NOVA IMS Information Management School

MEGI

Master's Degree Program in

Statistics and Information Management

Sustainable Consumption Concerns in different age groups

Mariana Alexandra Costa das Neves

Master Thesis

presented as partial requirement for obtaining a Master's Degree in Statistics and Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
Universidade Nova de Lisboa

NOVA Information Management School

Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa

Sustainable Consumption Concerns in different age groups

by

Mariana Alexandra Costa das Neves

Master Thesis presented as partial requirement for obtaining the Master's degree in Statistics and Information Management, with a specialisation in Risk Analysis and Management

Supervised by

Professor Marlon Dalmoro

November, 2024

STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism, any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledged the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, 30th November 2024

ABSTRACT

This study explored generational differences in sustainable concerns, focusing on five mediating variables: sustainable knowledge, sustainable values, sustainable beliefs, intentions versus attitudes, and contact with nature. Using a sample of 430 participants from different generations, distinct patterns of environmental engagement were identified. Younger generations, such as Millennials and Generation Z, stood out for their increased emotional involvement with environmental issues, reflected in higher levels of concern about human impact on the environment. Conversely, older generations, such as Baby Boomers and Generation X, demonstrated greater consistency in sustainable practices, such as recycling and purchasing organic products, often linked to financial stability and social norms. Among the mediating variables, sustainable values, beliefs, and contact with nature had the most significant positive impacts on sustainable concerns. In contrast sustainable knowledge and intentions versus attitudes showed less pronounced effects. These findings highlight a gap between theoretical knowledge and practical behaviour, often shaped by social and institutional barriers. The study underscores the importance of educational interventions and public policies that foster emotional and ethical connections to the environment, encouraging the transformation of intentions into actions. Moreover, the results emphasise the need for intergenerational collaboration to tackle global climate challenges, promoting an inclusive and conscious approach that ensures a sustainable future for all generations.

KEYWORDS

Generational Analysis; Intergenerational Sustainability; Pro-environmental Behaviour; Environmental Responsibility; Sustainable Practices; Behavioural Mediation; Socio-demographic Influences; Environmental Beliefs; Sustainable Concerns

Sustainable Development Goals (SDG):

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
CN	Nature Contact
CRS	Sustainable Beliefs
CS	Sustainable Knowledge
IvA	Intentions versus Attitudes
LLCI/ULCI	Lower Level Confidence Interval/Upper Level Confidence Interval
NEP	New Ecological Paradigm
PS	Sustainable Concerns
SD	Standard Deviation
SDG	Sustainable Development Goals
SPSS	Statistical Package for the Social Sciences
VS	Sustainable Values

INTRODUCTION

Sustainable consumption is an emerging and essential concept for addressing the environmental, social, and economic challenges of the 21st century. It involves conscious and responsible consumption choices to reduce negative environmental impacts and to promote the shift towards more eco-friendly products and services (Jackson, 2005). Beyond individual choices, sustainable consumption is viewed as a systemic challenge that demands profound structural changes in economies and societies, including effective public policies and the active participation of all sectors of society (Lorek & Spangenberg, 2001).

The importance of sustainable consumption is widely recognised as crucial for achieving sustainable development. Changes in consumption patterns are fundamental to mitigating the negative environmental impacts associated with economic growth (Thøgersen, 2006). More sustainable consumption practices also have significant social and economic implications, promoting a more equitable distribution of resources and encouraging innovation and the creation of new markets for eco-friendly products and services (Cohen, 2010).

Sustainable concerns encompass environmental, social, and economic issues. These concerns motivate consumers and businesses to adopt more responsible practices, driving public policies and corporate initiatives reduce environmental impact and promote sustainability (Peattie & Collins, 2009). As these concerns become more prevalent, there is increasing pressure on governments and businesses to implement more sustainable and transparent practices, resulting in technological innovations and improvements in supply chains (Gleim, Smith, Andrews & Cronin, 2013).

There are significant variations in sustainable concerns across different age and gender groups. Young people, adults, and the elderly demonstrate distinct motivations and sustainable consumption practices, influenced by factors such as education, family responsibilities, and values acquired over time (Hume, 2010; Straughan & Roberts, 1999; Wiernik, Ones & Dilchert, 2013). Women, for example, often exhibit more significant concern for environmental issues due to traditional social roles and heightened sensitivity to environmental justice issues (Hunter, Hatch & Johnson, 2004; Tindall, Davies & Mauboules, 2003).

To better understand the motivations and barriers to sustainable consumption, this research explores six core constructs: sustainable knowledge, sustainable values, sustainable beliefs, sustainable intentions vs attitudes, sustainable concerns, and contact with nature. These constructs are fundamental for understanding how various factors influence responsible consumption decisions. Sustainable knowledge reflects individuals' level of information and environmental awareness, while sustainable values and beliefs represent ethical principles and perceptions about the necessity of protecting the environment (Mostafa, 2006; Dunlap & Van Liere, 1978). The distinction between sustainable intentions and attitudes is particularly relevant for investigating the "gap" between the desire to act for the environment and the effective translation of that desire into sustainable practices, which is often limited by

contextual and emotional barriers (Kollmuss & Agyeman, 2002). Finally, contact with nature is considered an essential factor that can strengthen the emotional connection to the environment and foster a deeper commitment to sustainable practices (De Castro, 2008).

This study is therefore guided by the following research question: How do sustainability concerns impact consumer choices and attitudes across different age groups? Understanding these dynamics among young people, adults, and the elderly enables the identification of significant variations in motivations and sustainable consumption practices. Such understanding is essential for developing more effective awareness strategies and public policies tailored to each age group's specific needs and values.

1. LITERATURE REVIEW

1.1. SUSTAINABLE CONSUMPTION

Sustainable consumption is a central concept for mitigating the negative environmental impacts generated by economic growth, involving conscious and responsible choices in resource use. According to Jackson (2005), it transcends individual responsibility, emerging as a systemic challenge that requires profound transformations in economic and social structures. Active collaboration across different sectors of society, combined with effective public policy formulation, is essential for its realisation (Lorek & Spangenberg, 2001). The relevance of sustainable consumption is directly linked to achieving sustainable development, given its role in minimising adverse environmental impacts and promoting social and economic benefits. Sustainable consumption practices help reduce inequalities in resource distribution and act as catalysts for innovation, fostering the emergence of new markets and eco-friendly products that drive sustainable economic growth (Cohen, 2010). Thus, sustainable consumption not only addresses environmental challenges but also promotes positive transformations in economic and social frameworks (Thøgersen, 2006).

In this context, concerns related to sustainable consumption are fundamental in guiding individuals and organisations towards adopting more responsible practices. These concerns encompass three main dimensions: environmental, social, and economic. The environmental dimension highlights the reduction of natural resource use, waste minimisation, pollution control, and biodiversity preservation. Social concerns involve promoting fair working conditions, respecting human rights, and generating positive community impacts. On the economic side, aspects such as economic justice, strengthening local economies, and ethical trade practices are considered (McDonald, Oates, Thyne, Alevizou & McMorland, 2012). Additionally, individual factors such as personal values, environmental knowledge, and life experiences influence these concerns, with more conscious consumers often showing a greater willingness to pay for sustainable alternatives and prioritising eco-friendly products (Vermeir & Verbeke, 2006). This relationship between individual and collective concerns underscores the critical role of consumers as agents of transformation in advancing sustainable practices.

The growing attention to sustainable concerns also reflects an urgent need to address the negative impacts associated with overconsumption and unsustainable production practices, highlighting the importance of coordinated action. These concerns have the potential to catalyse systemic changes, encouraging both consumers and companies to adopt more responsible and environmentally friendly practices while fostering the transition to a green economy (Peattie & Collins, 2009; Jackson, 2009). The increasing social pressures for sustainable change have driven technological innovations, supply chain improvements, and greater corporate social responsibility. By responding to these demands, governments and

companies promote transformations that benefit not only the environment but also society as a whole (Gleim, Smith, Andrews & Cronin, 2013).

1.2. SUSTAINABLE CONCERNS AND AGE GROUPS

Among young people, particularly those aged 18 to 30, there is a growing concern with sustainable consumption, attributed to greater exposure to information about sustainability, whether through formal education or social media (Hume, 2010). This group tends to adopt practices such as recycling and purchasing eco-friendly products, motivated by values of social and environmental justice (Lee, 2008). However, despite their awareness, many young people face financial and social barriers that hinder the translation of these concerns into practical actions. Thus, positive intentions only sometimes result in concrete sustainable behaviours due to economic constraints and limited access to more eco-friendly alternatives (Roberts, 1996).

Typically, adults between 30 and 60, exhibit sustainable concerns that reflect their family and professional responsibilities. The presence of children often intensifies their commitment to sustainable practices, driven by concerns for the environmental future of the next generations (Straughan & Roberts, 1999). Thanks to greater financial stability, adults are able to adopt sustainable behaviours more consistently, such as purchasing organic food or reducing energy consumption. However, the lack of time and the need for convenience remain obstacles that can limit the full adoption of more environmentally friendly practices (Thøgersen, 2000).

Elderly individuals, generally over the age of 60, demonstrate sustainable concerns influenced by their life experiences and values acquired over time. Despite adopting more conservative consumption behaviours, they show a high level of concern for environmental preservation, motivated by a desire to leave a positive legacy for future generations (Wiernik, Ones & Dilchert, 2013). However, this group faces physical and technological barriers that may hinder the adoption of some practices, such as using green technologies or participating in more complex recycling programmes. Despite these limitations, environmental awareness remains prominent among older adults, significantly influencing the sustainability debate (Jansson, Marell & Nordlund, 2010).

Comparing sustainable concerns across different age groups reveals that motivations and practices vary significantly. Young people are often driven by ideals of social justice and global impact, while adults and older adults are more influenced by family responsibilities and conservation values. Young people stand out for their involvement in environmental campaigns and social movements. In contrast adults focus on sustainable daily practices, and older adults prioritise resource conservation and the transmission of sustainable values to future generations (Wray-Lake, Flanagan & Osgood, 2010). While these differences are evident, education and exposure to information about sustainability are determining factors across all age groups, with a particularly significant impact on young people who are in the process of forming their consumption habits. Targeted educational campaigns can be an

effective tool to increase sustainable awareness across all ages, particularly among young people, contributing to the adoption of behaviours better aligned with contemporary environmental challenges (Gilg, Barr & Ford, 2005).

1.3. SUSTAINABLE CONCERNS AND GENDER

Sustainable concerns vary significantly between genders, reflecting distinct behavioural patterns and social values. Women, for instance, tend to express higher levels of concern about environmental issues, a characteristic often linked to social roles that emphasise care and domestic responsibilities, including resource management and environmental protection (Hunter, Hatch, and Johnson, 2004). Moreover, their heightened sensitivity and empathy towards issues of environmental justice and intergenerational equity encourage active participation in sustainable activities, with more consistent engagement (Tindall, Davies, and Mauboules, 2003). In contrast, men are more likely to prioritise aspects such as economic success and social status, resulting in a lower propensity for sustainable consumption behaviours (Zelezny, Chua, and Aldrich, 2000).

1.4. BELIEFS AND BEHAVIOURS RELATED TO SUSTAINABLE CONSUMPTION

Environmental beliefs play an essential role in shaping attitudes and behaviours related to sustainable consumption, but they alone do not guarantee concrete actions. Although many individuals believe in the importance of environmental conservation, the lack of practical knowledge about sustainable practices often prevents these beliefs from translating into effective behaviours (Dunlap & Van Liere, 1978; Hines, Hungerford and Tomera, 1987). Emotional factors, such as fear of climate change, and ethical values, such as responsibility towards future generations, strengthen the link between beliefs and actions (Kollmuss & Agyeman, 2002). However, the formation of sustainable habits depends on contextual factors, such as access to eco-friendly products and social support (Thøgersen & Ölander, 2003).

Generational differences show distinct patterns concerning sustainable knowledge and behaviours. Generation Z and Millennials are often identified as the most environmentally conscious, a result of facilitated access to information technologies and the inclusion of sustainability topics in school curricula (Liang, Li, Cao & Zhang, 2024; Ham, Kim & Lee, 2019). This higher level of theoretical knowledge is reflected in practices such as recycling, waste reduction, and conscious consumption. These generations show a greater predisposition to purchase eco-friendly products and boycott brands associated with harmful environmental practices (Passafaro, Carrus, Maricchiolo & Pirchio, 2021; Geiger, Dombois & Funke, 2018). However, studies indicate that this elevated knowledge only sometimes translates into practical actions due to contextual barriers such as inadequate infrastructure and incentives (Barr, 2003). Furthermore, Millennials, in particular, show lower political and civic engagement in environmental issues, being less likely to participate in demonstrations or environmental voting compared to Baby Boomers and Generation X (Campbell, Freeman and Twenge, 2012).

On the other hand, Baby Boomers and Generation X demonstrate greater practical consistency in sustainable behaviours, such as purchasing organic food and using renewable energy. This behaviour can be attributed to the greater financial stability of these generations, allowing them to adopt practices often beyond the reach of younger generations (Machová, Ambrus, Zsigmond & Bakó, 2022). Additionally, they are frequently motivated by social norms and health concerns rather than intrinsic environmental values (Kamenidou, Stavrianea, Bara & 2020; Hsu, 2004). In countries like Greece, for example, Baby Boomers lead the purchasing of organic food, even though younger generations place greater importance on environmental issues in their consumption choices (Kamenidou, Stavrianea & Bara, 2020). This generational contrast reflects a clear discrepancy between theoretical knowledge and practical application, where older generations, despite possessing less formal knowledge, practice sustainable behaviours more consistently, often influenced by values acquired throughout life (Coughlin, 2018).

Emotional factors also significantly influence sustainable behaviours. Younger generations, such as Millennials and Generation Z, exhibit higher levels of concern, guilt, and anger regarding climate change—emotions that have intensified due to their greater likelihood of facing the most severe impacts of climate change during their lifetimes (Gray, Raimi, Wilson & Árvai, 2019; USGCRP, 2017). However, older generations, including Baby Boomers, have shown a progressive increase in belief in climate change, influenced by global movements such as Fridays for Future and Extinction Rebellion (Milfont, Davies & Wilson, 2019). These emotions are often tied to contact with nature, which plays a fundamental role in promoting environmental values. For younger generations, early interaction with nature helps build an emotional connection with sustainability, while for older generations, it reinforces values acquired over time (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2012). Intergenerational activities based on nature, such as educational programmes or community projects, provide mutual benefits: younger individuals learn from the experience of older generations, while the latter perpetuate sustainable practices and strengthen bonds with future generations (McClain, 2014; Bateson, 2011).

