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ARTICLE

# The nature of the intention to act sustainably: design and validation of a measurement scale

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## Abstract

**Purpose** – This study aims to develop and evaluate a measurement scale that establishes the influence of individual environmental attitudes, sustainability awareness, and personal values on the intention to act sustainably among Mexican university students.

**Theoretical framework –** This study was developed through the lens of the Theory of Planned Behavior.

**Design/methodology/approach** – Content, expert, and statistical validations were carried out on a sample of 192 young university students to conform and validate the instrument. Previous data analysis provided the suggested normality parameters, followed by an exploratory factor analysis that established the relevance of the items per construct for unidimensionality. Finally, a confirmatory factor analysis was carried out to confirm the unique conformation of the variables (convergent and discriminant validity).

**Findings** – An instrument composed of 19 items was obtained to evaluate the different variables, confirming the validity and reliability of the scale.

**Practical & social implications of research –** The study contributes to identifying the factors that generate sustainable behavior. It clarifies which elements are catalysts for generating such behaviors and guides the development of strategies to help future decision-makers maintain a balance in their actions toward general well-being.

**Originality/value** – The originality lies in the depth of the scale's validation analysis, the generated model, the topic addressed, and the possibility of replication by subsequent studies.

**Keywords:** Sustainability intention, environmental attitude, sustainability awareness, personal values, scale validation.

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## 1 Introduction

The analysis of environmental behavior has become a topic of interest in the literature, as there is a clear need to develop actions that encourage the establishment of sustainable behaviors (Corral & Queiroz, 2004; Rodriguez & Rodriguez, 2024). The literature on sustainable behavior suggests that intention is fundamental to establishing behavior because it is considered a prerequisite for its development. Intention is influenced by several factors, such as attitude, subjective norm, and perceived behavior – key elements of the Theory of Planned Behavior (TPB) (Torres et al., 2015).

The relevance of the factors that suggest the TPB for establishing behavior reflects the current modern society in which we live. However, modern society's concern for protecting the natural environment does not align with the needs of future generations in the face of global challenges. Most of the practices implemented nowadays are oriented toward short-term solutions that require minimal behavioral change. The adoption of complex sustainable initiatives is not considered preponderant in most countries around the world (Rex et al., 2015).

For this reason, understanding the choices people make and the internal and external factors that might influence their decisions is fundamental. This understanding may allow organizations and policymakers to design strategies that positively influence ethical and sustainable behavior, increasing the probability of establishing a behavioral change that leads to the implementation of practices that address the global challenges modern society faces (Abdolmohammadi & Baker, 2008).

The TPB has been widely used by scholars to understand the establishment of sustainable behavior in the context of sustainability intentions. This approach suggests that sustainable behavior is a voluntary action that integrates different drivers, including individuals' prior knowledge and motivations. This theoretical approach is oriented toward explaining changes in habits and the adoption of sustainable practices (Cherrier, 2012). A study developed by Ahmed et al. (2020) on the intention to buy organic food suggests that attitude, subjective norms, and perceived control have a positive effect on purchase intention. Furthermore, the study found that attitude has a positive effect on environmental awareness, which influences the intention to buy this type of food. Chen and Hung (2016) found that consumers' attitudes, perceived control, environmental awareness, environmental ethics, and beliefs are positively associated with their intention to buy green products. However, subjective norms and social impressions are not significantly correlated with sustainability intentions. Conversely, Munyaradiz (2023) analyzed how the TPB could predict business students' intentions regarding sustainable entrepreneurship. He found that only attitude had a positive influence on sustainable entrepreneurial intentions, while subjective norms indirectly effected intentions through attitude, and individual values were not statistically significant. Yasir et al. (2021) explored how values interact with sustainable entrepreneurial intention using the TPB. They suggest that students' intentions are supported by societal norms, perceived behavior toward sustainable entrepreneurship, and personal values that interact with sustainability intentions. Personal values are essential to fostering sustainable entrepreneurial intention.

This theoretical approach suggests that an individual's motivation to carry out a specific action is based on his or her decision to implement it and the belief that he or she can do so effectively. People's intentions are influenced by social standards, perceptions, and views about sustainability, reflecting the desire for a specific behavior and the ability to perform it (Yasir et al., 2021). The establishment of intention is outlined by three aspects: attitude toward specific behavior, subjective norms, and perceived control. These aspects highlight a person's behavior concerning a phenomenon (Giampietri et al., 2018; Nahapetyan et al., 2019; Sharma & Cyril, 2019).

The main argument of this perspective is that intention is bounded by the desire and ability to perform a certain behavior. Attitude and subjective norm are oriented toward the desire to perform the behavior, while perceived control focuses on its feasibility (Ajzen, 1991). Throughout the literature, several authors suggest that attitude is a significant predictor of intention because it is related to an individual's positive or negative view of a behavior (Doanh & Bernat, 2019; Rueda et al., 2022; Vuorio et al., 2018; Waris et al., 2021).

In the memory of an individual, there is an interaction between an object or situation and one's psychological assessment of it. This interaction defines one's acceptance of a specific behavior. This is because people's attitudes may reflect their personal beliefs about an objective behavior (Ahmed et al., 2020; Jabbour et al., 2019; Huang et al., 2018; Thelken & Jong, 2020). Therefore, people with more favorable attitudes toward a behavior may be more likely to engage in it, influencing the adoption of sustainable practices (Ajzen, 2020; Munyaradiz, 2023; Rex et al., 2015).

On the other hand, sustainability-oriented awareness is an integrated concept that represents the process of internalizing environmental, social, and economic issues. These issues can influence intentions, which in turn influence individual behavior (Barba-Sánchez et al., 2022; Xu et al., 2020). This implies a gradual understanding of the importance of sustainability issues and the desire to address them. This understanding is based on the personal beliefs of individuals, integrating their knowledge, concerns, cognitions, perceptions, attitudes, and values, as well as the solutions needed to achieve these objectives (Chen & Hung, 2016; Rannikko, 1996).

The degree to which individuals are aware of sustainability-related issues may influence intention and individual behavior; people with greater awareness are more likely to adopt sustainable practices (Kumar et al., 2019; Zhang et al., 2013). Authors have explored the influence of awareness on sustainability intentions, considering it a fundamental element for the establishment of an attitude that influences intention. From this perspective, the greater the awareness of sustainability issues, the greater the intention to participate in actions that contribute to finding solutions (Kumar et al., 2019; Si et al., 2020).

Previous studies suggest that sustainability awareness influences pro-environmental behavior, implying a positive relationship between awareness and attitude, which increases the likelihood that individuals will engage in sustainable practices (García et al., 2023; Gómez et al., 2023; Valenzuela et al., 2023; Xu et al., 2020). A study by Arundati et al. (2020) suggests that individuals with greater awareness of sustainability issues are more likely to acquire sustainable goods, thereby reducing environmental impact. On the other hand, Wierzbinski et al. (2021) argue that knowledge of environmental issues leads to the adoption of sustainable practices, suggesting that awareness precedes sustainable decision-making.

