ORIGINAL ARTICLE

Pro-environmental behaviours of generation Z: A cross-cultural approach

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Abstract

The mitigation and adaptation strategies to deal with climate change have not been effective so far and we still observe the effects derived from this problem. This paper aims to explore the determinants of individual pro-environmental behaviour of Generation Z, given the relevance of this generational cohort in society. Quantitative research is conducted based on 1050 valid questionnaires from Generation Z Colombian, Mexican and Brazilian citizens. The hypothesised relationships were tested through a structural equation model estimated using the partial least squares (PLS) regression technique. In addition, a multi-group analysis was carried out to examine potential differences among groups of different nationalities. The results support that the Theory of Planned Behaviour (TPB) adequately models human behaviour and that beliefs generate attitude and subsequently behaviour. However, when it comes to environmental issues, other factors such as environmental disaffection, intrinsic motivations and environmental participation are also relevant. From a theoretical point of view, this study proposes an innovative model supported by the literature. Besides, from a practical point of view, it provides an orientation to guide organisational representatives or leaders in climate change mitigation based on behavioural prediction. Finally, the contribution of this study lies in proposing an innovative model that is combined with the TPB to explain a trend of pro-environmental behaviour in generation Z, evaluating it from different perspectives with members of three different nationalities.

Keywords Pro-environmental Behaviour · Climate Change · Generation Z · Beliefs · Attitudes · Intrinsic Motivations

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1 Introduction

More than two decades of scientific research have shown that human exposure to air pollutants has a major impact on health (Weinmayr & Forastiere, 2022). This problem has become particularly relevant worldwide due to greenhouse gases and the frequency of extreme weather events (Wu et al., 2022). Without mitigation, climate change will result in severe temperature disturbances, droughts, sea level rise, species loss, and food insecurity, and will threaten the social and economic growth of the world's population (Hurst & Walker, 2022). Therefore, it is increasingly important that actions are taken to raise awareness in society about the importance of pro-environmental behaviours.

Human behaviour plays a key role in the increase or decrease of issues caused by climate change (He et al., 2023), and it is necessary to make drastic changes in current behaviours in order to successfully tackle these matters. Unfortunately, some people do not engage with pro-environmental behaviours (Jans, 2021), but it is clear that everyone's support is necessary to help fight this problem. Consequently, it is necessary to establish a pattern of behaviour that helps to improve the effectiveness of the actions taken up to now.

Several studies have validated the Theory of Planned Behaviour (hereinafter TPB) proposed by Fishbein and Ajzen (1975) as a good predictor of human behaviour, which ensures that beliefs determine or guide attitudes and behavioural intentions (Kumar & Nayak, 2022). The TPB has a flexible model and has been widely used to measure behaviour in a business and industrial context. However, this theory is not without limitations (Ashaduzzaman et al., 2022) and the fundamental model may not comprise sufficient components when it comes to pro-environmental behaviours.

Similarly, previous studies have highlighted the importance of using generational cohorts in behavioural research (Kamenidou et al., 2019), so it is considered essential to analyse this factor to obtain optimal prediction results. The coexistence of several generational cohorts is a challenge, since each cohort has preferences for different styles of motivation and communication (Maan & Srivastava, 2022) and, on the other hand, individuals from the same generational cohort share similar attitudes, beliefs and values (Seyedimany & Koksal, 2022), so it is essential to know how to increase the effectiveness of actions carried out for pro-environmental purposes.

A generational cohort is understood as a group of people born in the same period of time, united by age and lived cultural circumstances (Llopis-Amorós et al., 2019). The generation considered for this study is Generation Z, individuals born after 1995 (Cuic et al., 2022). There are several reasons why this generational group has been considered as a research objective, not least that it is the most numerous generation worldwide and represents a large part of the planet's labour force (Sakdiyakorn et al., 2021). Several of its members are about to graduate from university, which makes them a vital focus for any type of initiative. In turn, this group is classified as technologically intelligent, educated, innovative and creative, which, to a large extent, shapes their pro-environmental behaviour and their basic social values (Parzonko et al., 2021).

Also, it should not be overlooked that the young members of this generational group will experience greater effects of climate change in adulthood than adults today (Wallis & Loy, 2021), therefore, it can be assumed that this generational cohort should be the most committed to adopting pro-environmental attitudes, since they are the ones who will have to face the consequences of poor environmental management (Dąbrowski et al., 2022). In turn, there is only scant evidence in the literature of studies applying this TPB to Generation Z on pro-environmental issues, which is important to analyse because this relatively young group will experience the main future consequences, suggesting that they should be the most interested in adopting pro-environmental attitudes and behaviours (Dąbrowski et al., 2022). Therefore, this study aims to explore moderating factors that may influence the pro-environmental behaviour of Generation Z.

It is important that the beliefs, attitudes, and behaviours of Generation Z favour a positive future for the environment because these individuals will not only act in their own personal interest, but rather, they will transmit part of their identity, their knowledge and emotional attachment to social groups (Jans, 2021) that will help preserve the planet in both the medium and long term.

Additionally, a cross-cultural approach has been adopted using a sample of individuals belonging to generation Z considering different nationalities (Colombian, Mexican and Brazilian) to see if there are significant differences in the results and to validate whether or not cultural impact influences the behaviours of this generational cohort. The reason why these countries have been considered as the focus of research is because there are several studies that analyse and compare pro-environmental behaviour within the contexts of European, Asian, or North American countries (Culiberg & Elgaaied-Gambier, 2016; Lange & Iwasaki, 2020; Punzo et al., 2019; Rao et al., 2022; Soyez, 2012), while research in other regions (e.g., Latin America) is rather scarce. Paradoxically, developing countries, where most environmental challenges occur, with their associated impacts, have received little research attention (Amoah & Addoah, 2021). Consequently, this work contributes to the previous literature on causal models of pro-environmental behaviour prediction by answering the following questions:

RQ1: Does TPB explain Generation Z's individual pro-environmental behaviour?
RQ2: Does culture influence Generation Z's pro-environmental behaviour?