Despite growing environmental awareness across all generations, individual, social, and institutional barriers continue to hinder the adoption of sustainable practices. Lack of practical knowledge, cultural norms discouraging environmental actions, and inadequate infrastructure are critical obstacles (Blake, 1999). These limitations highlight the need for interventions that align younger generations' theoretical knowledge with practical actions while recognising the consistent contributions of older generations.

In conclusion, generational differences in sustainable attitudes and behaviours reflect distinct social, economic, and cultural contexts but point towards a progressive convergence around broader environmental values. Generation Z and Millennials stand out for their access to sustainable knowledge, theoretical awareness, and emotional engagement. Baby Boomers and Generation X bring practical consistency and stability, supported by greater financial

security and social norms. To achieve a more sustainable future, it is essential to promote intergenerational collaboration, aligning younger generations' theoretical knowledge with the practical application of older generations. Contact with nature and the sharing of experiences emerge as crucial elements to strengthen collective commitment to environmental protection and ensure a sustainable legacy for future generations.

1.5. THEORETICAL MODEL

The present study aimed to explore age differences concerning sustainable concerns, seeking to test the effect of potential explanatory factors.

Based on the literature review conducted, it was hypothesised that younger generations would exhibit higher levels of sustainable concerns compared to older generations (H1). Beyond this objective, the study also aimed to explore the potential explanatory role of five mediating factors. Following the review, it was anticipated that sustainable concerns would be associated with Sustainable Knowledge (H2), higher levels of Sustainable Values (H3), Sustainable Beliefs (H4), Intentions versus Attitudes (H5), and Nature Contact (H6). Additionally, a mediating effect of these five variables on the relationship between generation and sustainable concerns was expected (H7–H11).

Table 1 - Hypotheses

Hypothesis	Source
H1 – Younger generations exhibit higher levels of sustainable concerns.	USGCRP (2017); Clayton (2020); Guardian Labs (2020); Wu, Snell & Samji (2020).
H2 – Younger generations exhibit higher levels of sustainable knowledge.	Liang, Li, Cao & Zhang (2024); Ham, Kim & Lee (2019); Schultz & Zelezny (1999); Milfont, Davies & Wilson (2019).
H3 – Younger generations exhibit higher levels of sustainable values.	Passafaro, Carrus, Maricchiolo & Pirchio (2021); Campbell, Freeman & Twenge (2012).
H4 – Younger generations exhibit higher levels of sustainable beliefs.	Bamberg & Möser (2007); Thiermann & Sheate, (2021); Poortinga, Demski & Steentjes (2023); Zeng, Jiang & Yuan (2020)
H5 – Younger generations exhibit higher levels of intentions versus attitudes.	Tait, Saunders, Dalziel, Rutherford & Driver (2019); Kamenidou, Stavrianea & Bara (2020); Geiger, Dombois & Funke (2018).
H6 – Younger generations exhibit higher levels of contact with nature.	Mayer, Frantz, Bruehlman-Senecal & Dolliver (2012); McClain (2014); Bateson (2011).

H7 – The effect of sustainable knowledge on sustainable concerns is greater in younger generations.	Barr (2003); Coughlin (2018).
H8 – The effect of sustainable values on sustainable concerns is greater in younger generations.	Schultz & Zelezny (1999); Passafaro, Carrus, Maricchiolo & Pirchio (2021).
H9 – The effect of sustainable beliefs on sustainable concerns is greater in younger generations.	Bamberg & Möser (2007); Thiermann & Sheate, (2021).
H10 – The effect of intentions versus attitudes on sustainable concerns is greater in younger generations.	Tait, Saunders, Dalziel, Rutherford & Driver (2019); Geiger, Dombois & Funke (2018)
H11 – The effect of contact with nature on sustainable concerns is greater in younger generations.	Mayer, Frantz, Bruehlman-Senecal & Dolliver (2012); McClain (2014).

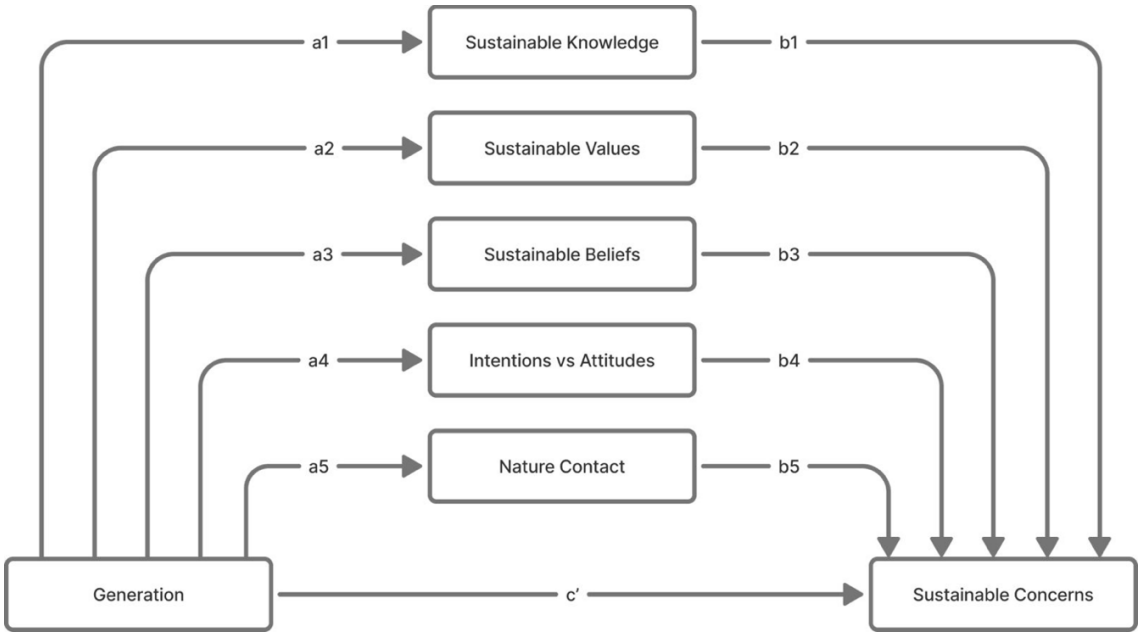


Figure 1 - Parallel Mediation using the Mediating Effect of Five Variables

2. METHODOLOGY

2.1. INSTRUMENTS AND MEASURES

The questionnaire was made available in digital format on the Qualtrics platform, and due to the technique used the sample for this investigation is characterised as a non-probabilistic convenience sample (Appendix A).

The questionnaire is divided into eight sections. The first part corresponds to the Sociodemographic Analysis. The second part corresponds to the analysis of the Sustainable Knowledge variable. The third part corresponds to the analysis of Sustainable Values. The fourth part corresponds to the Sustainable Beliefs variable. The fifth part corresponds to the Intentions vs Attitudes variable. The sixth part corresponds to the Sustainable Concerns variable. The seventh part corresponds to the Contact with Nature variable. Finally, the last part analyses sustainable concerns.

Demographic Questions

The sample obtained was characterise the based on age, gender, marital status, level of education, and professional status.

Sustainable Knowledge

To analyse the Sustainable Knowledge Variable, the questionnaire "Gender Differences in Egyptian Consumers' Green Purchase Behaviour: The Effects of Environmental Knowledge, Concern and Attitude" (Mostafa, 2006) was used. The primary objective of this questionnaire is to assess the population's knowledge about sustainability. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was used for all the questions.

Sustainable Values

To analyse the Sustainable Values Variable, the questionnaire from Green Human Resource Management and Employees' Green Creativity: The Roles of Green Behavioural Intention and Individual Green Values (Afsar & Al-Ghazali, 2020) was used. The primary objective was to assess the sustainable values of the sample. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was applied to all questions.

Sustainable Beliefs

To analyse the Sustainable Beliefs Variable, two questionnaires were utilised: New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale (Dunlap, Liere & Jones, 2002) and The Environmental Attitudes Inventory: A Valid and Reliable Measure to Assess the Structure of Environmental Attitudes (Duckitt & Milfont, 2010). The objective was to evaluate the beliefs that the sample identifies

with and agrees upon. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was used for all the questions.

Sustainable Intentions Vs Attitudes

To analyse the Intentions vs Attitudes Variable, the study Assessing People's General Ecological Behaviour: A Cross-Cultural Measure (Kaiser & Wilson) was used to evaluate the intentions and attitudes with which the sample identifies. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was applied to all questions.

Nature Contact

To analyse the Contact with Nature Variable, an adaptation of the study Depression and Contact with Nature (De Castro, 2008) was used to assess the sample's proximity to nature. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was applied to all questions.

Sustainable Concerns

To analyse the Sustainable Concerns Variable, the research Measurement of Environmental Concern: A Review and Analysis (Cruz & Manata) was used to determine the sustainable concerns with which the sample identifies. A five-point Likert scale (ranging from "Strongly Disagree" to "Strongly Agree") was applied to all questions.

2.2. PROCEDURES

Based on the formulated hypotheses, a literature review was conducted to select scales that met the measurement needs. After selecting the scales, the questionnaire was constructed using the Qualtrics platform – Online Survey Software & Insight Platform (Appendix A). Before data collection commenced, the questionnaire was submitted to and approved by the Nova IMS Ethics Committee (Appendix C).

Prior to data collection, a pre-test was conducted with 12 participants, ensuring at least one representative from each generation. Participants were then asked to share any doubts, questions, or suggestions for improvements. As a result, some questions were rephrased to enhance clarity.

For data collection, the questionnaire link was distributed across various social platforms (Facebook, WhatsApp, and Instagram). The data collection took place in June 2024.

The questionnaire began with a consent form for respondents, which provided information about data confidentiality, anonymity, research objectives, and estimated completion time. Subsequently, sociodemographic questions were presented, followed by the scales described above, which aimed at analyse the study variables. (Appendix B).

2.3. DATA ANALYSIS STRATEGY

Using the SPSS (Statistical Package for the Social Sciences) version 30 for MacBook, the hypotheses outlined at the beginning of this study were tested through inferential statistical analysis techniques. The collected statistical data were analysed and processed.

Initially, descriptive analyses of all sociodemographic content were conducted to better understand the obtained sample. Subsequently, correlations between the items within each scale were examined to assess their psychometric quality. To evaluate the internal consistency of the scales used, Cronbach's Alpha was calculated, yielding values above 0.6. This result indicates acceptable internal consistency according to psychometric interpretation standards, ensuring that the items within each scale are coherent and appropriate for measuring the hypotheses proposed in the study. (Appendix F).Next, the overall internal consistency of the scales was examined. To test the measurement models and support the assumptions of Baron & Kenny (1986), the PROCESS macro (Hayes, 2018) for IBM SPSS was employed. The PROCESS macro facilitates the analysis of direct and indirect effects within mediating models by using the bootstrapping process with a 95% confidence interval. This approach enhances the robustness of the results presented.

2.4. PARTICIPANTS

The inclusion criterion for the study was a minimum age of 18 years. The minimum number of participants required for the study was determined using the sample size calculation technique for proportion estimates, with a 95% confidence interval, resulting in a minimum of 384 participants.

A total of 512 participants were surveyed. From this total, all incomplete questionnaires and those who answered the exclusion question incorrectly were removed. This resulted in 430 valid responses (Table 2), with ages ranging from 18 to 80 years. The ages were subsequently converted into generational groups: Generation Z, Millennials, Generation X, and Baby Boomers. These generations were grouped based on Dimock's (2019) study, which classifies generations as follows: Generation Z includes those born from 1997 onwards, Millennials those born between 1981 and 1996, Generation X those born between 1965 and 1980, and Baby Boomers those born between 1946 and 1964.

The sample consisted of 72.6% female participants (N=312), 27.2% male participants (N=117), and 0.2% identifying as another gender (N=1). Due to the small percentage of participants in the "other" gender category, this group will not be considered in the analysis of the results. Regarding marital status, the majority of respondents were single (47%, N=202), followed by Married / Civil Partnership (42.1%, N=181), Divorced / Separated (8.8%, N=38), and Widowed (2.1%, N=9). In terms of educational attainment, most of the sample held a bachelor’s degree (41.6%, N=179), with the remaining participants distributed as follows: Secondary Education or Equivalent (36.3%, N=156), Master’s Degree (17.7%, N=76), Doctorate (2.6%, N=11), and

Below Secondary Education (1.9%, N=8). Finally, regarding Professional Status, the majority of participants were employed (76.5%, N=329), with the rest distributed as follows: Student (7.2%, N=31), Working Student (6.7%, N=29), Unemployed (5.1%, N=22), and Retired (4.4%, N=19).

Table 2 - Sociodemographic Characteristics of Participants

	Variation	%
Generation	Generation Z [18-25]	37,0%
	Millennials [26-41]	19,5%
	Generation X [42-57]	34,7%
	Baby Boomers [58-80]	8,8%
Gender	Female	72,6%
	Male	27,2%
	Outro	0,2%
Marital Status	Single	47,0%
	Married / Civil Partnership	42,1%
	Divorced / Separated	8,8%
	Widowed	2,1%
Level of Education	Below Secondary Education	1,9%
	Secondary Education or Equivalent	36,3%
	Bachelor's Degree	41,6%
	Master's Degree	17,7%
	Doctorate	2,6%
Professional Status	Student	7,2%
	Working Student	6,7%
	Worker	76,5%
	Unemployed	5,1%
	Retired	4,4%

3. RESULTS

In this chapter, the analysis of the collected data is presented, using version 30 of the SPSS (Statistical Package for the Social Sciences) software and the measurement models explored through the PROCESS Macro 4.2 developed by Hayes (2018).

Initially, tests were conducted to analyse the assumptions. Regarding the assumption of normality, this is not considered an issue as the central limit theorem is invoking and given the large sample size and its similar dimensions, ANOVA is considered robust to violations of this assumption (Field, 2005).