Regarding personal values, these are a relevant aspect in shaping a person's desire to act. They can be conceptualized as objectives that guide a person's life and determine the issues to which they wish to commit. These values influence behavior by helping individuals evaluate their context based on their perceptions and previous knowledge (Liang et al., 2022; Thelken & Jong, 2020). Schwartz (2010) defines values as ideals that inspire behaviors and represent guiding principles in a person's life. Values serve as criteria for making decisions, conducting oneself, adopting attitudes, and carrying out acts. Values outline a person's actions and are a fundamental aspect for understanding human conduct and establishing consistent behavior.

People tend to act according to their personal values and try to balance their actions with their perspectives, considering values to be the criteria needed to evaluate themselves or others (Yasir et al., 2021). Several authors have suggested that personal values can influence a person's intentions regarding sustainable issues since they serve as a personal guide. This allows values to influence behavior, serving as evaluation criteria for different actions, people, or situations (Han, 2015; Kumar et al., 2019).

The TPB suggests that attitudes and values may influence an individual's intentions and behaviors (Cohen & Winn, 2007). Personal values may be considered the basis of ethical obligations because they reflect beliefs about right and wrong, influence behavior, and reflect self-identity. These aspects are fundamental to changing behavioral intention (Rex et al., 2015).

On the other hand, sustainability is an issue that seeks to be integrated across different sectors, each of which contributes to sustainable development objectives. One important sector is the academic field, where young university students will be future strategic change agents whose decisions will be crucial in providing solutions to environmental challenges. Thus, it is important to identify the elements that influence their behavioral decisions (Instituto Mexicano de la Juventud, 2018; Organización de las Naciones Unidas, 2024).

Therefore, the objective of this study is to address the lack of integrated, validated instruments in the literature that assesses the psychological drivers of sustainable behavior. This study develops and validates a measurement scale that captures the influence of environmental attitude, sustainability awareness, and personal values on intention to engage in sustainable behavior. Although these constructs have been studied individually, there are no comprehensive tools that assess their combined effect within a unified framework. Integrating these constructs into a validated instrument could contribute to our understanding of the psychological determinants that drive sustainable decision-making. This study adopts a quantitative approach, incorporating content validation, expert judgment, and statistical procedures such as exploratory and confirmatory factor analysis to ensure the reliability and validity of the scale.

In addition to its theoretical contributions to sustainability and behavioral research, this scale provides practical value by offering managers, policymakers, and sustainability practitioners a validated tool to identify key factors that contribute to sustainable behavior, allowing them to develop and implement strategies that foster sustainable practices within organizations and societal contexts.

This document is structured as follows: first, a literature review conceptualizes each variable, followed by a detailed description of the methodology, explaining the validation carried out in its different phases, describing the study population and sample, the data collection instrument and its operationalization, and explaining the data analysis method. Next, it presents the results of the descriptive analysis, preliminary analysis, exploratory and confirmatory factor analyses, and the model fit. Then, it presents the model itself. Finally, the discussion and conclusions are presented.

## 2 Theoretical background

### 2.1 Intention to act sustainably

Intention is considered a precursor to behavior because it can motivate individuals to engage in certain behaviors. It can also be influenced by factors such as attitude, subjective norms, and perceived behavior, which are elements of the TPB (Torres et al., 2015). Intention captures the motivational factors that influence the establishment of behavior and are considered indicators of the effort people are willing to exert to perform a behavior (Ajzen, 1991). Trail and McCullough (2021) suggest that the stronger the intention, the higher the probability that an individual will engage in a specific behavior.

The theoretical perspective of the TPB suggests that establishing an intention may lead to the development of behavior since it is considered a precursor to conduct, indicating a person's willingness to take an action (Winter et al., 2021). Intentions are shaped by individuals' desires and abilities to perform a behavior, integrating motivations, normative beliefs, and perceived probabilities of success or failure. Individuals may attempt to develop a behavior if they believe the advantages outweigh the disadvantages (Ajzen, 1985).

Studies in the literature address the relationship between sustainability intentions and the establishment of a behavior. Jimenez et al. (2014) found that consumers were willing to buy remanufactured computers based on price and environmental concerns. These factors increased their purchase intention and demonstrated their desire to pay for eco-friendly services after balancing the advantages and disadvantages of supporting green initiatives. Dixon et al. (2015) found that subjective norms, attitudes, and perceived behavioral control influence behavioral intention to engage in energy conservation at a U.S. university. Rains et al. (2017) show that understanding environmental issues such as climate change influences consumers' willingness to pay for sustainable products and their intention to act sustainably based on their knowledge.

According to the TPB perspective, attitude is one of the factors that shapes the establishment of a sustainability intention. It describes an individual's desire to carry out a certain behavior. Attitude describes an individual's positive or negative interest in performing a certain action, allowing his or her interpretation of context to guide his or her actions (Rodríguez et al., 2022; Thelken & Jong, 2020). The second factor is subjective norms, which are oriented toward how closely people can approve or disapprove of a certain individual behavior. Subjective norms are the result of different normative beliefs, such as individual values that reflect the desire for approval. These beliefs can inhibit or motivate the individual's sustainability intentions (Vuorio et al., 2018). The third factor is perceived behavior, which reflects the degree to which an individual believes he or she is capable of successfully performing a certain activity (Ajzen, 1991; Ploum et al., 2018). Perceived behavior can be derived from the control of individual beliefs that describe the individual's confidence in his or her abilities (i.e., self-efficacy), allowing recognition of the degree to which he or she can resolve a situation and the capacity he or she possesses. This influences decision-making and motivates intentions that may become behaviors (Ploum et al., 2018; Thelken & Jong, 2020).

### 2.2 Environmental attitude and sustainability intentions

From this perspective, attitude plays a relevant role in the establishment of a sustainability intention, which can trigger a behavior (Kuo, et al., 2018). Attitude can be understood as an evaluation related to an individual's cognitive beliefs about ideas, people, objects, events, and situations. These evaluations create favorable or unfavorable perspectives that guide an individual's actions in a positive or negative way, reflecting their particular desires (Maio et al., 2018; Si et al., 2020).

A positive attitude toward sustainability-related issues can motivate the development of sustainability intentions and make it more likely that individuals with a strengthened attitude toward these issues will implement actions aligned with this orientation (Jabbour et al., 2019; Thelken & Jong, 2020).

Throughout the literature, various studies suggest that attitude is a significant predictor of intention setting. Nguyen et al. (2018) examined factors that contribute to or impede green purchase behavior in young consumers and found that attitudes, knowledge, personal norms, self-identity, and perceived barriers significantly influence the purchase of energy-efficient appliances in an emerging market. Taufique and Vaithianathan (2018) analyzed the antecedents of ecologically conscious consumer behavior in India from the perspective of the TPB, finding that attitude and perceived consumer effectiveness influence behavioral intention, which leads to ecologically conscious consumer behavior.