These questions are relevant for both researchers and managers, since they can help to create a roadmap that will establish actions aimed at mitigating the problems caused by climate change based on a behaviour prediction approach.

In order to achieve the proposed objective, firstly, an analysis of the main bibliographical sources of studies related to the subject of this paper is carried out. This literature review allows us to propose a theoretical model to identify the variables that lead to the pro-environmental behaviour of Generation Z and to propose hypotheses to be tested. Next, we describe the methodology followed to carry out the fieldwork in order to verify the existence of relationships between the proposed variables through a structured questionnaire or survey. This is followed by the

results obtained, from which, finally, conclusions are drawn, and some limitations and future lines of research are pointed out.

2 Literature review

The TPB, proposed by Fishbein and Ajzen (1975), is considered one of the best predictors of human behaviour and has been widely used to predict individual decision-making processes (Rao et al., 2022). This theory states that the individual's behaviour is conditioned by attitude and beliefs (Correia et al., 2022); however, when it comes to environmental issues, individuals are often influenced by other surrounding factors when deciding whether or not to adopt environmentally friendly behaviours. At this point, situational or motivational factors are considered important variables affecting individual pro-environmental behaviours (Cao et al., 2022).

Pro-environmental behaviour is defined as a conduct adopted by a person that is seen by societies as preserving the environment (Basiru et al., 2022) or, in turn, actions taken to avoid damage to and/or protect the environment (Correia et al., 2022). Along these lines, within the framework of the TPB, it is considered that before the individual opts for a pro-environmental behaviour, they must acquire a belief and later an attitude.

Beliefs are created by knowledge acquired by the individual in which different cognitive processes interact, such as attention, perception, and memory (Connors & Halligan, 2022), and are the result of cumulative experiences that are socially transferred to a large extent through education, organisational and cultural settings, and the exposure of individuals to the media and various sources of information (Laukkanen, 2022).

Attitudes are defined as the positive or negative evaluation of a specific behaviour (Ateş, 2020) and indicate to what extent the behaviour in question is agreeable, desirable, pleasant, useful (Karimi et al., 2021) or it can be the opposite and negatively influenced by disengagement.

Disengagement involves active and observable behaviours, for example giving up on a challenge due to negative emotions such as anxiety, sadness, and boredom (Taboada et al., 2017). Likewise, the condition is conceptualised as a lasting feeling guided by positive emotions that generates greater emotional empathy (Kim et al., 2018). In this sense, environmental disengagement is understood as the detachment of the individual towards nature.

On the other hand, motivations also play an important role in the adoption of the attitude and, therefore, in the determination of the behaviour. In this work, intrinsic motivation has been considered because it is positively linked to behaviour (Budzanowska-Drzewiecka & Tutko, 2021) and is more durable than external motivation, which is highly random due to the uncertainty of secondary incentives. Intrinsic motivation is defined as internally driven interest, that is, the passion, enjoyment, or satisfaction of performing a certain behaviour for pure pleasure (Faraz et al., 2021).

Similarly, an individual who has had previous experience in environmental matters is much more likely to develop pro-environmental behaviours compared to a

person who has never interacted in matters related to environmental protection or adaptation. Therefore, the more frequently individuals become involved in environmental issues, the greater their willingness and enthusiasm for environmental protection (Ye et al., 2022).

Finally, it is also considered that the low effectiveness of the actions carried out with pro-environmental intentions is due to the attitudes and behaviours exhibited by the different generational cohorts (Prayag et al., 2022). Mannheim (1970) defines the generational cohort as a set of individuals born within a similar time span who share a life stage. More specifically, the generational cohort is a group of people who are of comparable age and experience similar economic, social, and cultural events (Lin & Chen, 2022). It should be noted that generational differences are not determined by the age of an individual, but rather by shared experiences within specific periods of time (Eger et al., 2021).

In the generational studies literature, there has been controversy in the categorisation of generations; however, for the purposes of this study, the most widely accepted categorisation has been considered: Baby Boomers (1946–1964), Generation X (1965–1979), Generation Y or Millennials (1980–1995), and Generation Z or Centennials (1996–2003) (Yawson & Yamoah, 2020).

With the aim of improving the effectiveness of the pro-environmental actions carried out so far, the pro-environmental behaviours of Generation Z have been analysed. This choice is due to the fact that the most interesting characteristic of this generational group is their focus on improving their skills and knowledge (Casalegno et al., 2022), which is vital in the environmental fight and can help to influence other generational groups.

3 Hypotheses and proposed model

The Theory of Planned Behaviour (TPB), which explains that beliefs and attitudes influence the onset of a certain behaviour, has been used as the theoretical framework of the study. Numerous approaches support this theory in different fields of research (Carfora et al., 2021; Jung et al., 2020; Moon, 2021; Raghu & Rodrigues, 2022; Stehr et al., 2021; Youn et al., 2021; Yuriev et al., 2020). In all of them, attitudes are explained by beliefs, which can favour both negative and positive affective responses (Dąbrowski et al., 2022). Consequently, in the context of this study we present the following approach:

H1: Beliefs about climate change influence attitudes towards it.