3.1. MEDIATING VARIABLES

3.1.1. SUSTAINABLE KNOWLEDGE

Regarding the mediating variable health perception, its distribution was initially analysed in detail (Figure 1), revealing a good level of sustainable knowledge (M=3.40, SD=.643).

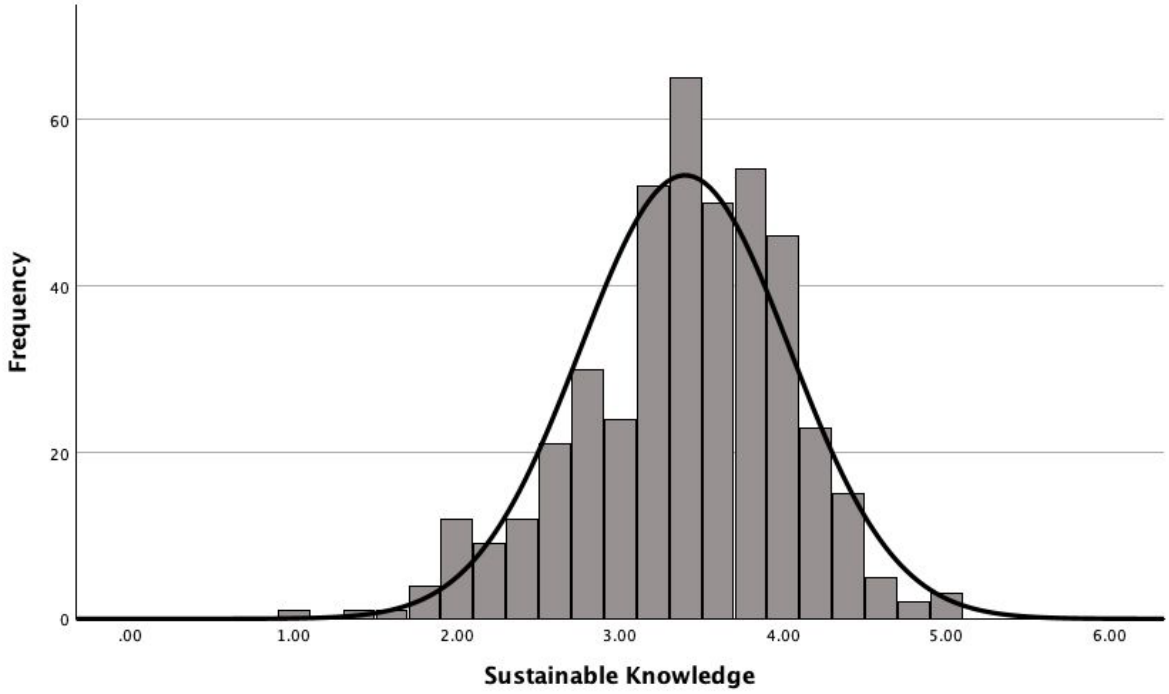


Figure 2 - Distribution of the Mediator Variable Sustainable Knowledge

To analyse generational differences, a One-way ANOVA was conducted. An analysis of the assumptions using Bartlett's test confirmed the assumption of homogeneity of variances. A significant generational effect was found, $F(3,426) = 6.614$, $p < .001$, $\eta^2p = .045$.

The post-hoc Tukey HSD test identified differences between the generations: Generation Z, Millennials, Generation X, and Baby Boomers. The Baby Boomers rated their knowledge as higher. It is noted that this scale was measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) (Figure 1 and Table 3).

Table 3 - Descriptive Measures of the Mediator Variable Sustainable Knowledge across Different Generations

	Mean	Standard Deviation	95% Confidence Interval	
			Lower Limit	Upper Limit
Generation Z	3.25	0.608	3.15	3.34
Millennials	3.36	0.638	3.22	3.49
Generation X	3.62	0.653	3.41	3.62
Baby Boomers	3.40	0.625	3.39	3.80

3.1.2. SUSTAINABLE VALUES

As with the previous variable, the distribution was first analysed in detail (Figure 2), revealing high levels of Sustainable Values (M=4.07, SD=.600).

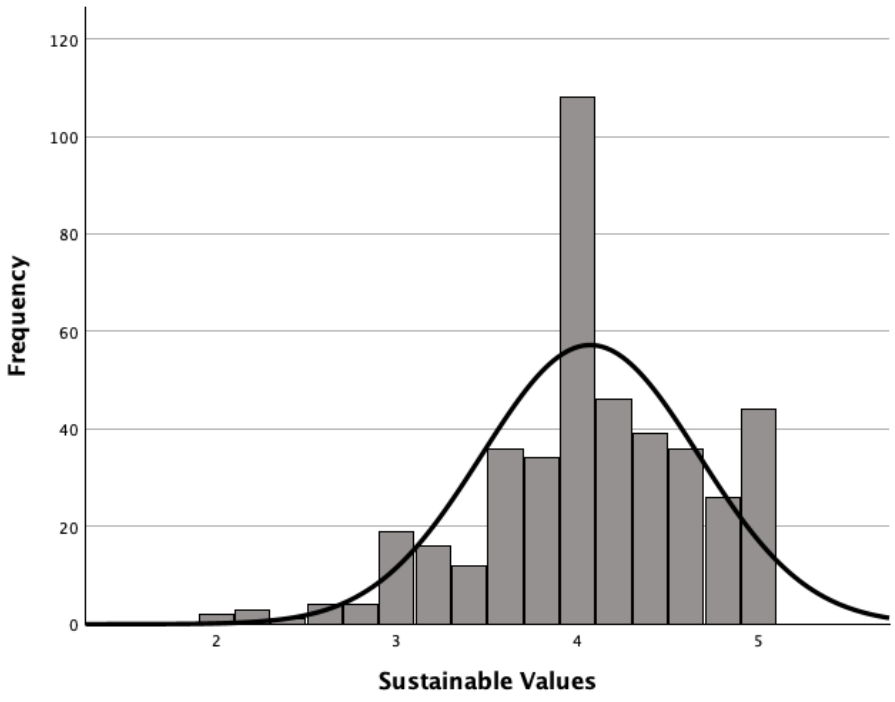


Figure 3 - Distribution of the Mediator Variable Sustainable Values

A One-way ANOVA was conducted, and Bartlett's test confirmed the assumption of homogeneity of variances. A significant generational effect was observed for Sustainable Values, $F(3,426) = 4.111$, $p = .007$, $\eta^2p = .028$.

The post-hoc Tukey HSD test identified differences between the generations: Generation Z, Millennials, Generation X, and Baby Boomers. Sustainable values were found to be highest in Generation X. It is noted that this scale was measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree) (Figure 3 and Table 4).

Table 4 - Descriptive Measures of the Mediator Variable Sustainable Values across Different Generations

			95% Confidence Interval	
	Mean	Standard Deviation	Lower Limit	Upper Limit
Generation Z	3.94	0.628	3.85	4.04
Millennials	4.09	0.591	3.95	4.22
Generation X	4.17	0.573	4.07	4.26
Baby Boomers	4.15	0.519	3.99	4.32

3.1.3. SUSTAINABLE BELIEFS

Through the analysis of the mediating variable Sustainable Beliefs (Figure 3), good levels of Sustainable Beliefs were observed ($M = 3.45$, $SD = .427$). To examine the effect of Generation on Sustainable Beliefs, a One-way ANOVA was conducted. Initial assumption testing using Bartlett's test confirmed the homogeneity of variances.

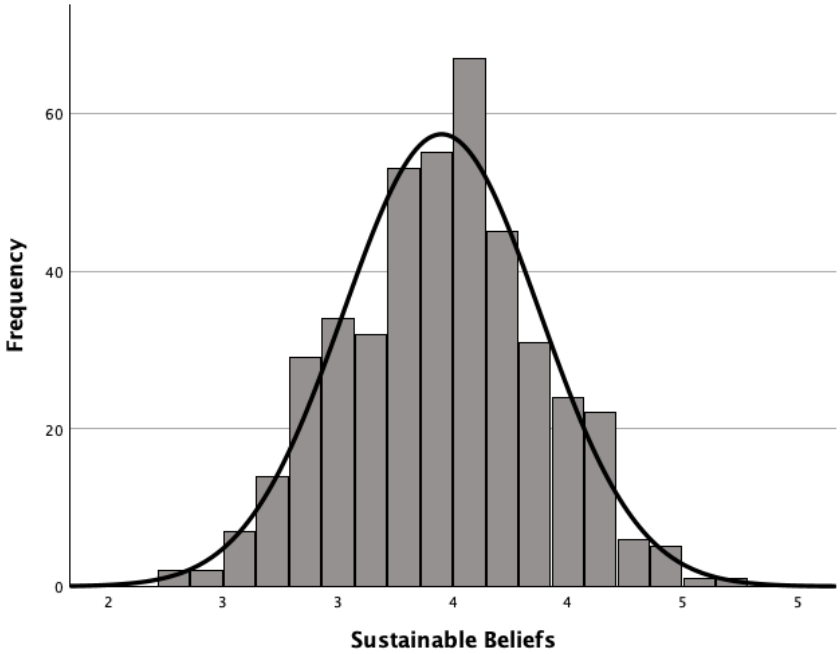


Figure 4 - Distribution of the Mediator Variable Sustainable Beliefs

No significant generational effect was observed ($F(3,426) = .802$, $p = .493$, $\eta^2p = .006$). Subsequently, the post-hoc Tukey HSD test revealed no substantial differences between generations, although Sustainable Beliefs levels were slightly higher in Generation Z compared to the other generations (Figure 3 and Table 5).

Table 5 - Descriptive Measures of the Mediator Variable Sustainable Beliefs across Different Generations

			95% Confidence Interval	
	Mean	Standard Deviation	Lower Limit	Upper Limit
Generation Z	3.49	0.422	3.42	3.56
Millennials	3.44	0.431	3.34	3.53
Generation X	3.42	0.434	3.34	3.49
Baby Boomers	3.46	0.411	3.34	3.60

3.1.4. SUSTAINABLE INTENTIONS VS ATTITUDES

A good level of Sustainable Intentions vs Attitudes was identified through the analysis of the mediating variable's distribution (Figure 4) (M = 3.37, SD = .460). To examine the effect of Generation on Intentions vs Attitudes, a One-way ANOVA was conducted. Bartlett's test was used to analyse the initial assumptions, confirming the homogeneity of variances.

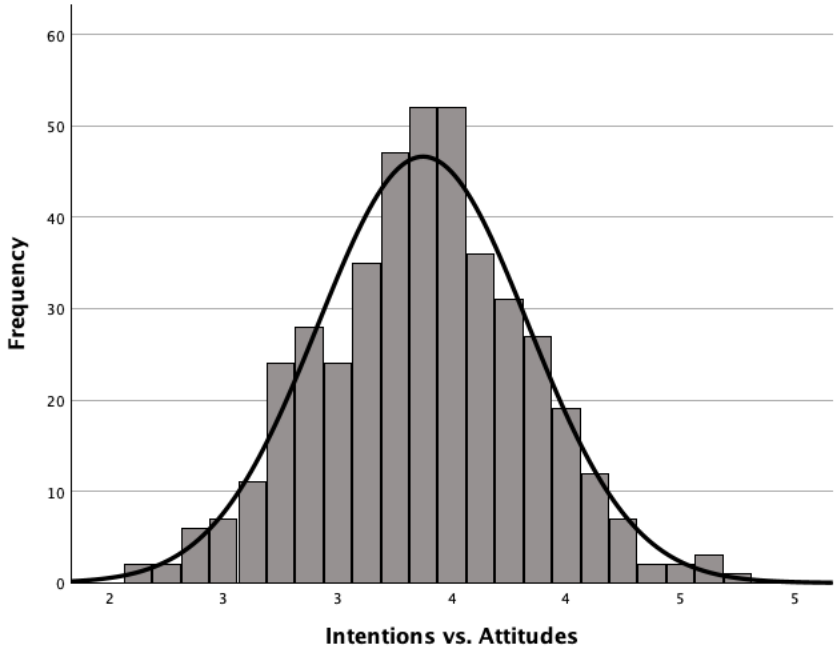


Figure 5 - Distribution of the Mediator Variable Intentions vs. Attitudes

No significant generational effect was observed ($F(3,426) = .398$, $p = .754$, $\eta^2p = .003$). Subsequently, the post-hoc Tukey HSD test revealed no differences between generations. However, Generation Z showed the highest level of Intentions vs Attitudes (M = 3.40, SD = .444) (Figure 4 and Table 6).

Table 6 - Descriptive Measures of the Mediator Variable Intentions vs. Attitudes across Different Generations

			95% Confidence Interval	
	Mean	Standard Deviation	Lower Limit	Upper Limit
Generation Z	3.40	0.444	3.33	3.47
Millennials	3.33	0.471	3.24	3.44
Generation X	3.37	0.481	3.28	3.44
Baby Boomers	3.38	0.424	3.25	3.51

3.1.5. NATURE CONTACT

Finally, the distribution of the mediating variable Nature Contact was analysed (Figure XX), revealing a good level of contact with nature (M = 3.68, SD = .440).