The TPB suggests that a favorable attitude increases the intention to engage in a specific behavior, increasing the likelihood of establishing sustainable conduct. Thus, it is possible to predict whether a person will act in a pro-environmental way (Swaim et al., 2013). Several authors support this relationship between attitude and intention, suggesting a positive influence of attitude on motivating sustainability intentions. For instance, Kumar (2019) found that people with positive attitudes regarding the natural environment are more likely to reduce their environmental impact. Ibrahim et al. (2021) analyzed the relationship between attitude and anti-littering intention and found that the former is a strong predictor of the latter. Wang et al. (2018) argue that individuals who prioritize environmental care are more likely to engage in environmentally friendly behavior.

Environmental attitudes are powerful influences on the establishment of sustainability intentions, which influence behavior. For this reason, developing pro-environmental attitudes is fundamental to motivating people to act sustainably (Swaim et al., 2013).

## 2.3 Awareness and sustainability intentions

Sustainability awareness is conceptualized as an understanding or internalization of environmental, social, and economic issues that can influence individual intention and, consequently, behavior (Barba-Sánchez et al., 2022; Xu et al., 2020). Awareness implies the extent to which a person is conscious of the adverse consequences of not acting sustainably and considers different valued aspects, such as people, animals, plants, the natural environment, and habitats (Schwartz, 1977).

Previous studies suggest that sustainability awareness affects intention, which subsequently affects individual behavior, through different factors that integrate the TPB (Ajzen & Fishbein, 1980; Wang et al., 2016). This perspective aligns with that of Chen and Tung (2014), who examined consumers' intention to visit sustainable hotels, considering pro-sustainability awareness as a variable preceding the three fundamental components of the TPB, suggesting positive effects. Similarly, Bamberg (2003) found in his study of university students that awareness of sustainability issues influences intention to engage in behavior through the basic variables of the TPB. In turn, Shen (2012) suggests that consumers who are more aware of the benefits of sustainable products are more likely to pay an additional price for such features, thus motivating intention and subsequently influencing behavior.

Therefore, the degree to which people are aware of sustainability issues can be a significant factor in forming attitudes that guide future intentions (Kumar et al., 2019). Chen and Hung (2016) point out that awareness of sustainability-related issues and the desire to contribute to solving them play a fundamental role in developing favorable attitudes and influencing behavior. Scholars have examined awareness of sustainability issues and its impact on sustainability intentions in relation to sustainable purchasing (Lee et al., 2014), renewable energy (Salmela & Varho, 2006), recycling and conservation (Nguyen et al., 2016), and sustainable business creation (Middermann et al., 2020; Peng et al., 2021).

All of these studies share the same orientation: people's attitudes are influenced by environmental awareness, and these attitudes lead to pro-environmental intentions (Badawi et al., 2023). To address problems with a sustainable approach, one must understand the consequences of not acting. This awareness can motivate a sense of responsibility and encourage sustainable behaviors. Thus, the greater the awareness of sustainability issues, the greater the intention to participate in actions that contribute to finding solutions (Si et al., 2020; Zhang et al., 2018).

### 2.4 Personal values and sustainability intentions

Personal values influence the desire to act sustainably and determine sustainability intentions (Fischer & Schwartz, 2011; Thelken & Jong, 2020). Personal values can be conceptualized as objectives that transcend situations and serve as guiding principles in a person's or social entity's life, providing stable beliefs regarding the desire to develop certain modes of existence (Schwartz, 1992). Personal values guide people's lives by determining the issues to which they commit, allowing them to evaluate their contexts based on their perceptions and prior knowledge, thus influencing their behavior (Liang et al., 2022).

Thogersen and Olander (2002) point out the relevance of personal values and their influence on individual behavior. They suggest that values influence sustainable behaviors, which implies that people tend to make decisions and act based on the values they consider most relevant, especially when there is conflict between different values. In such cases, individuals decide based on the values that best represent them. However, this may vary according to individual characteristics and contexts (Liang et al., 2022).

Personal values can directly and indirectly influence sustainability intentions and individual behavior. Values can sensitize individuals to potential consequences that may affect issues of concern, allowing them to develop a sense of empathy, which is underpinned by personal values (Kumar et al., 2019).

Several studies have suggested that personal values influence a person's intention to act sustainably because values serve as a personal guide that increases concern about sustainability issues, positively influencing their behavior. Bolzani and Foo (2018) suggest that individual values, such as self-enhancement, have a positive effect on sustainable entrepreneurial intention in European nations. Holland and Shepherd (2013) found that self-transcendent values motivate individuals to prioritize environmental protection and human well-being. On the other hand, Yasir et al. (2021) suggest that people with certain values are more inclined to prioritize environmental protection and integrate sustainable practices into their business and entrepreneurial endeavors.

Personal values are important in the decision-making process because they serve as criteria for evaluating different actions, people, or situations (Kumar et al., 2019; Schwartz & Bilsky, 1990). Therefore, personal values are fundamental to understanding sustainability intentions because they are considered determinants of behavioral intention toward sustainability (Vermeir & Verbeke, 2008).

## 3 Methodology

The methodology was a quantitative, cross-sectional, exploratory, non-experimental study. Numerical measurements were used to explain the phenomenon under study within a given timeframe without altering the analysis variables. This methodology has also been deemed relevant in previous studies for scale validation (Contreras et al., 2020; Arango-Ramírez et al., 2023; Martínez-González et al., 2021; May et al., 2020). The measurement scale was based on a reflective model in which the relationship was generated from each construct to each of its items. It is indicated that these must correlate with each other and be interchangeable in such a way that eliminating any of them does not affect the general explanation of the variable in question (Guenther et al., 2023; Vallejos, 2022; Rodríguez & Galvis, 2020; Arango-Ramírez et al., 2023).

To fulfill the objective of the present study, an instrument was developed, adapted, and validated in three stages commonly used by various authors to create and evaluate measurement scales (Contreras et al., 2020; Palacios-Mora et al., 2023; Arango-Ramírez, et al., 2023; Pedraz-Petrozzi et al., 2020): a) content validation, b) expert validation, and c) construct validation.

For content validation, a literature review was carried out to identify measures proposed by various authors regarding these variables. The items that best represented the constructs within the context of the study were selected. The recommendation to maintain at least three items per latent variable to determine reliability and validity statistics was considered (Lloret et al., 2014; Urbiola et al., 2014). At this stage, each of the authors of this study adapted and translated the measurement scales and then compared them to unify the wording. This was validated by a specialized English translator. Finally, five undergraduate students (as part of the target sample) were asked to read the questionnaire to confirm that each question's wording and content were understood (Supplementary Data 4 - Appendix A).