On the other hand, this work also proposes to incorporate variables of environmental disengagement and intrinsic motivation as relevant factors prior to adopting an attitude. In this regard, it can be expected that the attitude represents a negative individual affective response due to environmental disengagement or a positive one due to intrinsic motivation. As a result, attitude becomes an essential determinant for an individual to commit, or not, to practising pro-environmental behaviours (Razali et al., 2020). These approaches are supported by studies implemented in

different areas of knowledge, in which, from a positive perspective, intrinsic motivations influence the adoption of an attitude (Pihu et al., 2008; Cho et al., 2020; Qin & Tao, 2021; Al-Jubari et al., 2021), and from a negative and unfavourable point of view, disengagement acts as a predecessor of attitude, when studied from different approaches. For example, Brosch (2021) affirms that emotions are affective states that can be positive or negative and that to a certain extent condition attitudes. On the other hand, Ahn and Kwon (2020) mention that negative anticipated emotions are predecessors of attitude, or in turn, D'Arcy and Lowry (2019) affirm that a negative affective state precedes attitude. Environmental disengagement can also be understood as a lack of environmental commitment, which is supported by previous studies that corroborate that the tendency to morally disengage with pro-environmental initiatives is negatively associated with pro-environmental attitude (Nicolai et al., 2022). Similarly, previous studies have found that intrinsic motivation positively influences pro-environmental attitude and behaviour (Faraz et al., 2021). In light of the above, and within the context of this study, we outline the following hypotheses:

H2: Environmental disengagement of the individual generates a negative attitude towards climate change.

H3: Intrinsic motivations of the individual generate a positive attitude towards climate change.

Likewise, it has been highlighted that, once the individual adopts an attitude, behaviour subsequently follows. This statement is supported by the TPB raised by Fishbein and Ajzen (1975). Therefore, as it is a more specific field, there may be variation in behaviour when it comes to pro-environmental issues. However, several studies support the relationship between pro-environmental attitude and behaviour (Bissing-Olson et al., 2013; Whitburn et al., 2019; Shafiei & Maleksaeidi, 2020; Chwialkowska et al., 2020; Davignon et al., 2022; Hossain et al., 2022). Based on this evidence, the following approach is proposed:

H4: Attitudes towards climate change lead to individual pro-environmental behaviours.

In this way, our proposal is aimed at intertwining the factors that condition individual pro-environmental behaviours and although attitudes are an outstanding antecedent, there are also other factors that influence behaviour, such as previous participation in pro-environmental initiatives and the same intrinsic motivations that influence attitude. Cheng et al. (2022) affirm that, for an individual to be committed to carrying out an individual behaviour, first, they must be aware of the outcome of not participating in a pro-environmental behaviour; second, they must perceive that the stronger they are, the more likely they are to implement pro-environmental behaviours. Finally, they must have a sense of responsibility, which is acquired through awareness of the consequences. Therefore, it is assumed that people who have previously participated in pro-environmental activities will be more aware and will be more predisposed to perform individual pro-environmental behaviours.

In turn, intrinsic motivation also plays an important role before the behaviour is adopted, as supported by previous literature in different areas of knowledge (Afsar et al., 2016; Budzanowska-Drzewiecka & Tutko, 2021; Faraz et al., 2021). Based on this evidence, the following hypotheses are proposed:

H5: Intrinsic motivations influence individual pro-environmental behaviours.
H6: A person's previous participation in environmental initiatives influences individual pro-environmental behaviours.

Lastly, in the environmental context, several studies have examined the moderating role of nationality when analysing pro-environmental behaviours (Capstick et al., 2019; Higueras-Castillo et al., 2019; Lamiño-Jaramillo et al., 2022; Phuphisith et al., 2020) due to the importance of knowing whether culture influences these behaviours. Chwialkowska et al. (2020) propose a model of cultural influences on pro-environmental consumer behaviour extending the TPB framework by including additional variables showing that pro-environmental attitudes, intentions and behaviours vary by cultural differences. Similarly, Vicente-Molina et al. (2013) show that pro-environmental behaviour from motivations and attitudes vary by nationality. Furthermore, cross-cultural studies show that there are significant differences in pro-environmental behaviour with different cultural backgrounds (Mi et al., 2020).

In addition, other studies consider that factors such as beliefs, disengagement, intrinsic motivations, attitudes, and previous involvement in pro-environmental behaviour and climate change can be influenced by nationality from a cross-cultural approach. More specifically, McKercher et al. (2011) argue that beliefs and attitudes towards climate change and pro-environmental behaviours differ significantly across nationalities. Similarly, in research conducted by Wolf and Moser (2011), lack of commitment and negative attitudes towards climate change are influenced by nationality and cultural aspects.

Also, Gainsburg et al. (2023) support the possibility that country-level variables are directly linked to pro-environmental attitudes and behaviors, and thus to climate change. Likewise, Kim et al. (2013) validate the hypothesis that attitudes toward climate change are positively related to pro-environmental behavior. These allusions are supported by studies that consider nationality as a factor influencing pro-environmental behaviors (Pisano & Lubell, 2017; Wang et al., 2021).

At the same time, studies such as Capstick et al. (2022) show how nationality influences intrinsic motivations and pro-environmental behaviors. And, finally, previous participations in pro-environmental initiatives can influence individual pro-environmental behaviors being supported by studies that over the years have been tested considering nationality as a determinant factor in pro-environmental behaviors (Cordano et al., 2011; Culiberg & Elgaaied-Gambier, 2016; Izagirre-Olaizola et al., 2015; Morren & Grinstein, 2016; Poortinga et al., 2019; Punzo et al., 2019; Tam & Chan, 2017; Unanue et al., 2016).