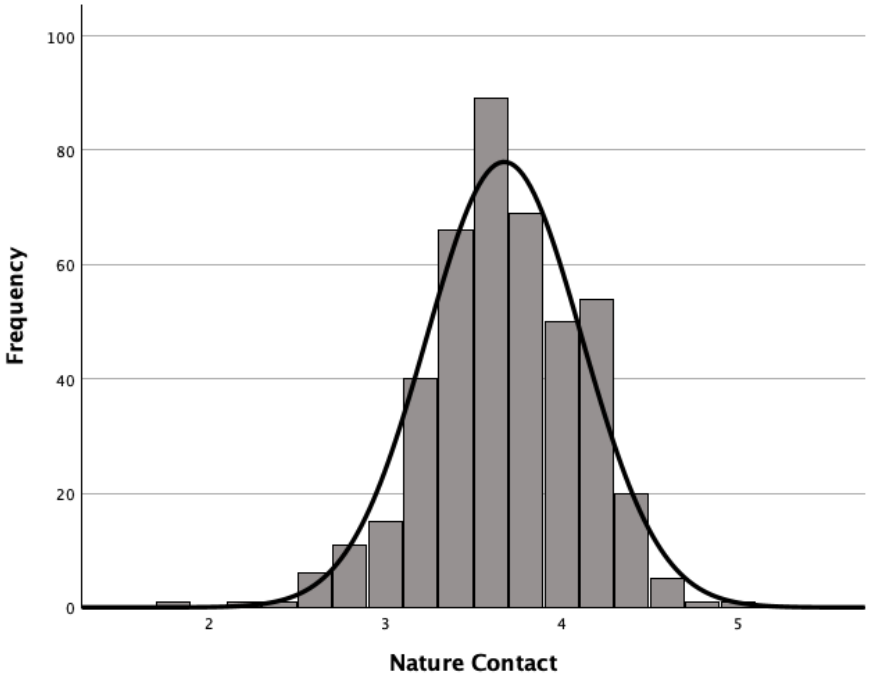


Figure 6 - Distribution of the Mediator Variable Nature Contact

Using a One-way ANOVA and Bartlett's test, the assumption of homogeneity of variances was confirmed. However, no significant generational effect was observed ($F(3,426) = .550$, $p = .648$, $\eta^2p = .004$). In the post-hoc Tukey HSD test, differences between generations were analysed, revealing higher levels of Contact with Nature in Generation Z (M = 3.70, SD = .417) (Figure 5 and Table 7).

Table 7 - Descriptive Measures of the Mediator Variable Nature Contact across Different Generations

			95% Confidence Interval	
	Mean	Standard Deviation	Lower Limit	Upper Limit
Generation Z	3.70	0.417	3.63	3.76
Millennials	3.69	0.411	3.60	3.77
Generation X	3.65	0.481	3.59	3.74
Baby Boomers	3.68	0.439	3.46	3.73

3.2. CRITERION VARIABLE

3.2.1. SUSTAINABLE CONCERNS

Regarding the criterion variable, Sustainable Concerns (Figure 6), a relatively high level of sustainable concerns was observed (M = 3.97, SD = .510).

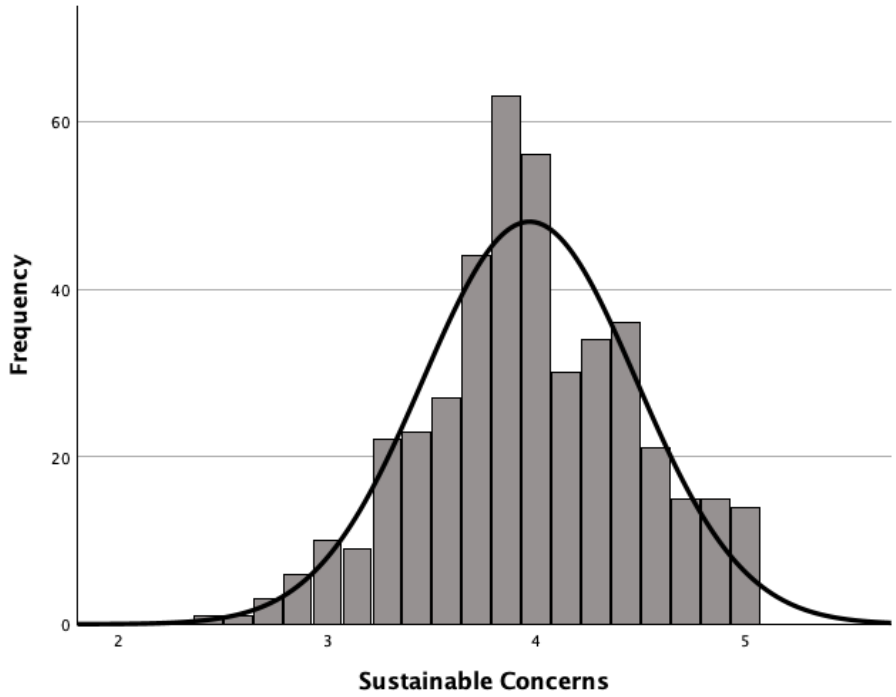


Figure 7 - Distribution of the Criterion Variable Sustainable Concerns

To analyse the data, a One-way ANOVA and Bartlett's test were conducted, confirming the assumption of homogeneity of variances. No significant generational effect was observed ($F(3,426) = 1.709$, $p = .164$, $\eta^2p = .012$).

Subsequently, the post-hoc Tukey HSD test identified differences between generations. It was found that Sustainable Concerns were higher among older generations (Generation X: M = 4.03, SD = .544; Baby Boomers: M = 4.03, SD = .495) compared to younger generations (Millennials: M = 3.95, SD = .520; Generation Z: M = 3.90, SD = .470) (Figure 6 and Table 8).

Table 8 - Descriptive Measures of the Criterion Variable Sustainable Concerns across Different Generations

	Mean	Standard Deviation	95% Confidence Interval	
			Lower Limit	Upper Limit
Generation Z	3.90	0.470	3.83	3.97
Millennials	3.95	0.520	3.84	4.06
Generation X	4.03	0.544	3.95	4.12
Baby Boomers	4.01	0.495	3.85	4.18

3.3. CORRELATION BETWEEN VARIABLES

Once the differences in generation for the criterion variable and mediating variables were analysed, an effort was also made to examine the relationship between sociodemographic variables, mediating variables, and the criterion variable (sustainable concerns). Initially, the relationships between sociodemographic variables and the criterion variable were examined (Appendix D).

Regarding gender, a very weak positive correlation was observed for women ($r = 0.085$, $p > 0.05$) and a very weak negative correlation for men ($r = -0.089$, $p > 0.05$), both of which were not statistically significant. In other words, no significant effect of gender was identified in relation to sustainable concerns.

Concerning marital status, the analysis revealed a significant negative correlation between being single and Sustainable Concerns ($r = -0.100$, $p < 0.05$), indicating that single individuals have fewer sustainable concerns. For married ($r = 0.075$, $p > 0.05$), divorced ($r = 0.073$, $p > 0.05$), and widowed individuals ($r = -0.054$, $p > 0.05$), the correlations were very weak and not significant. This result suggests that marital status, particularly for single individuals, may play a relevant role in sustainable concerns, while other categories did not show significant differences.

Using bivariate analysis, correlations between the mediating variables and the criterion variable (Sustainable Concerns) were also explored. All mediating variables showed a positive and significant correlation with the criterion variable. Specifically, the results indicated a weak but significant positive correlation for Sustainable Knowledge ($r = 0.241$, $p < 0.001$), a moderate and significant positive correlation for Sustainable Values ($r = 0.469$, $p < 0.001$) and Intentions vs Attitudes ($r = 0.397$, $p < 0.001$), and a strong and significant positive correlation

for Sustainable Beliefs ($r = 0.504$, $p < 0.001$). Additionally, a weak but significant positive correlation was observed between Contact with Nature and Sustainable Concerns ($r = 0.263$, $p < 0.001$).

These results indicate that all the mediating variables analysed play an essential role in relation to sustainable concerns, with sustainable values and beliefs showing the strongest associations. Since only marital status and the analysed mediating variables showed significant associations with Sustainable Concerns, it was decided to include these variables in subsequent analyses. However, considering that controlling for marital status did not significantly alter the results, it was decided to proceed with parallel mediation analysis without including covariates.

3.4. MEASUREMENT MODEL

To test the proposed model, Hayes' Model 4 (Hayes, 2018) was employed. In this model, the predictor variable was defined as generation (a dummy variable), the five mediating variables, and sustainable concerns as the criterion variable (Figure 7).

The analysis was conducted using a parallel mediation approach (Appendix E), based on the model proposed by Kane & Ashbaugh (2017). This method allowed for the simultaneous evaluation of all mediating variables included in the model. Additionally, to account for the generation variable, a dummy variable was created, with Generation Z serving as the reference group.

Exploring the assumptions required for model analysis, it was confirmed that the assumptions of linearity, absence of multicollinearity, normality, and homogeneity of variances were met. The Durbin-Watson test produced a value close to 2, indicating that the residuals are not autocorrelated.

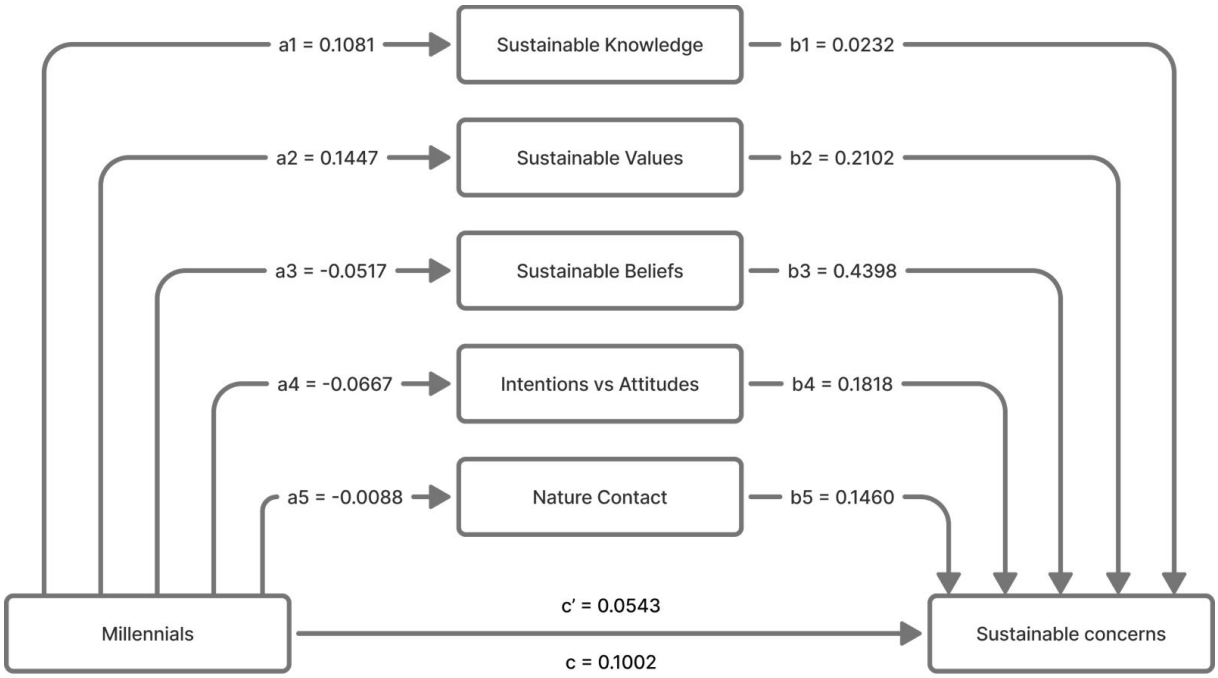
The results of the parallel mediation analysis demonstrated that the Millennial generation indirectly influences sustainable concerns through the mediating variables included in the model. As presented in the figure 8 and detailed results, Millennials showed a significant relationship with sustainable values ($B = 0.1154$, $t = 2.49$, $p = 0.013$), sustainable beliefs ($B = 0.0845$, $t = 1.17$, $p > 0.05$), intentions vs attitudes ($B = 0.0232$, $t = 0.70$, $p > 0.05$), and contact with nature ($B = -0.009$, $t = -0.15$, $p > 0.05$). On the other hand, the relationship with sustainable knowledge ($B = 0.2744$, $t = 4.27$, $p < 0.001$) was highly significant.

Additionally, the mediating variables had the following effects on sustainable concerns: sustainable knowledge showed a positive but not significant effect ($B = 0.0232$, $t = 0.70$, $p > 0.05$); sustainable values demonstrated a positive and highly significant relationship ($B = 0.2102$, $t = 5.58$, $p < 0.001$); sustainable beliefs demonstrated a strong and highly significant association ($B = 0.4398$, $t = 9.14$, $p < 0.001$); intentions vs attitudes showed a positive and significant association ($B = 0.1818$, $t = 3.88$, $p < 0.001$); and contact with nature also exhibited a positive and significant effect ($B = 0.1460$, $t = 3.26$, $p < 0.01$).

The 95% confidence intervals based on 5,000 bootstrap samples confirmed that the indirect effects through sustainable values (B = 0.03, CI 95% [0.008, 0.071]), sustainable beliefs (B = 0.06, CI 95% [0.012, 0.121]), intentions vs attitudes (B = 0.04, CI 95% [0.008, 0.092]), and contact with nature (B = 0.03, CI 95% [0.007, 0.064]) were significant, while sustainable knowledge showed a non-significant indirect effect (B = 0.003, CI 95% [-0.002, 0.011]).

The total effect of the Millennial generation on sustainable concerns was significant (R^2 = 0.417, F(3,426) = 37.71, p < 0.001). However, when controlling for the mediating variables, the direct effect of the Millennial generation on Sustainable Concerns was reduced (B = 0.0543, t = 1.01, p > 0.05), indicating that the mediating variables account for most of the observed relationship.

These results underscore that sustainable values, sustainable beliefs, intentions vs attitudes, and contact with nature play fundamental roles in mediating the relationship between generation and sustainable concerns. In contrast sustainable knowledge had a limited role. These findings highlight the importance of these dimensions as determinants of pro-environmental behaviours.



Notes: an represents the effect of Millennials on the mediators, with Generation Z coded as 0 and Millennials as 1; bn represents the effect of the mediators on sustainable concerns; c' is the direct effect of Millennials on sustainable concerns. *p < .05, **p < .01.