For the second phase, ten experts validated the instrument; five focused on content and five on methodology. This approach aimed to obtain content and structural validity from different scholars.

The twenty indicators of the instrument were evaluated in terms of relevance, clarity, and ease of understanding using a five-point scale (1-Bad, 5-Very Good). The results were quantified using the Aiken V coefficient to determine an overall assessment of the questionnaire. Coefficients equal to or greater than 0.8 are considered adequate to indicate validity (Contreras et al., 2020; Penfield & Giacobbi, 2004).

In addition, the quantitative assessments provided by the experts included a final qualitative column in which they could formulate observations to eliminate, modify, or incorporate pertinent aspects for each question. (Supplementary Data 5 - Appendix B shows that the results suggest validity since all values were significant and higher than 0.800 ($p < 0.05$). Thus, the items are considered valid by to experts. However, the observations for the highlighted questions should be taken into account.

The third phase, construct validation, evaluated the scores of the scales that measure concepts (Pérez-Gil et al., 2000). This is relevant because various ideas or definitions are not directly observable or measurable by a single value, requiring a set of indicators to measure and shape such concepts (Lloret et al., 2014; Pérez & Medrano, 2010). To obtain scores validating this final stage, an exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were conducted.

EFA uses an inductive approach of multivariate statistical methods to determine which items can effectively measure each construct. This involves subtracting items from a broader set of indicators when evaluating their relationship patterns. It starts with an internal evaluation of the construct structure to group the measures that best correlate with each other, differentiating them from other groupings within the construct (Lloret et al., 2014; Pérez & Medrano, 2010). On the other hand, CFA is a deductive approach that evaluates the similarity between the theoretical and practical conceptualizations of a construct when a clear understanding of the hypothesized structure of the variables already exists, thereby validating the CFA (Hair et al., 2009; Lloret et al., 2014). CFA establishes stricter criteria than EFA for evaluating solutions, thus confirming scale validity (Supplementary Data 1 - Variables and Codebook; Supplementary Data 2 - Dataset; Supplementary Data 3 - Dataset V of Aiken).

## 3.1 Data analysis method

The first stage of construct validation starts with an EFA using SPSS software. Through this analysis, we seek to establish an inductive approach to determine the items that will comprise the structure of each construct and identify the measures that best correlate with each other (Lloret et al., 2014; Pérez-Gil et al., 2000; Pérez & Medrano, 2010). EFA is a set of multivariate statistical methods that explore data to determine the best representation for each variable, starting from a broad set of measures. This allows us to select the items that best explain each variable and identify errors to avoid to obtain the greatest common variance (Hair et al., 2009; Lloret et al., 2014; Pérez & Medrano, 2010).

This analysis uses the maximum likelihood extraction method and Varimax rotation, since they provide optimal results (Gómez-Mejía, 2021; Saltos et al., 2021; Becerra & García, 2023; Pérez & Medrano, 2010). This stage evaluates the reliability of internal consistency using Cronbach's alpha to determine if the set of items measures what it should (Guenther et al., 2023; Ringle et al., 2023. It also performs a multicollinearity analysis to determine the level of correlation between the measures (Pérez & Medrano, 2010) and evaluate Bartlett's sphericity and Kaiser-Meyer-Olikin (KMO) sampling adequacy to determine whether the level of interrelation between items of the construct is adequate (Arango-Ramírez et al., 2023; Lloret et al., 2014).

Next, the communalities that indicate the average variation of the construct items are interpreted (Hair et al., 2009). The total variance extracted is determined to establish the percentage of total variance explained by the set of items of each construct (Arango-Ramírez et al., 2023). The matrix of rotated factors that establish the factor loadings for each item and the number of factors generated for each variable is analyzed (González et al., 2020; Cheah et al., 2019).

Then, using the SmartPLS4 software and the method of structural equations based on partial least squares (PLS-SEM), statistical calculations are generated to carry out the CFA, through which a deductive approach is developed to confirm the validity of the EFA (Hair et al., 2009; Lloret et al., 2014). Various authors have used this multivariate statistical technique to confirm previously proposed measurement scales (Ibarra & Rodríguez, 2020; López & Álvarez, 2021; Villén-Contreras et al., 2024; López, 2024).

A structural equation model (SEM) allows for the appropriate simultaneous evaluation of multiple regressions, examining the interrelationships between variables. Within this model, unobservable concepts (latent variables) can be represented by a set of specific measures. Likewise, causal relationships can be established and analyzed. SEM is considered one of the best procedures for model validation (Gonzalez-Montesinos & Backhoff, 2010).

On the other hand, the partial least squares (PLS) approach employs approximations to represent the constructs and convert them into more accurate interpretations by minimizing errors. It provides a better explanation of the variance explained by the constructs ($R^2$), and seeks to increase the variance explained by each variable. It is recommended for exploratory research and identifying scores for latent variables, as in the present case. It can handle normality problems in the data by adjusting the confidence intervals (Hair et al., 2019; Nguyen, 2020). Within this modality, the bootstrapping technique is used to obtain statistical significance.

For the second part of the analysis, a CFA is carried out using the PLS-SEM method. Because the model is reflective, various authors (Hair et al., 2019; Hair et al., 2022; Guenther et al., 2023; Ringle et al., 2023; Arango-Ramírez et al., 2023) suggest taking into account the contribution of each item to explaining the construct by evaluating the loadings (reliability analysis). The degree to which items within the same construct relate to each other (convergent validity) is established through the average variance extracted (AVE). Internal consistency reliability is determined through Cronbach's alpha (lower limit) and the composite reliability index (CR). The particularity (discriminant validity) of each construct is established through the heterotrait-monotrait criterion (HTMT), and the goodness of fit of the model is determined by SRMR.

## 3.2 Population and sampling

### 3.2.1 *Youth and sustainability*

This study emphasizes the perspectives of young university students in Mexico regarding the influence of environmental attitudes, sustainability awareness, and personal values on their intention to act sustainably. The interest in this group is based on the importance of the participation of young people as agents of strategic change in generating integral solutions to social and ecological challenges (Instituto Mexicano de la Juventud, 2018; Organización de las Naciones Unidas, 2024).

Young people play a very important role in social evolution, since they are the ones who will make important family, cultural, environmental, work, business, and political decisions in the near future and set the course in generating solutions. Therefore, analyzing their attitudes and positions on sustainability can contribute to the development of strategies to increase their commitment to the issue (Martínez, 2022; Díaz et al., 2020).

Several studies have indicated the importance of considering the perspectives of young people as catalysts for change (Campechano-Escalona et al., 2021; Romero-Argueta et al., 2020; Martínez, 2022; Díaz et al., 2020; Brandão et al., 2018). These studies suggest that they are more oriented towards sustainability than previous generations and demonstrate greater environmental and societal awareness and responsibility, whether conscious or unconscious, especially after the COVID-19 pandemic (Dávalos, 2023; Martínez, 2022).