In this sense, concern about environmental damage is increasingly pressing and several experts have analyzed differences between countries, such as studies analyzing the United States, Japan, Mexico and Peru (Bechtel et al., 2006); China and Japan (Branzei et al., 2001); Costa Rica-Mexico-Venezuela-Brazil (Christen

et al., 1998); Switzerland and Sweden (Kaiser & Biel, 2000). Some research has incorporated a larger sample of countries: studies of 27 countries (Oreg & Katz-Gerro, 2006); and 43 countries (Inglehart, 1995). Therefore, it is important to know whether the model proposed in this study shows variations according to nationality. Consequently, we posit:

H7: There are differences between individuals of different nationalities in the intensity of the following relationships:

(7a) Beliefs about climate change influence the attitude towards it.
(7b) The individual's environmental disengagement generates a negative attitude towards climate change.
(7c) The intrinsic motivations of the individual generate a positive attitude towards climate change.
(7d) Attitudes towards climate change generate individual pro-environmental behaviours.
(7e) Intrinsic motivations influence individual pro-environmental behaviours.
(7f) An individual's prior involvement in environmental initiatives influences individual pro-environmental behaviours.

Based on the above, and on the literature review, an innovative theoretical model is proposed that includes TPB variables and combines them with additional factors that influence pro-environmental behaviours, with the aim of finding an adequate mechanism to help in the fight against climate change by individuals belonging to Generation Z. This model is represented visually in Fig. 1.
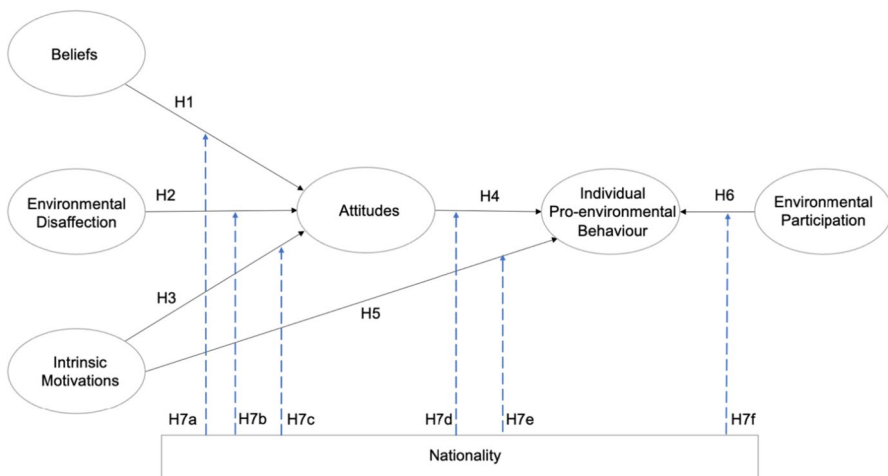

Fig. 1 Proposed Model. Source: Made by the authors

4 Materials and methods

4.1 Measurement of the variables

To achieve the proposed objective and contrast the model and the hypotheses, a quantitative investigation was carried out through a structured questionnaire. The scales used were adapted from previous studies and an ad hoc proposal for data collection was also implemented. Specifically, the scales of the Beliefs, Attitudes, Individual pro-environmental behaviours, and Environmental disengagement variables were adapted from the scale proposed by Maibach et al. (2011) and measured using Likert-type scales as in the original proposal. Regarding the Intrinsic motivation variable, the proposed items were adapted from Guay et al. (2000) and measured using 7-point Likert scales. Finally, the items considered for the variable Environmental participation were based on an ad hoc proposal in order to gather information on previous interactions of respondents with environmental actions and explore whether or not this influences the other variables considered in this study; the items are measured using 5-point Likert scales ranging from 1 = never to 5 = very often.

On the other hand, all the variables of the questionnaire have been considered as reflective constructs, with the exception of the Beliefs variable, which has been conceived as formative. In this sense, the formative constructs have indicators that are the source of the variable, so any change or modification does not affect the other indicators, while in a reflective construct the minimum change in the variable is reflected in the other indicators (Hanafiah, 2020).

4.2 Sample and information collection

Information was gathered on Generation Z members of Colombian, Mexican, and Brazilian nationality. Although there is still no consensus regarding the exact age range of Generation Z, most academics agree that they are individuals born after 1995 (Cuic et al., 2022). Therefore, for the purposes of this research, the age range is between 18 and 25 years old. In this way, it is intended to evaluate a pattern of behaviour by comparing different nationalities in order to identify variables that help explain the phenomenon under study.

To obtain the necessary information, a non-probability "snowball" sampling was used, obtaining 1050 valid questionnaires as a final sample. Table 1 shows the main characteristics of the research.

Regarding the demographic profile of the respondents (Table 2), Generation Z was taken into consideration, which includes relatively young individuals, due to the repercussion that this generational cohort has in caring for the environment and because it is a group that has a high level of education, is technology savvy (Su et al., 2019), and has the ability to instil a sense of responsibility in other community members to lead the fight against climate change both now and in the future. In this sense, the generational cohort is explained as a group of people born in the same time span and who have been exposed to the same social, political, or economic

Table 1 Technical data of the research

Data	Description
Universe	Citizens of Colombian, Mexican and Brazilian nationality belonging to generation Z between 18 and 25 years of age, both included
Sampling procedure	Non-probabilistic snowballing
Method	Structured questionnaire administered online
Measuring technique	Likert type scales
Sample size	1050 valid questionnaires
Survey data collection period	January—March 2021
Geographical scope	Latin American countries: Colombia, Mexico and Brazil
Statistical techniques	Principal component analysis—Partial least squares structural equation model estimation (PLS-SEM)
Statistical programmes	IBM SPSS version 25 and SmartPLS 4.0

Source: Authors' proposal

Table 2 Sample characteristics

Variables	N	%
Gender		
Male	362	34%
Female	678	65%
Prefers not to identify	10	1%
Age		
18–21 years	595	57%
22–25 years	455	43%
Nationality		
Colombian	544	52%
Mexican	229	22%
Brazilian	277	26%

Source: Authors' proposal

events (Moise et al., 2020). Therefore, the population or generational cohort taken into consideration for this study is Generation Z, also known as "Centennials", with an age range from 18 to 25 years.

