturation of environmental practices over time. It is also suggested to expand the sample to other segments of MSEs and to incorporate environmental performance indicators. These approaches can deepen the understanding of the mechanisms that favor the transition of operational practices to more structured levels of institutionalization of environmental sustainability.

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