However, other authors (Fatoki, 2019; Menacho & Felipe, 2022) have identified inconsistencies between young people's thoughts and actions. This creates a disconnect between thoughts and deeds. These authors suggest that young people may believe their actions do not significantly impact the environment or lack the commitment to carry out these actions. On the other hand, some argue that young people do not understand why they behave the way they do. They confuse an innate sense of responsibility toward the environment and others with a duty derived from complying with certain rules (Campechano-Escalona et al., 2021). Therefore, there is a need to develop moral and sustainability intentions in young people (Romero-Argueta et al., 2020; Dávalos, 2023; Sánchez-Carracedo et al., 2021; Menacho & Felipe, 2022; Si et al., 2020), as well as increase their commitment to the environment (Martínez, 2022).

### 3.2.2 *Population and sample*

The area of study comprises three regions of Mexico: Tamaulipas (124,273), Hidalgo (94,231), and Yucatán (77,441. These regions represent the north, center, and south of the country, respectively. The population profile comprises 295,945 university students from these regions (ANUIES, 2023). Promoting sustainable practices in these states protects their natural resources, including grasslands, coasts, beaches, ports, crops, species diversity

(flora and fauna), natural reserves, hills, non-metallic minerals, water resources, and aquifers (Gobierno del Estado de Tamaulipas, 2025; Gobierno de México, 2023; Gobierno del Estado de Yucatán, 2025).

The sample was selected without restriction by major, sex, or any other demographic characteristic, except for state and educational level. This was done to include a greater number of students represented in the sample. Likewise, access to participants and their voluntary participation were considered according to the logistical and operational resources available at the time of administering the instrument in order to avoid affecting the quality of the analysis. Considering the exploratory nature of the research, the goal was to gain a preliminarily understanding of the phenomenon under study based on analysis of the three selected areas. These areas represent different universities and contexts, providing an approach to the diversity of the country.

Using the finite population formula to determine the sample size (Rodríguez et al., 2022; Vázquez & Flores, 2021; Zelada, 2022), we obtained a recommended number of 288 individuals to survey, taking into consideration a confidence level (z) coefficient of 1.96, a population (N) of 295,945, a probability in favor (p) of 0.75, a probability against (q) of 0.25, and an error (e) margin of 0.05.

$$n = \frac{Nz^2pq}{e^2(N-1)+z^2pq}$$

$$n = \frac{295,945(1.96)^2}{(0.05)^2(295,945-1)+} \frac{(0.75)(0.25)}{(1.96)^2(0.75)(0.25)} = 288 \quad (1)$$

Nevertheless, the response rate was just over 60%, yielding 192 questionnaires with the necessary characteristics for analysis. Non-probabilistic convenience sampling was used from the economic-administrative, engineering, health, legal, natural, and educational areas (Saleem et al., 2018; Torres et al., 2015). Students were selected at the discretion of the participating universities based on the support they provided. Likewise, snowball sampling was used (Hernández, 2021) because the participants distributed the questionnaires to their acquaintances who met the study criteria.

Some limitations derived from the sampling method used are related to the representativeness of the university population in the selected states. Since a random technique was not used, not all students had the same chance of being chosen for the sample, restricting the participation of some groups with different characteristics. Therefore, the results should be considered an approximation and should not be generalized to the population. They should be limited to the participants only (Asiamah et al., 2022).

Despite the response rate, the number of 192 questionnaires satisfies the requirements of Hair et al. (2009) and Lloret et al. (2014). They indicate that a sample size of 100 observations is satisfactory when there are up to five variables and 150 observations when there are up to seven. In addition, Pérez and Medrano (2010) propose a minimum of five participants per item, supporting arguments by Nunnally and Bernstein (1994). Thus, this study totals at least 100 participants. The extraction technique used for the EFA is maximum likelihood estimation, which suggests a minimum of 100 observations to generate consistent results. The absence of missing data also favors the reliability of the results (Hair et al., 2009).

Finally, this research uses the PLS analysis technique. This technique can efficiently work with both large and small samples since it seeks to minimize error. Therefore, it uses the rule of ten to determine the minimum sample size. The rule states that the number of generated structural relationships (paths) should be multiplied by ten to determine the minimum amount required (Hair et al.t, 2017; Quoquab & Mohammad, 2020). For the present study, the minimum sample size was 30, and 192 were collected, which is a satisfactory amount.

## 3.3 Data collection instrument

Data were collected from May to August 2023 using a self-administered electronic questionnaire with Likert-type scale questions. The questionnaire was distributed by a Google Drive form. The instrument uses four demographic variables for classification: age, sex, state of residence, and race. This allows for an analysis of the participants' profile.

The scales for measuring the observable variables were operationalized through twenty items (see Supplementary Material 6 - Appendix C). Five items evaluated Intention to Act Sustainably, considering mainly the contributions of Torres et al. (2015), Silva et al. (2021), Dixon et al. (2015), García (2023), and Rodríguez et al. (2022). Five items assessed Environmental Attitude, based on Diaz and Beerli (2006), Girón and Leyva (2013), Saiz and Moreno (2010), and Ayuque-Rojas et al. (2024).

Sustainability Awareness was measured with five items, considering the contributions of Laso et al. (2019) and Torres et al. (2023). Finally, the variable Individual's Personal Values was constituted by five measures based on the work of Campos and Lara (2023), Rodríguez et al. (2022), and Schwartz (1992). In all cases, the items were evaluated using a five-point Likert scale, where (1) indicates "Strongly Disagree" and (5) indicates "Strongly Agree."

# 4 Results

## 4.1 Descriptive data analysis

The descriptive results of the analyzed sample (Table 1) provide information regarding the respondents' age, sex, state of residence, and career. Notably, the majority of respondents are between the ages of 17 and 18 (32.4%) or 19 and 20 (48.9%). Thus, this study is evaluated through the perceptions of young students primarily pursuing bachelor's degrees in economics and administration (36.4%), engineering (22.9%), health sciences (16.7%), legal sciences (7.3%), natural sciences (5.8%), and educational sciences (4.7%). This provides an interdisciplinary perspective for analyzing sustainability, an important aspect identified by the United Nations (Organización de las Naciones Unidas, 2018) for generating comprehensive solutions due to the complexity of the studied phenomenon.

Additionally, there is a nearly balanced representation of men (46.9%) and women (53.1%) who are residents of the north (Tamaulipas, 43.7%), center (Hidalgo, 25%), and south (Yucatán, 31.2%) of the country. This allows for a broader vision to enrich the study by incorporating the characteristics of different contexts and understanding the decision-making and behaviors of both men and women in generating solutions (Organización de las Naciones Unidas, 2022).