It should be noted that, due to the non-probabilistic sampling procedure considered for this study, the sample is not representative of the population, but due to the high number of valid questionnaires collected, it can be considered as a suitable sample to test the validity of the hypotheses put forward.

4.3 Data analysis techniques

The analysis of the results obtained was carried out in two phases. First, an exploratory factor analysis with Varimax rotation was carried out for the items of the

reflective constructs in order to demonstrate how the indicators were grouped in each of the factors. Secondly, the formative indicators of the model were evaluated through an analysis of collinearity and load weighting relationship. Finally, the measurement instrument was evaluated and the structural model estimated using the partial least squares regression technique (PLS-SEM) (Bagozzi, 1994; Bagozzi & Yi, 1988; Fornell & Larcker, 1981).

5 Results

5.1 Measurement instrument validation

Following the exploratory analysis, and once the formative and reflective items of each of the study variables had been established, a confirmatory analysis was carried out with the aim of validating the measurement instrument. Table 3 shows the results of this study, in which all reliability indicators, both Cronbach's alpha coefficient (CA) and the composite reliability coefficient (CR), have values higher than the reference value of 0.7 recommended by Nunnally (1994). Similarly, the AVE values exceed 0.6, higher than the reference value of 0.5 (Fornell & Larcker, 1981), indicating adequate convergent validity of the model.

Regarding the discriminant validity analysis, for all the constructs the condition is met that the square roots of the AVE for a certain construct are greater than the correlations with the other constructs of the model, according to the criteria of Fornell and Larcker (1981). Likewise, it is corroborated that the monotrait (MT) correlations (relationships between indicators of the same construct) are greater than the heterotrait (HT) correlations (relationships between indicators that measure different constructs), following the HTMT theory proposed by Henseler et al. (2016), observing in this case that all the coefficients are below 0.90 (Gold et al., 2001; Teo et al., 2008). Table 4 shows that the two criteria applied are met and thereby confirms the discriminant validity of the reflective constructs considered in the structural model.

Lastly, since the convergent and discriminant validity analysis is applicable only for reflective constructs Chin (1998), to verify the veracity of the items implemented in the formative construct of the model, it was evaluated, on the one hand, the existence of a possible multicollinearity through the variance inflation factor (VIF), and, on the other hand, the magnitude and significance of their weights. In this study, none of the VIF exceeds the limit value of 3.3 indicated by Petter et al. (2007). Additionally, it was found that the weights of the indicators are significant and it was confirmed that none of the assumptions is violated (Daoud, 2017), which is why it is assumed that the model is reliable and it is possible to proceed with the next verification step.

5.2 Structural equation model estimation and hypotheses testing

Once the psychometric properties of the measurement instrument had been verified, the model was estimated by applying the bootstrapping technique (Henseler,

Table 3 Confirmatory factor analysis results

Factor/Item	M	SD	loading	weight	t-value	CA	CR	AVE
Beliefs						N/A	N/A	N/A
CR1. How much do you think climate change will harm you personally?	0.892	0.029		0.897*	30.939			
CR2. When do you think climate change will start to harm people in your country?	0.486	0.060		0.487*	8.130			
CR3. On a scale of -3 (very negative) to +3 (very positive), do you think climate change is a positive or negative thing?	0.560	0.059		0.563*	9.630			
Attitudes						0.857	0.777	0.601
ACT1. How concerned are you about climate change?	0.835	0.011	0.835*		78.767			
ACT2. How much had you thought about climate change before today?	0.795	0.014	0.796*		57.316			
ACT3. How important is the issue of climate change to you personally?	0.778	0.017	0.778*		46.890			
ACT4. How often do you talk about climate change with your family and friends?	0.681	0.023	0.682*		29.615			
Individual Pro-environmental Behaviour						0.884	0.738	0.792
CPI1. Over the past 12 months, how often have you valued companies that are taking action to reduce climate change by purchasing their products?	0.894	0.009	0.894*		94.534			
CPI2. Over the past 12 months, how often have you penalized companies that oppose steps to reduce climate change by NOT buying their products?	0.886	0.011	0.887*		84.376			
Environmental Disaffection						0.838	0.722	0.634
DM1. Disengaged (no serious consideration of climate change)	0.843	0.021	0.843*		40.500			
DM2. Doubtful (has doubts about the existence of climate change)	0.799	0.021	0.800*		38.681			
DM3. Denialist (convinced that there is no change in climate)	0.742	0.026	0.744*		28.346			
Intrinsic Motivation						0.907	0.863	0.709
MI1. Because I think these activities are interesting	0.836	0.016	0.836*		51.268			
MI2. Because I enjoy this kind of activities	0.909	0.007	0.909*		138.103			
MI3. Because these activities are fun	0.764	0.022	0.765*		35.050			
MI4. Because I feel good doing these activities	0.852	0.012	0.852*		71.066			
Environmental Participation						0.901	0.856	0.695
PM1. I have carried out or promoted curricular internships with university teams, related to climate change and its impact on the territory	0.843	0.014	0.844*		59.151			

Table 3 (continued)

Factor/Item	M	SD	loading	weight	t-value	CA	CR	AVE
PM2. I have received or given teaching that has allowed me to learn about climate change and its impacts on the territory	0.835	0.013	0.834*		62.789			
PM3. I have participated in research on climate change and its impacts on the territory	0.833	0.018	0.834*		47.560			
PM4. I have participated in shared actions between the University and actors in the territory aimed at finding solutions for climate change adaptation and mitigation	0.821	0.019	0.822*		43.315			

Source: Authors' proposal

Table 4 Discriminant validity

	F1	F2	F3	F4	F5	F6
F1. Beliefs	N/A	N/A	N/A	N/A	N/A	N/A
F2. Attitudes	0.775	0.601	0.499	0.442	0.495	0.275
F3. Individual Pro-environmental Behaviour	0.373	0.890	0.634	0.324	0.271	0.396
F4. Environmental Disaffection	-0.348	-0.248	0.796	0.709	0.279	0.121
F5. Intrinsic Motivation	0.414	0.222	-0.234	0.842	0.792	0.157
F6. Environmental Participation	0.224	0.323	0.008	0.137	0.834	0.695

Values on the diagonal are the square roots of the AVE.