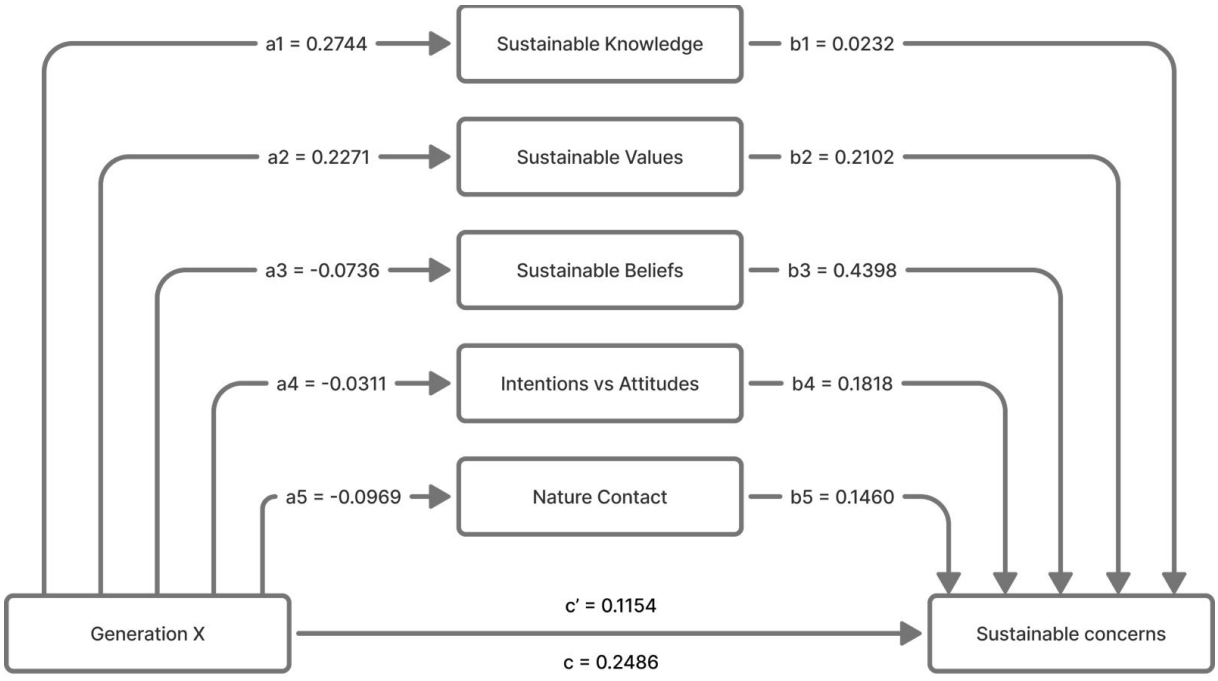
Figure 8 - Parallel Mediation in Millennials using the Mediating Effect of Five Variables

In the case of Generation X (Figure 9 and Table 9), higher levels of sustainable values and sustainable knowledge were observed compared to Generation Z (B = 0.2271, t(426) = 4.89, p < 0.001; B = 0.2744, t(426) = 3.81, p < 0.001, respectively). However, the relationships with sustainable beliefs, intentions vs attitudes, and contact with nature were not significant (B = -0.0736, t(426) = -1.51, p > 0.05; B = -0.0311, t(426) = -0.59, p > 0.05; B = -0.0969, t(426) = -1.22, p > 0.05, respectively).

For a 95% confidence interval, it was observed that indirect effects occurred through sustainable values and sustainable knowledge. Specifically, the indirect effect through sustainable values was significant (B = 0.0936, 95% BootCI = [0.0325, 0.1705]), as was the effect through sustainable knowledge (B = 0.041, 95% BootCI = [0.012, 0.089]).

Generation X reports a greater adoption of sustainable concerns even when the indirect effect of generation on mediators is considered (B = 0.2486, t(426) = 5.36, p < 0.001). When mediators are controlled for, the direct effect of Generation X on sustainable concerns decreases (B = 0.1154, t(426) = 2.48, p < 0.05), indicating that a large part of the relationship is explained by the mediators, although it remains significant.

These results reinforce that sustainable values and sustainable knowledge play essential roles in mediating the relationship between Generation X and sustainable concerns, highlighting the importance of these dimensions as determinants of pro-environmental behaviours.



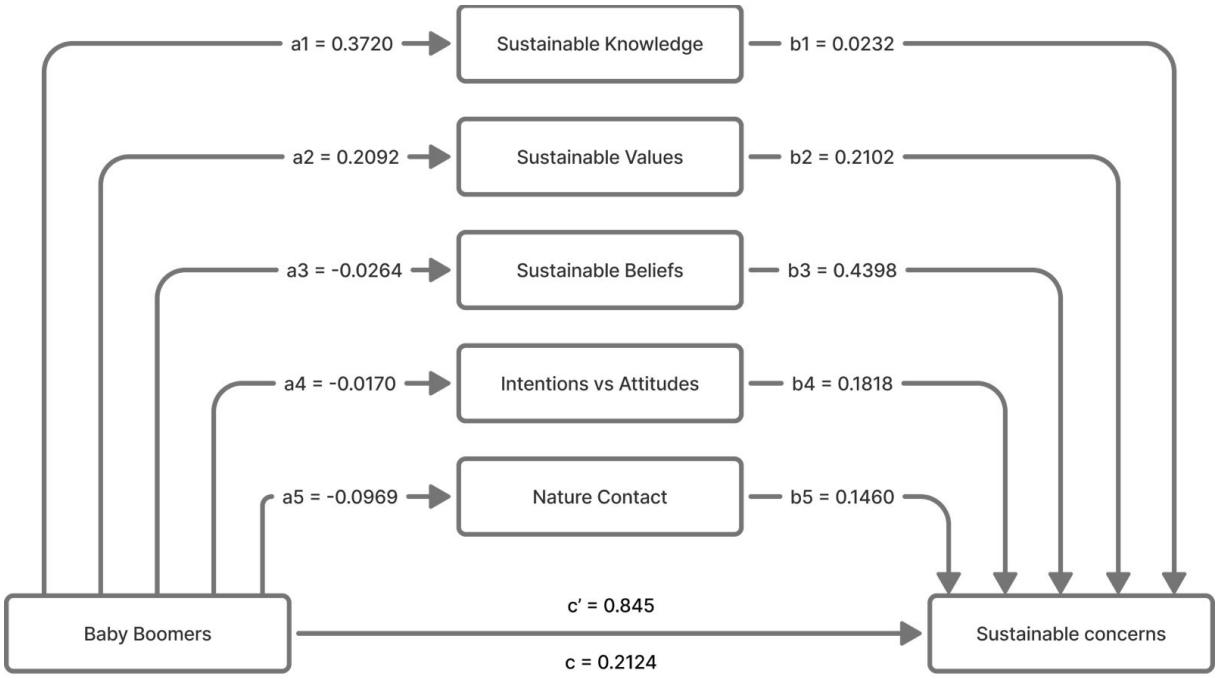
Notes: an represents the effect of Generation X on the mediators, with Generation Z coded as 0 and Generation X as 1; bn represents the effect of the mediators on sustainable concerns; c' is the direct effect of Generation X on sustainable concerns. *p < .05, **p < .01.

Figure 9 - Parallel Mediation in Generation using the Mediating Effect of Five Variables

Finally, as shown in Figure 10 and Table 9, it is evident that Baby Boomers exhibit higher levels of sustainable knowledge, sustainable values, and contact with nature compared to Generation Z (B = 0.3720, t = 3.26, p < 0.01; B = 0.2092, t = 1.95, p < 0.05; and B = -0.0969, t = -1.21, p > 0.05, respectively). On the other hand, sustainable beliefs and intentions vs attitudes did not demonstrate statistically significant relationships (B = -0.0264, t = -0.34, p > 0.05; and B = -0.0170, t = -0.20, p > 0.05, respectively).

In line with the patterns observed for Generations Y and X, it was found that, at a 95% confidence interval, significant indirect effects occurred through sustainable values (B = 0.03, 95% BootCI [0.008, 0.071]) and sustainable beliefs (B = 0.06, 95% BootCI [0.012, 0.121]). However, the indirect effects through sustainable knowledge and intentions vs attitudes were not significant.

Finally, Baby Boomers demonstrate a stronger relationship with sustainable concerns, even when the indirect effect of generation on mediators is considered (B = 0.2124, t = 4.09, p < 0.01). Similar to the analyses for the previous generations, a significant total effect is observed (B = 0.40, t = 4.09, p < 0.01). However, when controlling for the mediators, the direct effect of belonging to the Baby Boomer generation on sustainable behaviours decreases (B = 0.0845, t = 1.16, p > 0.05), becoming non-significant.



Notes: an represents the effect of Generation X on the mediators, with Generation Z coded as 0 and Baby Boomers as 1; bn represents the effect of the mediators on sustainable concerns; c' is the direct effect of Generation X on sustainable concerns. *p < .05, **p < .01.

Figure 10 - Parallel Mediation in Baby Boomers using the Mediating Effect of Five Variables

Table 9 - Regression Results for the Mediation Model of Mediator Variables in the Relationship between Generation and Sustainable Concerns

	Coef.	Standard Error	t	p
Constant	0.31	0.23	1.33	0.19
Millennials	0.05	0.05	1.01	0.31
Generation X	0.12	0.05	2.49	0.01
Baby Boomers	0.08	0.72	1.17	0.24
Direct Effect of Sustainable Knowledge	0.02	0.03	0.70	0.49
Direct Effect of Sustainable Values	0.21	0.04	5.58	<0.001
Direct Effect of Sustainable Beliefs	0.43	0.05	9.14	<0.001
Direct Effect of Intentions vs Attitudes	0.18	0.05	3.88	0.0001
Direct Effect of Nature Contact	0.15	0.04	3.26	0.0012
Bootstrapping for indirect effect				
	Coef.	Standard Error	LI 95% IC	LS 95% IC
Indirect Effect of Millennials on Sustainable Concerns via Sustainable Knowledge	0.003	0.01	-0.01	0.01
Indirect Effect of Generation X on Sustainable Concerns via Sustainable Knowledge	0.01	0.01	-0.01	0.03
Indirect Effect of Baby Boomers on Sustainable Concerns via Sustainable Knowledge	0.01	0.01	-0.01	0.04
Indirect Effect of Millennials on Sustainable Concerns via Sustainable Values	0.03	0.02	-0.003	0.07

Indirect Effect of Generation X on Sustainable Concerns via Sustainable Values	0.05	0.02	0.02	0.9
Indirect Effect of Baby Boomers on Sustainable Concerns via Sustainable Values	0.04	0.02	0.003	0.9
Indirect Effect of Millennials on Sustainable Concerns via Sustainable Beliefs	-0.02	0.03	-0.08	0.03
Indirect Effect of Generation X on Sustainable Concerns via Sustainable Beliefs	-0.03	0.02	-0.08	0.01
Indirect Effect of Baby Boomers on Sustainable Concerns via Sustainable Beliefs	-0.01	0.03	-0.08	0.05
Indirect Effect of Millennials on Sustainable Concerns via Intentions vs Attitudes	-0.01	0.01	-0.04	0.01
Indirect Effect of Generation X on Sustainable Concerns via Intentions vs Attitudes	-0.01	0.01	-0.02	0.01
Indirect Effect of Baby Boomers on Sustainable Concerns via Intentions vs Attitudes	-0.003	0.01	-0.03	0.03
Indirect Effect of Millennials on Sustainable Concerns via Nature Contact	-0.001	0.01	-0.02	0.02
Indirect Effect of Generation X on Sustainable Concerns via Nature Contact	-0.005	0.01	-0.02	0.01
Indirect Effect of Baby Boomers on Sustainable Concerns via Nature Contact	-0.01	0.01	-0.04	0.01

4. DISCUSSION

In this final chapter, the results presented earlier will be discussed based on the formulated hypotheses, literature review, and theories described at the beginning of this investigation.

The main objective of this study was to explore generational differences in sustainable concerns and the impact of five mediating variables: sustainable knowledge, sustainable values, sustainable beliefs, intentions vs attitudes, and contact with nature. Eleven hypotheses were formulated, each addressing different dimensions related to sustainable concerns and the factors influencing them.

The findings partially supported our H1, which proposed that younger generations (Millennials and Generation Z) would exhibit greater sustainable concerns. Millennials stood out with higher levels of concern about environmental issues, as observed in the literature, which associates this group with greater exposure to environmental campaigns and a higher likelihood of facing the worst impacts of climate change (USGCRP, 2017; Milfont, Davies & Wilson, 2019). However, no significant differences were identified among the younger generations when compared in isolation, suggesting the influence of institutional and normative barriers (Barr, 2003).

Regarding sustainable knowledge (H2), the results confirmed a positive and significant impact of this variable on sustainable concerns ($B = 0.241$, $p < 0.001$). This finding aligns with the literature, which highlights the relevance of theoretical knowledge about sustainable practices in fostering pro-environmental attitudes (Liang, Li, Cao & Zhang, 2024; Ham, Kim & Lee, 2019). Nevertheless, the translation of knowledge into practical action still needs to be improved, such as a lack of infrastructure and incentives (Barr, 2003).

As for sustainable values (H3), a positive and significant relationship with sustainable concerns was observed ($B = 0.2102$, $p < 0.001$). This result corroborates Schultz & Zelezny (1999), who identify biospheric values as fundamental predictors of pro-environmental attitudes. The literature further emphasises that sustainable values are rooted in the ethics of intergenerational responsibility and commitment to environmental preservation, especially among younger generations (Passafaro, Carrus, Maricchiolo & Pirchio, 2021).

H4, which examined the impact of sustainable beliefs on sustainable concerns, was broadly confirmed. This mediating variable showed the greatest impact among those analysed ($B = 0.4398$, $p < 0.001$). This finding supports the literature that highlights beliefs about the consequences of human actions on the environment as foundational to environmental attitudes (Dunlap & Van Liere, 1978; Bamberg & Möser, 2007). Millennials and Generation Z, in particular, demonstrated greater emotional engagement with climate issues (Poortinga, Demski & Steentjes, 2023).

Regarding intentions vs attitudes (H5), a significant, though less pronounced, relationship with sustainable concerns was identified ($B = 0.1818$, $p < 0.01$). Millennials and Generation Z stand out for their intention to consume sustainably, but as noted by Geiger, Dombois & Funke, (2018), these intentions do not always translate into practical actions due to contextual and institutional barriers.

Concerning contact with nature (H6), the results showed a significant positive relationship with sustainable concerns ($B = 0.1460$, $p < 0.01$). This finding aligns with Mayer, Frantz, Bruehlman-Senecal & Dolliver (2012), who highlight the psychological and emotional benefits generated by exposure to nature. Younger generations seem to benefit more from these interactions, strengthening their emotional connection to the environment (Capaldi, Passmore, Nisbet, Zelenski & Dopko, 2015).

The results of the parallel mediation analysis confirmed the relevance of the variables sustainable values, sustainable beliefs, and contact with nature as mediators in the relationship between generation and sustainable concerns. These variables explained a large part of the observed effect. At the same time, sustainable knowledge and intentions vs attitudes showed less pronounced effects, suggesting the need to explore contextual factors that strengthen the translation of knowledge and intentions into sustainable practices.