## 4.2 Exploratory factor analysis (EFA)

The internal consistency reliability, multicollinearity, Bartlett's sphericity, KMO, commonalities of the measures, total variance extracted, and matrix of rotated factors were evaluated as part of the EFA. Regarding Cronbach's alpha, the resulting values are considered satisfactory for all constructs (ranging from 0.796 to 0.927), exceeding the recommended value of 0.700 for adequate internal consistency (Hair et al., 2009, 2017). Concerning the multicollinearity of its measures, taking the low (0.300-0.500), medium (0.500-0.700), and high (0.700-0.900) levels as a basis (Galván et al., 2019; Pérez & Medrano, 2010), medium and high correlations (0.640 to 0.784) are presented for Intention to Act Sustainably, low and medium (0.437 to 0.645) for Environmental Attitude, medium and high (0.630 to 0.876) for Sustainability Awareness, and low and medium (0.324 to 0.650) for Individual's Personal Values.

On the other hand, the KMO (0.743 to 0.897) and Bartlett's sphericity index (<0.05) suggest adequate interrelationships between the variables (Lloret et al., 2014; Pérez & Medrano, 2010). Taking the low (<0.40), medium (0.50), and high (>0.60) levels as a reference (Hair et al., 2009; Lloret et al., 2014), the commonalities are indicated as high (0.607 to 0.792) for Intention to Act Sustainably, low to high (0.380 to 0.642) for Environmental Attitude, moderate to high (0.559 to 0.800) for Sustainability Awareness, and low to high (0.366 to 0. 660) for Individual's Personal Values. This establishes a total variance extracted higher than 50% in all cases (50.91% to 72.04%) across a single factor, with loadings higher than 0.600. All items are considered significant according to the recommended threshold of >0.500 (Hair et al., 2017; Lloret et al., 2014; Urbiola et al., 2014). To obtain these results, eliminating item A1 is suggested. Table 2 shows the key findings of the EFA on the left.

Table 1
**Sample Profile**

| | |
|---|---|
| **Age** | **17-18 (32.4%); 19-20 (48.9%); 21-22 (15.1%); 23-24 (1.5%); 25 or more (2.1%)** |
| Sex | Men (46.9%); Women (53.1%) |
| State | Tamaulipas (43.7%); Hidalgo (25%); Yucatán (31.2%) |
| Career | Economics and Administration (36.4%); Engineering (22.9%); Health Sciences (16.7%); Legal Sciences (7.3%); Natural Sciences (5.8%); Educational Sciences (4.7%) |

**Source:** Elaborated by the authors based on SPSS

Table 2
**Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA)**

| Variable | Item | EFA | | | | CFA (**) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Loading | Commonality | Cronbach's Alpha | VTE (*) | Loading | Cronbach's Alpha | CR | AVE |
| *Intention to Act Sustainably* | IS1 | 0.866 | 0.751 | 0.927 | 72.04% | 0.844 | 0.927 | 0.927 | 0.719 |
| | IS2 | 0.825 | 0.680 | | | 0.814 | | | |
| Medium to high correlation | IS3 | 0.890 | 0.792 | | | 0.875 | | | |
| (0.640 to 0.784) | IS4 | 0.879 | 0.773 | | | 0.850 | | | |
| | IS5 | 0.779 | 0.607 | | | 0.854 | | | |
| *Environmental Attitude* | A2 | 0.801 | 0.642 | 0.796 | 50.94% | 0.682 | 0.804 | 0.799 | 0.514 |
| | A3 | 0.616 | 0.380 | | | 0.655 | | | |
| Low to medium correlation | A4 | 0.665 | 0.442 | | | 0.476 | | | |
| (0.0.437 to 0.645) | A5 | 0.757 | 0.573 | | | 0.966 | | | |
| *Sustainability Awareness* | CS1 | 0.747 | 0.559 | 0.924 | 71.15% | 0.851 | 0.924 | 0.923 | 0.707 |
| | CS2 | 0.820 | 0.672 | | | 0.916 | | | |
| Medium to high correlation | CS3 | 0.870 | 0.757 | | | 0.943 | | | |
| (0.630 to 0.876) | CS4 | 0.894 | 0.800 | | | 0.729 | | | |
| | CS5 | 0.878 | 0.771 | | | 0.744 | | | |
| *Individual's Personal Values* | V1 | 0.707 | 0.500 | 0.832 | 50.91% | 0.637 | 0.836 | 0.836 | 0.514 |
| | V2 | 0.721 | 0.520 | | | 0.634 | | | |
| | V3 | 0.813 | 0.660 | | | 0.987 | | | |
| Low to medium correlation | V4 | 0.605 | 0.366 | | | 0.624 | | | |
| (0.324 to 0.650) | V5 | 0.707 | 0.499 | | | 0.634 | | | |

(*) Total variance explained; (**) Significance at 5%, bootstrapping with 5,000 iterations.
**Source:** Elaborated by the authors based on SPSS and SmartPLS4 software results.

In accordance with theory (Guenther et al., 2023; Ringle et al., 2023; Arango-Ramírez et al., 2023; González et al., 2020), the indicators proposed for each construct are interconnected. This establishes their relevance in representing the variables and consistently strengthening their explanation. Likewise, optimal levels of unidimensionality are achieved. In practice, this implies that the items measure what they are supposed to measure, creating a valid, reliable, and useful research instrument.

## 4.3 Confirmatory factor analysis (CFA)

In the CFA, reliability is determined by evaluating item loadings, internal consistency (Cronbach's alpha), and the composite reliability index (CR) to assess convergent validity. Additionally, the AVE is used to determine the association of the measures with each other, and the HTMT criterion is used to establish the uniqueness of each construct. Finally, the SRMR is used to confirm the model's fit.

The loadings are satisfactory and significant for almost all of the items (>0.600) except for A4 (0.476). Eliminating A4 would affect the AVE value of Environmental Attitude. Hair et al. (2009) indicate that variables with loadings of 0.450 are adequately representative when the sample size is greater than 150. This condition is met, so the item is kept. Therefore, the appropriate relationships are established between the measures and their variables (Hair et al., 2017; Lloret et al., 2014; Urbiola et al., 2014).

Likewise, Cronbach's alpha (0.804 to 0.927) and CR (0.799 to 0.927) are considered satisfactory in all cases (>0.700), suggesting adequate internal consistency of the variables (Hair et al., 2009, 2017). Concerning the AVE, this is satisfactory overall (0.514 to 0.719) and in line with the recommended value (>0.500), indicating a stronger association among the measures within each construct (Afthanorhan, 2014; Hair et al., 2019). Table 2 shows the key findings of CFA on the right.

In relation to discriminant validity (Table 3), the HTMT criterion (0.532 to 0.838) indicates that each variable is distinct from the others, since the values remain below the recommended threshold (<0.900) (Hair et al., 2017, 2019). To obtain the results, the need to eliminate item A1 is presented, thus confirming the results presented in the EFA. According to the cited authors, the presence of convergent and discriminant validity confirms the quality of the constructs, reflecting coherent, adequate, and unique measurements across items.