Below the diagonal: Correlations between factors.

Above the diagonal: HTMT ratio.

N/A = Not applicable.

Source: Made by the authors.

2017) with 5000 subsamples in the PLS program, all this, with the aim of verifying whether or not the hypotheses are fulfilled. As shown in Table 5, the results for all the path coefficients are statistically significant and present the hypothesised indications, supporting all the hypotheses introduced in the model. Finally, with regard to the explanatory capacity (R2) and predictive capacity (Q2), it is verified that both Attitude and Individual pro-environmental behaviour predict their variables adequately and contribute to a great extent to the literature on behavioural research by obtaining explanatory values greater than 0.2, which is considered relevant in the field of social sciences (Hair et al., 2014).

5.3 Multigroup analysis

Once the results of the proposed model had been obtained, in order to contrast the possible differences between groups of different nationalities, a multigroup analysis was carried out to compare the links proposed in the model for the three nationalities included in the sample (544 Colombians, 229 Mexicans, and 277 Brazilians). Before proceeding with the multigroup analysis, a composite measurement invariance analysis was performed (Henseler et al., 2016). This tool is used to confirm that the dissimilarity between the groups is due to the differences between the latent variables and not to other issues, that is, it analyses whether the contrasts are only due to differences in the structural model and not in the measurement model (Carranza et al, 2020). Subsequently, the MICOM analysis was carried out, which is a three-step process that includes: (Step 1) configuration invariance; (Step 2) compositional invariance; (Step 3) equality of composite mean values and variances (Henseler et al., 2016).

After carrying out the MICOM review, in this study it has been verified that the first step is fulfilled and that the model has the same configuration for both the Colombian nationality group and the Mexican and Brazilian nationality groups. Regarding the second step, it is verified that the scores of the composites using the weights for each one of the nationalities do not differ using the weights of the others

Table 5 Structural equation model estimation

Hypothesis	Original sample	t-value (Bootstrapping)	Decision
H1: Beliefs—> Attitudes	0.343	11.510*	Supported
H2: Environmental Disaffection—>Attitudes	-0.184	6.759*	Supported
H3: Intrinsic Motivation—> Attitudes	0.297	10.352*	Supported
H4: Attitudes—> Individual Pro-environmental Behaviour	0.289	9.896*	Supported
H5: Intrinsic Motivation—> Individual Pro-environmental Behaviour	0.069	2.219*	Supported
H6: Environmental Participation—> Individual Pro-environmental Behaviour	0.249	8.780*	Supported

R2 (Attitudes)=0.344; R2 (Individual Pro-environmental Behaviour)=0.204.

Source: Authors' proposal.

and the composite invariance is confirmed. To complete the last step, the equality of means and the equality of variances were compared. In this case, equality could not be verified in the variables Beliefs, Environmental disengagement, Individual pro-environmental behaviour, and Environmental participation, but the equality was verified for the Attitude and Intrinsic Motivation variables, which is why it is assumed that the invariance of the measure is partial and the multigroup analysis (MGA) is carried out.

At this point, it is evaluated whether there are significant differences between the Colombian, Mexican, and Brazilian nationality groups using two methods: the MGA test developed by Henseler et al. (2016) and the Welch-Satterthwaite Eq. (Satterthwaite, 1946; Welch, 1947). The first method directly compares the randomly created subsamples by replacing the original data set (Henseler et al., 2009) and the second method performs the analysis in the case of unequal variances. The reason why it was decided to carry out two different tests is because in the MICOM analysis it was possible to detect that the variances are not equal in some of the variables implemented in the model (Table 6).

The measurement criterion of the tests carried out is based on the fact that, if the p value is less than 0.05 or greater than 0.95, there are significant differences between the groups (Henseler et al., 2009). The results of the multigroup analysis of this study indicate that there are no significant differences between the Colombian, Mexican, and Brazilian nationality groups in almost all of the hypotheses proposed. However, it was identified that individual pro-environmental attitudes and behaviours vary between the Colombian and Brazilian nationalities. Consequently, it is verified that the cultural factor influences to a certain extent the individual's behaviour, but in general terms, a pattern of behaviour is established that helps to understand the degree of involvement of Generation Z in pro-environmental initiatives.

6 Discussion

Based on the results of this study, it is certain that this research makes several important theoretical contributions to the literature, which recognises the need to make the population aware of the effects generated by climate change (Bikomeye et al., 2021). This problem is a subject of current concern, and will continue to be so for future generations; therefore, there is a need to change human actions at all levels (Vanegas-Rico et al., 2022).