H7, which investigated the effect of sustainable knowledge on sustainable concerns, was also confirmed, showing that greater knowledge contributes to increased environmental awareness (Liang, Li, Cao & Zhang, 2024). Similarly, the results for H8 highlighted that sustainable values are significant predictors of sustainable concerns (Schultz & Zelezny, 1999). H9, relating to sustainable beliefs, confirmed that these are the strongest mediating factors in the model, consistent with Bamberg & Möser (2007). On the other hand, H10 revealed that, although sustainable intentions are high, their translation into concerns still faces institutional challenges (Geiger, Dombois & Funke, 2018). Finally, H11 highlighted the importance of contact with nature as a catalyst for sustainable concerns, particularly among younger generations (Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2012).

In summary, the findings reinforce the complexity of interactions between generations, mediators, and sustainable concerns. Younger generations stand out for their greater environmental awareness but face challenges in transforming this awareness into concrete actions. On the other hand, sustainable values, sustainable beliefs, and contact with nature emerge as crucial factors in strengthening sustainable concerns and pro-environmental behaviours, underscoring the importance of strategies that align education, infrastructure, and public policies to promote sustainable practices.

5. CONCLUSIONS

The growing concern for the environment has led many researchers to explore generational differences and the factors driving the adoption of sustainable behaviours. Among the variables frequently analysed are sustainable knowledge, values, beliefs, intentions versus attitudes, and contact with nature, all recognised as determinants in promoting pro-environmental practices (Dunlap & Van Liere, 1978; Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2012; Passafaro, Carrus, Maricchiolo & Pirchio, 2021).

This study aimed to contribute to this field by investigating how these mediating variables influence the relationship between different generations and their sustainable concerns, with a particular focus on the Portuguese population. Through a quantitative approach and the use of a parallel mediation model, it was possible to corroborate existing literature, propose new questions, and deepen understanding of this relevant and timely topic.

The results indicate that sustainable values, sustainable beliefs, and contact with nature are the most impactful factors in the relationship between generations and sustainable concerns. These findings support the literature, which highlights ethical values and emotional connection to the environment as fundamental in motivating sustainable behaviours (Schultz & Zelezny, 1999; Mayer, Frantz, Bruehlman-Senecal & Dolliver, 2012). While sustainable knowledge and intentions versus attitudes also showed positive effects, the results suggest that translating these factors into concrete actions is often needed by contextual barriers, such as a lack of adequate infrastructure and social incentives (Barr, 2003).

Additionally, younger generations, such as Millennials and Generation Z, demonstrated greater sustainable concerns and emotional engagement with environmental issues. However, older generations, such as Baby Boomers and Generation X, stood out for their consistency in specific practices, such as recycling and purchasing organic products. These results underline the importance of an intergenerational approach in addressing climate change (Kamenidou, Stavrianea & Bara, 2020; Machová, Ambrus, Zsigmond & Bakó, 2022).

Although some hypotheses were not confirmed, this study makes a significant contribution to understanding generational dynamics related to sustainability. The analysis of the impact of mediating variables, such as sustainable beliefs and contact with nature, reinforces the need for educational strategies and public policies aimed at fostering a stronger emotional and ethical connection to the environment, thereby encouraging concrete and practical actions.

In conclusion, while the findings align with relevant literature, they also raise new questions and highlight the need for targeted interventions. This study demonstrates that all generations play a crucial role in promoting sustainability, challenging stereotypes that often portray older generations as less concerned about the environment. By emphasising the importance of intergenerational collaboration, this research underscores the need for coordinated efforts to ensure a more sustainable and responsible future.

5.1. LIMITATIONS AND FUTURE SUGGESTIONS

This research presents several limitations that should be considered and that provide opportunities for future studies. The first limitation relates to the nature of the sample, which was obtained through convenience sampling and does not allow for the generalisation of the results to a broader population. This aspect reduces the representativeness of the sample and, consequently, the robustness of the conclusions. Additionally, it was observed that the distribution of respondents across generations was uneven, with some generations, such as Baby Boomers, having fewer participants. This disparity may have influenced the ability to identify statistically significant differences between generations, particularly in mediating variables.

Another limitation concerns the fact that some of the measures used may not be sufficiently discriminative. Although the instruments demonstrated acceptable internal consistency, it would be relevant to explore more precise measures, especially for variables such as sustainable knowledge and intentions vs attitudes. Future research could address this by employing more tailored and comprehensive scales to capture nuances among participants.

Furthermore, the study focused solely on five mediating variables, excluding other factors that may influence sustainable concerns, such as social norms or cultural variables. Including such factors in future investigations could enhance understanding of the determinants of sustainable concerns, offering a more holistic perspective.

Regarding suggestions for future research, the study opens up several possibilities for delving deeper into the topic. Firstly, it would be interesting to explore in greater detail the impact of sustainable knowledge on sustainable concerns, considering how levels of environmental literacy may vary across different educational and cultural contexts. Future studies could also examine specific educational interventions that promote not only theoretical knowledge but also the practical application of sustainability.

In parallel, it is suggested that the influence of social norms on sustainable consumption be investigated, as these may moderate the relationship between intentions and behaviours. Research could analyse how group dynamics and social pressures affect sustainability-related decisions across different generations.

Another promising avenue for research would be the analysis of the relationship between connection to nature and happiness. Existing literature points to a positive relationship between exposure to natural environments and increased psychological well-being and life satisfaction. Future studies could explore whether this relationship varies across generations and how connection to nature contributes to the adoption of sustainable behaviours and individual happiness.

Additionally, it would be valuable to deepen the understanding of the role of sustainable beliefs and biospheric values in shaping pro-environmental attitudes and behaviours. Future

research could examine how these dimensions interact with variables such as perceptions of environmental risk or institutional support to influence sustainable concerns and actions.

Finally, considering the results of the mediation analyses, it would be essential to explore contextual and motivational variables that may intervene in the relationship between knowledge, intentions, and sustainable actions. Longitudinal studies examining the impact of public policies and cultural changes could provide additional insights into how to effectively promote sustainable behaviours across different generations.

BIBLIOGRAPHICAL REFERENCES

Al-Ghazali, B. M., & Afsar, B. (2020). Green human resource management and employees' green creativity: The roles of green behavioral intention and individual green values. *Corporate Social Responsibility and Environmental Management, 27*(2), 396–412. https://doi.org/10.1002/csr.1987

Bamberg, S., & Möser, G. (2007). Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology, 27*(1), 14–25. https://doi.org/10.1016/j.jenvp.2006.12.002

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Barber, N., Taylor, D. C., & Strick, S. K. (2009). Wine consumers' environmental knowledge and attitudes: Influence on willingness to purchase. *International Journal of Wine Research, 1*, 59–72. https://doi.org/10.2147/IJWR.S4649

Barr, S. (2003). Strategies for sustainability: Citizens and responsible environmental behavior. *Area, 35*(3), 227-240. https://doi.org/10.1111/1475-4762.00172

Bartlett, M. S. (1954). A note on the multiplying factors for various chi-square approximations. *Journal of the Royal Statistical Society. Series B (Methodological), 16*(2), 296-298. https://doi.org/10.1111/j.2517-6161.1954.tb00174.x

Bateson, M. C. (2011). *Composing a Further Life: The Age of Active Wisdom.* Vintage Books.

Belsley, D. A., Kuh, E., & Welsch, R. E. (1980). *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity.* Wiley-Interscience. http://dx.doi.org/10.1002/0471725153

Blake, J. (1999). Overcoming the 'value-action gap' in environmental policy: Tensions between national policy and local experience. *Local Environment, 4*(3), 257-278. http://dx.doi.org/10.1080/13549839908725599

Campbell, W. K., Freeman, E. C., & Twenge, J. M. (2012). Generational differences in young adults' life goals, concern for others, and civic orientation, 1966–2009. *Journal of Personality and Social Psychology, 102*(5), 1045–1062. https://doi.org/10.1037/a0027408

Capaldi, C. A., Passmore, H. A., Nisbet, E. K., Zelenski, J. M., & Dopko, R. L. (2015). Flourishing in nature: A review of the benefits of connecting with nature and its impact on human

well-being. *The International Journal of Wellbeing, 5*(4), 1-16. http://dx.doi.org/10.5502/ijw.v5i4.1

Clayton, S. (2020). Climate anxiety: Psychological responses to climate change. *Journal of Anxiety Disorders, 74*, 102263. https://doi.org/10.1016/j.janxdis.2020.102263

Coakes, S. J., & Steed, L. (2009). SPSS: Analysis Without Anguish (4th ed.). Wiley.

Cohen, M. J. (2016). *The future of consumer society: Prospects for sustainability in the new economy.* Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198768555.001.0001

Coughlin, J. F. (2018). *The longevity economy: Unlocking the world's fastest-growing, most misunderstood market.* PublicAffairs.

Cruz, S. M., & Manata, B. (2020). Measurement of environmental concern: A review and analysis. *Frontiers in Psychology, 11*, 363. https://doi.org/10.3389/fpsyg.2020.00363

De Castro, J. B. (2008). *Depressão e contacto com a Natureza* (Seminário de Psicologia da Saúde, Instituto Superior de Psicologia Aplicada, Portugal).

De Vaus, D. (2013). *Surveys in social research* (6ª ed.). Routledge.

Duckitt, J., & Milfont, T. L. (2010). The Environmental Attitudes Inventory: A valid and reliable measure to assess the structure of environmental attitudes. *Journal of Environmental Psychology, 30*(1), 80–94. https://doi.org/10.1016/j.jenvp.2009.09.001

Dunlap, R. E., & Van Liere, K. D. (1978). The "new environmental paradigm". *Journal of Environmental Education, 9*(4), 10-19. https://doi.org/10.1080/00958964.1978.10801875

Dunlap, R. E., Van Liere, K. D., & Jones, R. E. (2002). New trends in measuring environmental attitudes: Measuring endorsement of the New Ecological Paradigm: A revised NEP scale. *Journal of Social Issues, 56*(3), 425–442. https://doi.org/10.1111/0022-4537.00176

Durbin, J., & Watson, G. S. (1950). Testing for Serial Correlation in Least Squares Regression: I. *Biometrika, 37*(3/4), 409–428. https://doi.org/10.2307/2332391

Durbin, J., & Watson, G. S. (1951). Testing for Serial Correlation in Least Squares Regression: II. *Biometrika, 38*(1/2), 159–179. https://doi.org/10.1093/biomet/38.1-2.159

Field, A. (2005). *Discovering statistics using SPSS* (2nd ed.). Sage Publications.

Field, A. (2013). *Discovering Statistics Using SPSS* (4th ed.). Sage Publications.

Geiger, S. M., Dombois, C., & Funke, J. (2018). The role of environmental knowledge and attitude: Predictors for ecological behavior across cultures? *Umweltpsychologie, 22*(1), 69–87.

Glantz, S. A., & Slinker, B. K. (2001). *Primer of Biostatistics* (5th ed.). McGraw-Hill.

Gleim, M. R., Smith, J. S., Andrews, D., & Cronin Jr, J. J. (2013). Against the green: A multi-method examination of the barriers to green consumption. *Journal of Retailing, 89*(1), 44-61. https://doi.org/10.1016/j.jretai.2012.10.001

Gilg, A., Barr, S., & Ford, N. (2005). Green consumption or sustainable lifestyles? Identifying the sustainable consumer. *Futures, 37*(6), 481-504. https://doi.org/10.1016/j.futures.2004.10.016

Gray, S. A., Raimi, K. T., Wilson, R., & Árvai, J. (2019). Will millennials save the world? The effect of age and generational differences on environmental concern. *Journal of Environmental Management, 242*, 394–402. https://doi.org/10.1016/j.jenvman.2019.04.071

Green, S. B., & Salkind, N. J. (2016). *Using SPSS for Windows and Mac: Analyzing and Understanding Data* (7th ed.). Pearson.

Guardian Labs. (2020). *Climate anxiety among young people: How the future is perceived by the next generation.* The Guardian.

Gujarati, D. N., & Porter, D. C. (2009). *Basic Econometrics* (5th ed.). McGraw-Hill.

Gujarat, D. (2015). *Econometrics by Example* (2nd ed.). Palgrave Macmillan.

Ham, C.-D., Kim, J., & Lee, J. (2019). The role of CSR in crises: Integration of situational crisis communication theory and the persuasion knowledge model. *Journal of Business Ethics, 158*(2), 353–372. https://doi.org/10.1007/s10551-017-3706-0

Hayes, A. F. (2018). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach* (2ª ed.). Guilford Press.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *Journal of Environmental Education, 18*(2), 1-8. https://doi.org/10.1080/00958964.1987.9943482

Hume, M. (2010). Compassion without action: Examining the young consumers' consumption and attitude to sustainable consumption. *Journal of World Business, 45*(4), 385-394. https://doi.org/10.1016/j.jwb.2009.08.007

Hunter, L. M., Hatch, A., & Johnson, A. (2004). Cross-national gender variation in environmental behaviors. *Social Science Quarterly, 85*(3), 677-694. https://doi.org/10.1111/j.0038-4941.2004.00239.x

Hsu, S. J. (2004). The effects of an environmental education program on responsible environmental behavior and associated environmental literacy variables in Taiwanese college students. *Journal of Environmental Education, 35*(2), 37–48. https://doi.org/10.3200/JOEE.35.2.37-48

Jackson, T. (2005). *Motivating sustainable consumption: A review of evidence on consumer behaviour and behavioural change.* Sustainable Development Research Network.

Jackson, T. (2009). *Prosperity without Growth: Economics for a Finite Planet.* Earthscan.