Table 3
**Discriminant Validity - HTMT Analysis**

| | Environmental Attitude | Sustainability Awareness | Intention to Act Sustainably | Individual's Personal Values |
|---|---|---|---|---|
| Environmental Attitude | | | | |
| Sustainability Awareness | 0.621 | | | |
| Intention to Act Sustainably | 0.535 | 0.719 | | |
| Individual's Personal Values | 0.838 | 0.695 | 0.532 | |

**Source:** Elaborated by the authors based on SmartPLS4 software results.

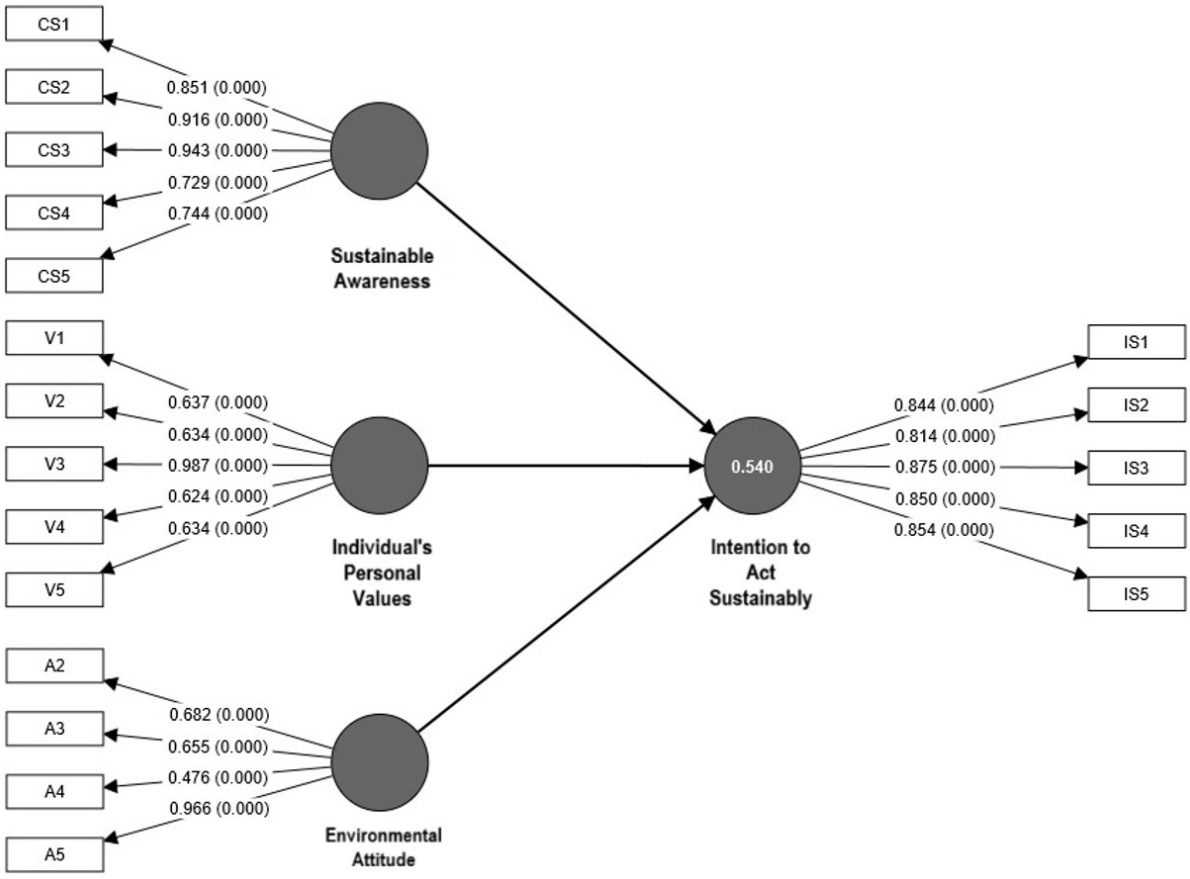


**Figure 1.** Intention to Act Sustainably Model
**Source:** Elaborated by the authors based on SmartPLS4 results.

Meanwhile, the practical implication is that the scales can be used with confidence and precision, avoiding errors or confusion in interpreting the results.

Finally, regarding the goodness of fit, the SRMR (0.072) indicates an adequate fit for the model at the 99% confidence level (Figure 1). This suggests that the discrepancy between the observed data and the estimates is low, meaning the theoretical and real values are close. Thus we can assume that the model accurately represents the theory and can be used to replicate it in subsequent studies.

# 5 Discussion and conclusion

## 5.1 Discussion

Based on the interest in promoting sustainable practices among the various relevant sectors, efforts are being made to engage young university students, who will be future strategic decision-makers, in addressing environmental issues. The primary focus of analysis is on the factors that influence behaviors oriented towards

sustainability (Instituto Mexicano de la Juventud, 2018; Organización de las Naciones Unidas, 2024). The objective of this study was to develop and evaluate a measurement scale to determine the influence of environmental attitude, sustainability awareness, and personal values on the intention to act sustainably. All measures were developed based on a literature review and subsequently validated.

The results indicate that the intention to act sustainably is as a valid and reliable scale, consistent with the findings of studies by Torres et al. (2015); Dixon et al. (2015), Silva et al. (2021), García (2023), and Rodríguez et al. (2022). The construct representation is 72%, similar to the percentage obtained by Rodríguez et al. (2022), but higher than that obtained by Dixon et al. (2015). The factor loadings (>0.814) are higher than those obtained by Silva et al. (2021), García (2023), and Rodríguez et al. (2022). Likewise, Cronbach's alpha (0.927) is higher than in the studies by García (2023), Escámez and Escámez (2020), and Torres et al. (2015).

The above results suggest that this scale addresses the recommendation of Torres et al. (2015) to conduct studies on environmental behavior. Likewise, it builds on the work of Rodríguez et al. (2021) by statistically validating some of the authors' proposed variables. Furthermore, the proposed scale is valid and reliable, with higher values than those obtained by the aforementioned authors. It is therefore established as coherent and statistically measurable. It can support the theoretical construction of the variable for use in future research and expand knowledge generation. In practice, the scale can be used to assess sustainability trends by gauging people's level of interest, enabling the development of strategies to promote sustainable behaviors.

Concerning the environmental attitude variable, the results are also consistent with those of the items selected in the studies of Diaz and Beerli (2006) and Saiz and Moreno (2010), suggesting a valid and reliable scale. In this regard, 50.9% of the explanation of this construct has loadings higher than 0.616. This percentage is similar to the 53.73% obtained by Musitu-Ferrer et al. (2020) in their study. The difference is that the latter study evaluated two dimensions, while the present study evaluates one. Cronbach's alpha was 0.804, higher than that obtained by Saiz and Moreno (2010), Chumbe Rodríguez (2021), and Musitu-Ferrer et al. (2020), but lower than that obtained by Ayuque-Rojas et al. (2024) (0.941). Regarding Aiken's V, although the values obtained were satisfactory, they were lower than the results of Chumbe Rodríguez (2021) (0.992).