The literature recognises the need to explore human behaviour in environmental matters, especially in the generational and cross-cultural context where the literature on pro-environmental behaviours is still in an embryonic stage. To answer this call for future research on pro-environmental behaviours, this study provides statistical support to demonstrate how prior beliefs, attitudes, disengagement, motivations, and involvement influence the adoption of pro-environmental behaviour in Generation Z individuals. In this sense, the main contribution of our study is that, although previous empirical research has considered the TPB as a model to predict pro-environmental behaviours, to the best of our knowledge, no work has contemplated this theory together with disengagement, motivation, and participation, which are considered

Table 6 Multi-group analysis results

	P-Value Difference (One-Tailed)											
Hypothesis	Colombians vs Mexicans				Colombians vs Brazilians				Mexicans vs Brazilians			
Relationships	Path Difference	Welch-Satterthwait Test	MGA Test	Supported	Path Difference	Welch-Satterthwait Test	MGA Test	Supported	Path Difference	Welch-Satterthwait Test	MGA Test	Supported
H7a: Beliefs—> Attitudes	0.034	0.648	0.655	No/No	0.146	0.056	0.046	No/Yes	0.112	0.225	0.222	No/No
H7b: Environmental Disaffection—> Attitudes	0.072	0.271	0.272	No/No	0.121	0.065	0.064	No/No	0.049	0.505	0.506	No/No
H7c: Intrinsic Motivation—> Attitudes	0.023	0.740	0.744	No/No	-0.008	0.906	0.900	No/No	-0.031	0.702	0.701	No/No
H7d: Attitudes—> Individual Pro-environmental Behaviour	-0.134	0.062	0.063	No/No	-0.181	0.013	0.013	Yes/Yes	-0.047	0.555	0.557	No/No
H7e: Intrinsic Motivation—> Individual Pro-environmental Behaviour	-0.017	0.812	0.809	No/No	0.129	0.096	0.093	No/No	0.146	0.105	0.104	No/No

Table 6 (continued)

Hypothesis	P-Value Difference (One-Tailed)											
	Colombians vs Mexicans				Colombians vs Brazilians				Mexicans vs Brazilians			
Relationships	Path Difference	Welch-Satterthwait Test	MGA Test	Supported	Path Difference	Welch-Satterthwait Test	MGA Test	Supported	Path Difference	Welch-Satterthwait Test	MGA Test	Supported
H7f: Environmental Participation—> Individual Pro-environmental Behaviour	−0.030	0.663	0.668	No/No	0.021	0.747	0.745	No/No	0.051	0.486	0.487	No/No

Source: Authors' proposal

relevant factors in an environmental context. Our research goes beyond those studies by combining a model validated in the literature with an added value that benefits the behaviour prediction. In other words, our results support the importance of individual beliefs, attitudes, motivations, disengagement, and previous participation for an individual to act in a favourable way with the environment and contribute to the fight against climate change. Another way to contribute to the advancement of research in the environmental context is to consider the generational cohort, since a relatively young age group shows different behaviour patterns in relation to other social groups (Parzonko et al., 2021). In addition, it is appropriate to include nationality as a moderating and driving force in pro-environmental behaviours as cultural differences have been highlighted in various lines of research as a factor to be taken into consideration.

In this sense, the results obtained show that (a) there is a positive and significant relationship between beliefs, attitudes and behaviours, as proposed in the TPB (Fishbein & Ajzen, 1975), (b) environmental disengagement negatively influences the adoption of attitudes (Ahn & Kwon, 2020; Brosch, 2021; D'Arcy & Lowry, 2019) while intrinsic motivations have a positive influence (Pihu et al., 2008; Cho et al., 2020; Qin & Tao, 2021; Al-Jubari et al., 2021), (c) the individual's prior involvement in environmental initiatives and intrinsic motivations influence pro-environmental behaviours (Afsar et al., 2016; Budzanowska-Drzewiecka & Tutko, 2021; Cheng et al., 2022; Faraz et al., 2021), thus confirming the results described in previous studies.

Additionally, the research model was estimated for individuals of Colombian, Mexican, and Brazilian nationality with structural equation modelling (PLS-SEM) using a multigroup analysis. The study findings show that the model is valid and acceptable in groups of different nationalities and that most of the hypotheses are fulfilled. However, attitudes and behaviours between individuals of Colombian and Brazilian nationality may show significant differences, just as the relationship between environmental participation and pro-environmental behaviours is different for Mexican and Brazilian individuals. These results are in line with the reports made in previous studies that concluded that there are significant differences in the behaviours of individuals of different nationalities (Capstick et al., 2019; Higueras-Castillo et al., 2019; Lamiño-Jaramillo et al., 2022; Phuphisith et al., 2020).

In countries that apply rigid measures towards actions that harm the environment, pro-environmental behaviours will be aligned with the cultural values of that country, while, in countries with flexible measures, due to the wide variation in the cultural beliefs of the members of society, pro-environmental behaviours will vary (Mattison & Brouthers, 2021). In Latin American countries such as Colombia, Mexico, and Brazil, culture is unlikely to have a direct influence on behaviour, but specific cultural values may affect beliefs and attitudes, which in turn influence behaviour and may vary among themselves (Chwialkowska et al., 2020).

The results obtained in this study show that there are significant differences between individuals of Colombian and Brazilian nationality, which is not predictable since they all belong to South America and it can be assumed that the cultural difference is not as marked as it is for European or Asian countries. Leon (2019) affirms that individuals who share the same language, history, political and socioeconomic environment develop a considerable amount of common mental

programming. Therefore, as they are countries with different languages and policies, this can condition their attitude and explain the variation in their behaviour.

Another determining factor may be that countries such as Brazil, Mexico, and Colombia are still undergoing rapid industrialisation and environmental standards are not capable of coping with the pressure generated by rapid growth (Vicente-Molina et al., 2013). Therefore, from a cultural perspective, it can be assumed that Brazil is better at environmental transformation than Mexico and Colombia. Additionally, it should be considered that Brazil is the largest country in South America, has the fifth largest population in the world, and has the most solid economy in the region (Haack et al., 2019); therefore, from a pro-environmental point of view, its inhabitants may perceive their efforts to collaborate in the fight against climate change as less productive and influential compared to the inhabitants of smaller countries in the region, who may perceive their contribution as more beneficial for society and this could be one of the reasons for their change in attitude or behaviour.