Jansson, J., Marell, A., & Nordlund, A. (2010). Green consumer behavior: Determinants of curtailment and eco-innovation adoption. *Journal of Consumer Marketing, 27*(4), 358-370. https://doi.org/10.1108/07363761011052396

Kaiser, F. G., & Wilson, M. (2004). Assessing people's general ecological behavior: A cross-cultural measure. *Journal of Applied Social Psychology, 30*(5), 952–978. https://doi.org/10.1111/j.1559-1816.2000.tb02505.x

Kamenidou, I. E., Stavrianea, A., & Bara, E. Z. (2020). Generational differences toward organic food behavior: Insights from five generational cohorts. *Sustainability, 12*(6), 2299. https://doi.org/10.3390/su12062299

Kane, L., & Ashbaugh, A. R. (2017). Simple and parallel mediation: A tutorial exploring anxiety sensitivity, sensation seeking, and gender. *The quantitative methods for psychology, 13*(3), 148-165. https://doi.org/10.20982/tqmp.13.3.p148

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8*(3), 239-260. https://doi.org/10.1080/13504620220145401

Lee, K. (2008). Opportunities for green marketing: Young consumers. *Marketing Intelligence & Planning, 2*6(6), 573-586. https://doi.org/10.1108/02634500810902839

Liang, J., Li, J., Cao, X., & Zhang, Z. (2024). Generational Differences in Sustainable Consumption Behavior among Chinese Residents: Implications Based on Perceptions of Sustainable Consumption and Lifestyle. *Sustainability, 16*(10), 3976. https://doi.org/10.3390/su16103976

Lorek, S., & Spangenberg, J. H. (2001). Indicators for environmentally sustainable household consumption. *International Journal of Sustainable Development, 4*(1), 101-120. http://dx.doi.org/10.1504/IJSD.2001.001549

Machová, R., Ambrus, R., Zsigmond, T., & Bakó, F. (2022). The impact of green marketing on consumer behavior in the market of palm oil products. *Sustainability, 14*(3), 1364. https://doi.org/10.3390/su14031364

Mayer, F. S., Frantz, C. M., Bruehlman-Senecal, E., & Dolliver, K. (2012). Why is nature beneficial? The role of connectedness to nature. *Environment and Behavior, 41*(5), 607-643. https://doi.org/10.1177/0013916508319745

McClain, L. R. (2014). Intergenerational learning at a nature center: Families using prior experiences and participation frameworks to understand raptors. *Environmental Education Research, 20(*2), 177–201. https://doi.org/10.1080/13504622.2013.775219

Milfont, T. L., Davies, C. L., & Wilson, M. S. (2019). The moral foundations of environmentalism: Care- and fairness-based morality interact with political liberalism to predict pro-environmental actions. *Social Psychological Bulletin, 14*(2), Article e32633. https://doi.org/10.32872/spb.v14i2.32633

McDonald, S., Oates, C. J., Thyne, M., Alevizou, P. J., & McMorland, L. A. (2012). Comparing sustainable consumption patterns across product sectors. *International Journal of Consumer Studies, 33*(2), 137-145. https://doi.org/10.1111/j.1470-6431.2009.00755.x

Mostafa, M. M. (2006). Gender differences in Egyptian consumers' green purchase behaviour: The effects of environmental knowledge, concern and attitude. *International Journal of Consumer Studies, 31*(3), 220-229. https://doi.org/10.1111/j.1470-6431.2006.00523.x

Pallant, J. (2016). *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS* (6th ed.). McGraw-Hill Education.

Pallant, J. (2020). *SPSS Survival Manual* (7th ed.). Open University Press.

Passafaro, P., Carrus, G., Maricchiolo, F., & Pirchio, S. (2021). The effects of contact with nature during outdoor environmental education programs on students' wellbeing, connectedness to nature and pro-sociality. *Frontiers in Psychology, 12*, 648458. https://doi.org/10.3389/fpsyg.2021.648458

Peattie, K., & Collins, A. (2009). Guest editorial: Perspectives on sustainable consumption. *International Journal of Consumer Studies, 33*(2), 107-112. https://doi.org/10.1111/j.1470-6431.2009.00758.x

Poortinga, W., Demski, C., & Steentjes, K. (2023). Generational differences in climate-related beliefs, risk perceptions and emotions in the UK. *Communications Earth & Environment, 4*(1), 229. https://doi.org/10.1038/s43247-023-00870-x

Razali, N. M., & Wah, Y. B. (2011). Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors, Anderson-Darling, and Cramer-von Mises tests. *Journal of Statistical Modeling and Analytics, 2*(1), 21-33.

Roberts, J. A. (1996). Will the real socially responsible consumer please step forward? *Business Horizons, 39*(1), 79-83. https://doi.org/10.1016/S0007-6813(96)90087-7

Schultz, P. W., & Zelezny, L. (1999). Values as predictors of environmental attitudes: Evidence for consistency across 14 countries. *Journal of Environmental Psychology, 19*(3), 255-265. https://doi.org/10.1006/jevp.1999.0129

Sharma, S. (1996). Applied Multivariate Techniques. Wiley-Interscience.

Sidiropoulos, E. (2022). The influence of higher education on student learning and agency for sustainability transition. *Sustainability, 14*(5), 3098. https://doi.org/10.3390/su14053098

Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues, 56*(3), 407-424. https://doi.org/10.1111/0022-4537.00175

Straughan, R. D., & Roberts, J. A. (1999). Environmental segmentation alternatives: A look at green consumer behavior in the new millennium. *Journal of Consumer Marketing, 16*(6), 558–575. https://doi.org/10.1108/07363769910297506

Tabachnick, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics* (6th ed.). Pearson Education.

Tait, P., Saunders, C., Dalziel, P., Rutherford, P., & Driver, T. (2019). Examining generational preferences for sustainability attributes of wine: A discrete choice experiment in California. *In Proceedings of the 93rd Annual Conference of the Agricultural Economics Society* (289680). Warwick University, Coventry, UK: Agricultural Economics Society. https://doi.org/10.22004/ag.econ.289680

Thiermann, U. B., & Sheate, W. R. (2021). The way forward in mindfulness and sustainability: a critical review and research agenda. *Journal of Cognitive Enhancement, 5*(1), 118–139. https://doi.org/10.1007/s41465-020-00180-6

Thøgersen, J. (2000). Psychological determinants of paying attention to eco-labels in purchase decisions: Model development and multinational validation. *Journal of Consumer Policy, 23*(3), 285–313. https://doi.org/10.1023/A:1007122319675

Thøgersen, J. (2006). Norms for environmentally responsible behaviour: An extended taxonomy. *Journal of Environmental Psychology, 26*(4), 247–261. https://doi.org/10.1016/j.jenvp.2006.09.004

Thøgersen, J., & Ölander, F. (2003). Spillover of environment-friendly consumer behaviour. *Journal of Environmental Psychology, 23*(3), 225–236. https://doi.org/10.1016/S0272-4944(03)00018-5

Tindall, D. B., Davies, S., & Mauboules, C. (2003). Activism and conservation behavior in an environmental movement: The contradictory effects of gender. *Society & Natural Resources, 16*(10), 909–932. https://doi.org/10.1080/716100620

USGCRP. (2017). *Climate Science Special Report: Fourth National Climate Assessment, Volume I.* U.S. Global Change Research Program. https://doi.org/10.7930/J0J964J6

Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer "attitude-behavioral intention" gap. *Journal of Agricultural and Environmental Ethics, 19*(2), 169–194. https://doi.org/10.1007/s10806-005-5485-3

Wiernik, B. M., Ones, D. S., & Dilchert, S. (2013). Age and environmental sustainability: a meta-analysis. *Journal of Managerial Psychology, 28*(7/8), 826–856. https://doi.org/10.1108/JMP-07-2013-0221

Wooldridge, J. M. (2010). *Econometric Analysis of Cross Section and Panel Data* (2nd ed.). MIT Press.

Wray-Lake, L., Flanagan, C. A., & Osgood, D. W. (2010). Examining trends in adolescent environmental attitudes, beliefs, and behaviors across three decades. *Environment and Behavior, 42*(1), 61–85. https://doi.org/10.1177/0013916509335163

Zelezny, L. C., Chua, P. P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. Journal of Social Issues, 56(3), 443–457. https://doi.org/10.1111/0022-4537.00177

Zeng, J., Jiang, M., & Yuan, M. (2020). Environmental risk perception, risk culture, and pro-environmental behavior. *International Journal of Environmental Research and Public Health, 17(*5), 1750. https://doi.org/10.3390/ijerph17051750

APPENDIX A

Questionnaire

Age?

Gender

- Female
- Male
- Other

Marital status

- Single
- Married / Civil partnership
- Divorced / Separated
- Widow

Level of education

- Lower than secondary school
- Secondary Education or Equivalent
- Bachelor's Degree
- Master's Degree
- PhD

Professional Status

- Student
- Worker Student
- Employee
- Unemployed
- Retired

Sustainable Knowledge

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
I know that I buy products and packaging that are safe for the environment.	○	○	○	○	○
I know more about recycling than the average person.	○	○	○	○	○
I know how to select products and packaging that reduce the amount of waste going to landfill.	○	○	○	○	○
I understand the environmental phrases and symbols on product packaging.	○	○	○	○	○
I have a lot of knowledge about environmental issues	○	○	○	○	○

Sustainable values

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
I feel personally obliged to do what I can to prevent environmental degradation.	○	○	○	○	○
I feel obliged to save the environment from degradation, regardless of what others do.	○	○	○	○	○
People like me should do what we can to protect the environment from degradation.	○	○	○	○	○
I feel guilty when I contribute to environmental degradation.	○	○	○	○	○
I feel obliged to take the environment and nature into account in my daily behavior.	○	○	○	○	○

Answer this question with the number 17

Sustainable Beliefs

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
When humans interfere with nature, it often has disastrous consequences	○	○	○	○	○
The so-called "ecological crisis" facing humanity has been greatly exaggerated	○	○	○	○	○
I am totally opposed to measures that force industry to use recycled materials if this makes products more expensive.	○	○	○	○	○
The belief that advances in science and technology can solve our environmental problems is completely wrong and misguided.	○	○	○	○	○
If things continue on their current course, we will soon experience a major ecological catastrophe	○	○	○	○	○
Humans should not interfere with nature, even when nature is uncomfortable and inconvenient for us.	○	○	○	○	○
I oppose any removal of wilderness areas, regardless of how economically beneficial their development might be.	○	○	○	○	○

Intentions versus Attitudes

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
I let the water run for a while to reach the right temperature	○	○	○	○	○
I reuse my shopping bags	○	○	○	○	○
In winter, I keep the heating on so I don't have to wear a sweater	○	○	○	○	○
I wait until I have a full load before doing the laundry	○	○	○	○	○
If I'm offered a plastic bag in a store, I'll always take it	○	○	○	○	○
I'm a member of an environmental organization.	○	○	○	○	○
When shopping, I prefer paper bags to plastic ones	○	○	○	○	○
Whenever possible, in the closest areas (around 20km), I use public transport or ride my bike	○	○	○	○	○

Sustainable concerns

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
The news media have exaggerated the ecological problem.	○	○	○	○	○
If mankind is going to survive at all, environmental pollution must be stopped.	○	○	○	○	○
I am worried about future children's chance of living in a clean environment.	○	○	○	○	○
We shouldn't worry about environmental problems because science and technology will solve them before very long.	○	○	○	○	○
People should buy (and return) beverages only in returnable containers.	○	○	○	○	○
People should use less detergent than the manufacturer recommends to help preserve water quality.	○	○	○	○	○
Overpopulation is a major source of environmental problems today.	○	○	○	○	○

Nature contact

	Strongly disagree	Disagree	Neutral	Agree	Totally agree
I recognize and appreciate the intelligence of other living organisms.	○	○	○	○	○
I often feel a strong empathy with animals and plants.	○	○	○	○	○
I often feel disconnected from nature.	○	○	○	○	○
When I think about my place on Earth, I see myself as a privileged member of the hierarchy that exists in nature.	○	○	○	○	○
My personal well-being is independent of the well-being of the natural world.	○	○	○	○	○

APPENDIX B

Informed Consent

English (United Kingdom)

Dear participant,

The following questionnaire is being carried out as part of my master's thesis in Statistics and Information Management with a specialization in Risk Analysis and Management, which I am currently completing at NOVA Information Management School (NOVA IMS).

In this study, we aim to understand concerns about sustainable consumption in different age groups. Your answers are extremely important, completely anonymous, and will only be used for academic purposes.

Participation is voluntary, which means that you are free to participate or not, as well as to withdraw at any time, without any penalty. This questionnaire takes about 5 minutes to complete and there are no risks involved in answering the questions.

Informed Consent Form

I declare that I am 18 years of age or older and agree to take part in this research. I am aware that my participation is voluntary and that I can leave the questionnaire at any time, without any penalty, and that all data is confidential.

If you have any questions, please get in touch.
m20211257@novaims.unl.pt

Yes, I agree to participate

No, I disagree with participating

→

APPENDIX C

Approval by the Ethics Committee of Nova IMS

This is to certify that

Project No.: **OTHER2024-3-133249**

Project Title: **Sustainable Consumption Concerns in different age groups**

Principal Researcher: **Mariana Alexandra Costa das Neves**

according to the regulations of the Ethics Committee of NOVA IMS and MagIC Research Center this project was considered to meet the requirements of the NOVA IMS Internal Review Board, being considered **APPROVED** on 3/13/2024.

It is the Principal Researcher's responsibility to ensure that all researchers and stakeholders associated with this project are aware of the conditions of approval and which documents have been approved.

The Principal Researcher is required to notify the Ethics Committee, via amendment or progress report, of

- Any significant change to the project and the reason for that change;
- Any unforeseen events or unexpected developments that merit notification;
- The inability of the Principal Researcher to continue in that role or any other change in research personnel involved in the project.