The prior results allow us to contribute statistically to the measures proposed by Girón and Leyva (2013) in their qualitative study. They also provide solid, measurable support for the theoretical construction of the variable by building on previous research contributions. Furthermore, the results strengthen the Theory of Planned Behavior by identifying attitude as an element that explains the generation of behavioral intentions. The results also serve as a basis for future studies related to attitudinal changes. In practice, using the scale can help identify favorable or unfavorable attitudes toward the environment and determine the need for interventions that encourage intentions based on more positive predispositions.

The sustainability awareness variable is also presented as a valid, reliable scale, coinciding with the results of the items selected in the studies of Laso et al. (2019) and Torres et al. (2023), but with the same one-dimensionality as the scale in the study by Torres et al. (2023). The construct explanation (71.1%) is higher than that presented by Torres et al. (2023) and Aliaga-Herrera et al. (2022), while the factor loadings (>0.729) are slightly lower than those presented by Laso et al. (2019) and higher than those presented by Aliaga-Herrera et al. (2022), but they are very similar to those presented by Torres et al. (2023). Additionally, Cronbach's alpha (0.924) is higher than that obtained by Laso et al. (2019) and Aliaga-Herrera et al. (2022), but very similar to that obtained by Torres et al. (2023).

Based on the above, the Sustainability Awareness Scale is deemed a solid theoretical construct and an accurate, consistent tool for measuring individuals' understanding of the environmental impact of their actions. This instrument can serve as a basis for future research to expand existing theories and evaluate awareness-raising interventions on the importance of sustainability. It can also help identify the need for more and effective awareness-raising messages to reduce negative impacts and enhance biodiversity preservation.

Finally, the individual's personal values variable presents a valid and reliable scale for the selected measures, coinciding with the results of similar items presented by Campos and Lara (2023). The explanation of the construct (50.91%) through a single factor is lower than that obtained by Campos and Lara (2023) and Rodríguez et al. (2022). The latter handle this variable through two and three factors, respectively, which suggests that the representation of this variable is more complex and is better presented as a second-order construct rather

than through a single construct. Likewise, the resulting loadings (>0.624) are lower than those presented by the aforementioned authors, but higher than those obtained by Govaerts and Olsen (2024). Cronbach's alpha (0.836) is also slightly lower than that reported by Rodríguez et al. (2022) and Labrador and Moros (2017), but similar to the results of Thelken and Jong (2020) and Govaerts and Olsen (2024).

The scale results effectively measure the principles that guide people's behavior, reinforcing the theoretical contributions to the construction of the variable. However, the variable may be more complex than expected, requiring a measurement involving multiple dimensions. Additionally, the results expand and contribute to the Theory of Planned Behavior by integrating the element of personal values into the explanation of behaviors, as suggested by Ajzen (1991) at the end of his theory. This emphasizes the importance of evaluating personal values to explain sustainable behaviors and determine the level of motivation toward social responsibility. Through this, strategies can be developed to generate a stronger connection between individuals' principles and sustainability.

Based on the findings and results, the measures selected to represent each of the constructs of the proposed instrument are adequate. They present satisfactory evaluations of convergent and discriminant validity, except for one attitude indicator that had to be eliminated. The model fit also presents satisfactory values, suggesting that the model can be used for replication in subsequent studies.

## 5.2 Conclusion

Analyzing and exploring behaviors involves considering multiple factors, both internal and external to the individual. This leads to complexity in identifying appropriate measures to adequately assess these factors and make explanations and predictions about behaviors. On the other hand, the study of behavior is further challenged by sustainability, since the subject itself requires the consideration of multiple elements that represent it. Because of this, literature on the analysis of sustainable behavior is limited, so there is constant invitation to delve deeper into the subject by considering different influencing factors, as well as developing evaluation metrics. This will allow for continuity in exploratory studies, quantitative analysis, exploration and extension of the analysis in different regions, replication of the use of certain instruments to identify possible differences in results, and application of the analysis scales to different subjects.

Therefore, the present study aims to address the suggestions identified by proposing a valid and reliable instrument that measures the intention to act sustainably, environmental attitude, sustainability awareness, and personal values, while obtaining satisfactory measures for each construct. The article addresses the existing gap in integrated, validated instruments for assessing the psychological determinants of sustainable behavior within a unified decision-making framework as part of the theoretical implications. The study also seeks to contribute to the understanding of sustainable behavior among the Mexican population by developing a body of knowledge that can serve as a basis for further regional studies on the topic. Furthermore, the results of the study are expected to provide practical value for sustainability professionals and policymakers in designing and implementing collaborative strategies that foster sustainable behavior.

However, this research has certain limitations. Primarily, the sampling technique is non-probabilistic, so the results can only be interpreted based on the sample analyzed and not the population as a whole. Therefore, generalizations cannot be made based on the findings. Likewise, the analysis focuses on university students, so applying the instrument to other subjects may produce different results, either due to factors such as the interpretation of each measure, previous experiences, cultural aspects, the social sector in question (business, government, or the general community), or other related factors. Additionally, as this is a quantitative study based on the analysis of numerical data and predefined scales, deeper perceptions of the respondents may not have been fully captured, leaving out key aspects relevant to explaining the phenomenon under study.

For the above reasons and to complement this research, it is suggested that future studies replicate the instrument in different contexts and with different subjects to expand and validate its applicability beyond the selected sample. Likewise, it is proposed that probability sampling be used to delve into the findings through interviews (qualitative study) and regression analysis to determine the contribution of environmental attitudes, sustainability awareness, and personal values to the explanation of intention to behave sustainably. This can be done through the application of mediating or control variables or comparative studies.

Referring to Ajzen (1991), who mentions that behavior can be explained by different factors, we are encouraged to strengthen the proposed scale by including and analyzing additional internal and external variables, such as culture, skills, competencies, and the influence of regulatory frameworks and existing policies.

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## SUPPLEMENTARY MATERIAL

Supplementary material accompanies this paper.
Supplementary Data 1 - Variables and Codebook
Supplementary Data 2 - Dataset
Supplementary Data 3 - Dataset V of Aiken
Supplementary Data 4 - Appendix A
Supplementary Data 5 - Appendix B
Supplementary Data 6 - Appendix C
Supplementary data for this article can be found online at https://doi.org/10.7910/DVN/BXTYBU

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**Research data availability statement - Open science:**
The full data supporting the findings of this study have been made available at: https://doi.org/10.7910/DVN/BXTYBU.

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**Conflicts of interest:**
The authors have no conflicts of interest to declare.



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