This study suggests important implications for both theory and application in the field of behavioural research. From a theoretical point of view, although several previous investigations have proposed different models seeking to understand pro-environmental behaviour (Soutter & Boag, 2019; Vanegas-Rico et al, 2018; Berger Silva & Andaur Rodríguez, 2022), empirical research with a generational and cross-cultural focus is still rather limited. This study provides the literature with an innovative and reliable behaviour prediction model, making it possible to analyse Generation Z behaviours from the perspective of individuals of different nationalities.

7 Conclusion

In response to the questions posed in the introduction, i.e. (RQ1) Does TPB explain Generation Z's individual pro-environmental behaviour?, and (RQ2) Does culture influence Generation Z's pro-environmental behaviour?, we conclude that when it comes to environmental issues there are additional relevant predecessors to the TPB that contribute to the understanding of human behaviour. It is corroborated that environmental disengagement, intrinsic motivations, and environmental participation play a fundamental role in the behaviour of individuals and that the cultural and generational factor affects this behaviour trend.

Starting from the growing concern about the alterations produced by climate change, which continues to create economic, social, physical, and health impacts that require mitigation and adaptation (Stewart, 2021), this study, through the presentation and empirical analysis of a theoretical model, analysed the individual pro-environmental behaviours of the generational cohort belonging to Generation Z and confirmed that there are significant positive relationships between the constructs proposed in the model. This supports all the hypotheses and affirms that motivations, disengagement, and previous participation play a fundamental role in the adoption of an attitude and, subsequently, a behaviour. In addition, it was confirmed that there are significant differences in certain variables of the model based on nationality, both for Colombian and Brazilian individuals, as well as for Mexicans

and Brazilians. This difference may be due to the fact that when it comes to environmental issues, societies can be more rigid or flexible in terms of their policies.

From a business point of view, the results obtained in this study help to guide the representatives or leaders of organisations in the mitigation of climate change from a behaviour prediction approach. It is important that leaders or managers focus their efforts first on beliefs, which are prior knowledge that guide people in adopting an attitude (Goh & Baum, 2021). Although belief is described as knowledge, it is important that the way in which information is conveyed to individuals is drastically changed. Currently, there are a number of campaigns that seek to generate environmental awareness or concern. However, instead of disseminating the desired knowledge, what they actually generate is detachment and lack of commitment. This is because society has changed and no longer attracted to commercials or campaigns in traditional media that are perceived as dull. There is a need to focus on new technologies and publicise information, videos, images, etc., in a fun way and across media that are widely used by Generation Z. This will enable individuals to perceive this information appropriately and subsequently adopt a favourable attitude towards the environment.

Second, they must carry out actions that generate feelings of attachment, since this emotion will respond to stimuli that are directed towards specific, differentiated, and short-term pro-environmental objectives (van Kleef & Côté, 2022). In this sense, it has been proven that environmental disengagement can have a negative effect on the adoption of an attitude and this could be the key to changing the unproductive results that have been obtained so far in this field of research. Generation Z individuals are relatively young members of society that are currently studying at university or navigating the job market. Therefore, the actions implemented by the universities or from the companies are currently oriented towards an aspect of the work or studies. However, in the case of universities, the aim is not to include environmental actions within the content of an academic subject, but rather propose it as a recreational activity that generates attachment and a sense of belonging. Likewise, companies should separate environmental actions from work activities and implement mechanisms that allow individuals to interact in initiatives against climate change, but without perceiving them as part of their job.

Third, special attention should be paid to intrinsic motivations; when people have an internal stimulus, the experience of goal achievement is transferred to goal pursuit (Fishbach & Woolley, 2022). Leaders or managers of the various organisations are currently focusing their efforts on motivating Generation Z individuals to participate in the fight against climate change through economic or academic incentives, generating external and momentary motivation that does not last over time. Therefore, it is necessary to implement actions that generate pleasure, for example, promote environmental activities within organisations that allow them to compete with each other and gradually obtain individual and collective recognition for their interactions and specific initiatives, such as the EIT Climate-KIC Climathon (EIT, 2023).

Lastly, previous participation in environmental activities has been found to influence pro-environmental behaviours. Therefore, attention should be paid not so much to the dimension of participation, but rather to repetition. The way in which environmental content is presented must be analysed in detail, seeking a balance so as not to become wearisome but to reinforce it so that the individual always keeps it in mind and can constantly contribute.

In conclusion, our findings help behavioural research not only to meet social requirements related to environmental protection (Bordian et al., 2022), but also to provide management guidance to improve predictions of pro-environmental behaviours in members belonging to Generation Z.

This research is subject to a series of limitations that must be considered to evaluate the results and the conclusions derived from them, which are established as opportunities for future research. Firstly, the research is based on the TPB, which has received criticism and questioning in recent years due to the fact that various studies concluded that its components are insufficient to accurately predict behaviour (Sniehotta et al., 2014). For this reason, the introduction of new factors is proposed, such as intrinsic and extrinsic motivations, in order to improve the explanatory and predictive capacity of the model in future research. Second, with regard to the sample, although the size is large enough for statistical analysis, the existence of differences could be explored with a larger number of participants. Third, it is necessary to consider countries located in other geographical areas in order to analyse whether the cultural aspect can influence the results seen from a broader context. Fourth, differences between generations could be evaluated and contrasted if the proposed model can be validated in another generational cohort, or comparisons could be made between groups, such as Millennials vs. Centennials. Fifth, other constructs that can influence pro-environmental behaviour could be added to the model, such as the attribution of responsibility, self-esteem, or satisfaction. Finally, the model can be applied in other contexts, such as the industrial or business sector, in order to determine if the study variables have a similar impact in other areas.

Data availability The dataset that supports the findings of this study is available from the corresponding author on request.

Declarations

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Not applicable.

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