Lisbon, 3/13/2024

NOVA IMS Ethics Committee
ethicscommittee@novaims.unl.pt

APPENDIX D

Correlation Matrix between Sociodemographic Variables, Mediators, and Criterion Variable

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Female	-													
2. Male	-.99**	-												
3. Single	-.19*	.2**	-											
4. Married	.11*	-.12*	-.80**	-										
5. Divorced	.12*	-.12*	-.29**	-.27**	-									
6. Widow	.05	-.05	-.14**	-.13**	-.05	-								
7. Education Level	.02	-.02	.15**	-.06	-.1*	-.13**	-							
8. Employment Statues	.07	-.06	-.33**	.21**	.15**	.14**	-.11*	-						
9. Sustainable Knowledge	.03	-.03	-.15**	.11*	.06	.03	-.1*	.15**	-					
10. Sustainable Values	.11*	-.11*	-.18**	.16**	.06	-.05	.02	.09	.39**	-				
11. Sustainable Beliefs	.04	-.05	.05	-.02	-.02	-.08	.14**	.03	.08	.29**	-			
12. Intentions vs. Attitudes	.02	-0.2	-.001	-.03	.04	.03	-.01	-.03	.3**	.38**	.32**	-		
13. Nature Contact	.04	-.04	.02	-.01	-.01	-.01	-.09	0.2	.13**	.24**	.14**	.16**	-	
14. Sustainable Concerns	.09	-.09	-.1*	.08	.07	-.05	-.03	.01	.24**	.47**	.5**	.4**	.26**	-

Note. The values presented refer to Spearman's R;

* p<.05, ** p<.01

APPENDIX E

Output of PROCESS Statistical for Parallel Mediation

```
***************** PROCESS Procedure for SPSS Version 4.2 *****************
Written by Andrew F. Hayes, Ph.D. www.afhayes.com
Documentation available in Hayes (2022). www.guilford.com/p/hayes3
**************************************************************************
Model : 4
Y : PS
X : gen
M1 : CS
M2 : VS
M3 : CRS
M4 : IvA
M5 : CN
Sample
Size: 430
Coding of categorical X variable for analysis:
gen X1 X2 X3
1.000 .000 .000 .000
2.000 1.000 .000 .000
3.000 .000 1.000 .000
4.000 .000 .000 1.000
**************************************************************************
OUTCOME VARIABLE:
CS
Model Summary
R .2110 R-sq .0445 MSE F .3983 6.6145 df1 3.0000 df2 426.0000 .0002
Model
coeff se t p LLCI ULCI
constant 3.2491 .0501 64.9124 .0000 3.1507 3.3474
X1 .1081 .0851 1.2696 .2049 -.0592 .2754
X2 .2744 .0720 3.8135 .0002 .1330 .4159
X3 .3720 .1140 3.2641 .0012 .1480 .5960
p
Standardized coefficients
coeff
X1 .1680
X2 .4265
X3 .5782
Covariance matrix of regression parameter estimates:
constant X1 X2 X3
constant .0025 -.0025 -.0025 -.0025
X1 -.0025 .0072 .0025 .0025
X2 -.0025 .0025 .0052 .0025
X3 -.0025 .0025 .0025 .0130
**************************************************************************
OUTCOME VARIABLE:
VS
Model Summary
R .1677 R-sq .0281 MSE F .3518 4.1113 df1 3.0000 df2 426.0000 .0068
Model
coeff se t p LLCI ULCI
constant 3.9434 .0470 83.8351 .0000 3.8509 4.0359
X1 .1447 .0800 1.8087 .0712 -.0126 .3019
X2 .2271 .0676 3.3577 .0009 .0941 .3600
X3 .2092 .1071 1.9537 .0514 -.0013 .4197
constant Covariance matrix of regression parameter estimates:
X1 X2 constant .0022 -.0022 -.0022 -.0022
X1 -.0022 .0064 .0022 .0022
X2 -.0022 .0022 .0046 .0022
Standardized coefficients
coeff
X1 .2414
X2 .3787
```

```
X3 .3490
X3
X3 -.0022 .0022 .0022 .0115
p
**************************************************************************
OUTCOME VARIABLE:
CRS
Model Summary
R .0749 R-sq .0056 MSE F .1827 .8021 df1 3.0000 df2 426.0000 .4932
Model
coeff se t p LLCI ULCI
constant 3.4888 .0339 102.9293 .0000 3.4221 3.5554
X1 -.0517 .0576 -.8967 .3704 -.1650 .0616
X2 -.0736 .0487 -1.5107 .1316 -.1694 .0222
X3 -.0264 .0772 -.3416 .7328 -.1781 .1253
p
Standardized coefficients
coeff
X1 -.1210
X2 -.1724
X3 -.0617
Covariance matrix of regression parameter estimates:
constant X1 X2 X3
constant .0011 -.0011 -.0011 -.0011
X1 -.0011 .0033 .0011 .0011
X2 -.0011 .0011 .0024 .0011
X3 -.0011 .0011 .0011 .0060
**************************************************************************
OUTCOME VARIABLE:
IvA
Model Summary
R R-sq MSE F df1 df2 p
.0529 .0028 .2123 .3984 3.0000 426.0000 .7542
Model
coeff se t p LLCI ULCI
constant 3.3986 .0365 93.0121 .0000 3.3268 3.4704
X1 -.0667 .0621 -1.0739 .2835 -.1889 .0554
X2 -.0311 .0525 -.5927 .5537 -.1344 .0721
X3 -.0170 .0832 -.2044 .8381 -.1805 .1465
constant Covariance matrix of regression parameter estimates:
X1 X2 X3
constant .0013 -.0013 -.0013 -.0013
X1 -.0013 .0039 .0013 .0013
X2 -.0013 .0013 .0028 .0013
Standardized coefficients
coeff
X1 -.1452
X2 -.0677
X3 -.0370
X3 -.0013 .0013 .0013 .0069
**************************************************************************
OUTCOME VARIABLE:
CN
Model Summary
R R-sq MSE F df1 df2 .0621 .0039 .1943 .5503 3.0000 426.0000 .6482
Model
coeff se t p LLCI ULCI
constant 3.6969 .0350 105.7623 .0000 3.6282 3.7656
X1 -.0088 .0595 -.1473 .8829 -.1256 .1081
X2 -.0324 .0503 -.6452 .5191 -.1312 .0664
X3 -.0969 .0796 -1.2170 .2243 -.2533 .0596
p
constant Covariance matrix of regression parameter estimates:
X1 X2 X3
constant .0012 -.0012 -.0012 -.0012
X1 -.0012 .0035 .0012 .0012
X2 -.0012 .0012 .0025 .0012
Standardized coefficients
```

```
coeff
X1 -.0199
X2 -.0737
X3 -.2201
X3 -.0012 .0012 .0012 .0063
************************************************************************
OUTCOME VARIABLE:
PS
Model Summary
R .6461 R-sq .4174 MSE .1543 F 37.7066 df1 8.0000 df2 421.0000 .0000
Model
coeff se t p LLCI ULCI
constant .3065 .2308 1.3277 .1850 -.1473 .7602
X1 .0543 .0536 1.0143 .3110 -.0510 .1596
X2 .1154 .0464 2.4854 .0133 .0241 .2067
p
X3 .0845 .0724 1.1678 .2435 -.0577 .2268
CS .0232 .0333 .6983 .4854 -.0422 .0886
VS .2102 .0377 5.5837 .0000 .1362 .2842
CRS .4398 .0481 9.1353 .0000 .3452 .5344
IvA .1818 .0469 3.8786 .0001 .0896 .2739
CN .1460 .0448 3.2583 .0012 .0579 .2342
Standardized coefficients
coeff
X1 .1066
X2 .2264
X3 .1657
CS .0293
VS .2472
CRS .3684
IvA .1639
CN .1260
Covariance matrix of regression parameter estimates:
IvA constant CN
X1 X2 X3 CS VS CRS
constant .0533 -.0012 -.0011 -.0010 -.0012 -.0008 -.0047
-.0027 -.0053
X1 -.0012 .0029 .0011 .0011 -.0001 -.0002 .0001
.0002 .0001
X2 -.0011 .0011 .0022 .0011 -.0002 -.0003 .0002
.0002 .0001
X3 -.0010 .0011 .0011 .0052 -.0003 -.0002 .0001
.0002 .0003
CS -.0012 -.0001 -.0002 -.0003 .0011 -.0004 .0001
-.0003 -.0001
VS -.0008 -.0002 -.0003 -.0002 -.0004 .0014 -.0004
-.0004 -.0003
CRS -.0047 .0001 .0002 .0001 .0001 -.0004 .0023
-.0005 -.0001
IvA -.0027 .0002 .0002 .0002 -.0003 -.0004 -.0005
.0022 -.0001
CN -.0053 .0001 .0001 .0003 -.0001 -.0003 -.0001
-.0001 .0020
************************** TOTAL EFFECT MODEL ****************************
OUTCOME VARIABLE:
PS
Model Summary
R .1091 R-sq .0119 MSE F .2587 1.7092 df1 3.0000 df2 426.0000 .1644
Model
coeff se t p LLCI ULCI
constant 3.9030 .0403 96.7583 .0000 3.8237 3.9822
X1 .0511 .0686 .7451 .4566 -.0837 .1860
X2 .1268 .0580 2.1857 .0294 .0128 .2407
X3 .1083 .0918 1.1793 .2389 -.0722 .2888
p
Standardized coefficients
coeff
X1 .1002
```

```
X2 .2486
X3 .2124
Covariance matrix of regression parameter estimates:
constant X1 X2 X3
constant .0016 -.0016 -.0016 -.0016
X1 -.0016 .0047 .0016 .0016
X2 -.0016 .0016 .0034 .0016
X3 -.0016 .0016 .0016 .0084
************** TOTAL, DIRECT, AND INDIRECT EFFECTS OF X ON Y **************
Relative total effects of X on Y
Effect se t p LLCI ULCI c_ps
X1 .0511 .0686 .7451 .4566 -.0837 .1860 .1002
X2 .1268 .0580 2.1857 .0294 .0128 .2407 .2486
X3 .1083 .0918 1.1793 .2389 -.0722 .2888 .2124
Omnibus test of total effect of X on Y
R2-chng F df1 df2 p
.0119 1.7092 3.0000 426.0000 .1644
----------
Relative direct effects of X on Y
Effect se t p LLCI ULCI c'_ps
X1 .0543 .0536 1.0143 .3110 -.0510 .1596 .1066
X2 .1154 .0464 2.4854 .0133 .0241 .2067 .2264
X3 .0845 .0724 1.1678 .2435 -.0577 .2268 .1657
Omnibus test of direct effect of X on Y:
R2-chng F df1 df2 p
.0087 2.1034 3.0000 421.0000 .0992
----------
Relative indirect effects of X on Y
gen -> CS -> PS
Effect BootSE BootLLCI BootULCI
X1 .0025 .0048 -.0057 .0143
X2 .0064 .0092 -.0101 .0265
X3 .0086 .0126 -.0147 .0355
gen -> VS -> PS
Effect BootSE BootLLCI BootULCI
X1 .0304 .0180 -.0032 .0672
X2 .0477 .0181 .0167 .0871
X3 .0440 .0225 .0031 .0905
gen -> CRS -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0227 .0265 -.0779 .0276
X2 -.0324 .0219 -.0769 .0087
X3 -.0116 .0326 -.0782 .0524
gen -> IvA -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0121 .0119 -.0375 .0114
X2 -.0057 .0098 -.0241 .0146
X3 -.0031 .0145 -.0327 .0255
gen -> CN -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0013 .0086 -.0182 .0165
X2 -.0047 .0080 -.0219 .0107
X3 -.0141 .0124 -.0401 .0090
Partially standardized relative indirect effect(s) of X on Y:
gen -> CS -> PS
Effect BootSE BootLLCI BootULCI
X1 .0049 .0094 -.0112 .0285
X2 .0125 .0181 -.0201 .0522
X3 .0169 .0248 -.0291 .0708
gen -> VS -> PS
Effect BootSE BootLLCI BootULCI
X1 .0597 .0352 -.0064 .1301
X2 .0936 .0354 .0325 .1705
X3 .0863 .0440 .0060 .1783
gen -> CRS -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0446 .0519 -.1519 .0542
X2 -.0635 .0430 -.1502 .0170
```

```
X3 -.0227 .0640 -.1529 .1025
gen -> IvA -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0238 .0234 -.0738 .0225
X2 -.0111 .0193 -.0482 .0284
X3 -.0061 .0284 -.0643 .0497
gen -> CN -> PS
Effect BootSE BootLLCI BootULCI
X1 -.0025 .0169 -.0349 .0324
X2 -.0093 .0157 -.0429 .0209
X3 -.0277 .0244 -.0792 .0177
************************************************************************
Bootstrap estimates were saved to a file
Map of column names to model coefficients:
Conseqnt Antecdnt
COL1 CS constant
COL2 CS X1
COL3 CS X2
COL4 CS X3
COL5 VS constant
COL6 VS X1
COL7 VS X2
COL8 VS X3
COL9 CRS constant
COL10 CRS X1
COL11 CRS X2
COL12 CRS X3
COL13 IvA constant
COL14 IvA X1
COL15 IvA X2
COL16 IvA X3
COL17 CN constant
COL18 CN X1
COL19 CN X2
COL20 CN X3
COL21 PS constant
COL22 PS X1
COL23 PS X2
COL24 PS X3
COL25 PS CS
COL26 PS VS
COL27 PS CRS
COL28 PS IvA
COL29 PS CN
Coeff BootMean BootSE BootLLCI BootULCI
constant 3.2491 3.2499 .0476 3.1569 3.3427
X1 .1081 .1061 .0844 -.0594 .2724
X2 .2744 .2731 .0710 .1341 .4118
X3 .3720 .3689 .1117 .1368 .5774
Coeff BootMean BootSE BootLLCI BootULCI
constant 3.9434 3.9438 .0503 3.8440 4.0425
X1 .1447 .1429 .0825 -.0165 .3109
X2 .2271 .2268 .0682 .0918 .3597
X3 .2092 .2068 .0974 .0137 .3919
Coeff BootMean BootSE BootLLCI BootULCI
constant 3.4888 3.4888 .0337 3.4226 3.5546
X1 -.0517 -.0524 .0589 -.1696 .0643
X2 -.0736 -.0740 .0480 -.1658 .0202
X3 -.0264 -.0272 .0733 -.1721 .1166
********** BOOTSTRAP RESULTS FOR REGRESSION MODEL PARAMETERS ************
OUTCOME VARIABLE:
CS
----------
OUTCOME VARIABLE:
VS
----------
OUTCOME VARIABLE:
CRS
```

```
----------
OUTCOME VARIABLE:
IvA
Coeff BootMean BootSE BootLLCI BootULCI
constant 3.3986 3.3989 .0354 3.3280 3.4670
X1 -.0667 -.0666 .0627 -.1905 .0583
X2 -.0311 -.0305 .0528 -.1315 .0716
Coeff BootMean BootSE BootLLCI BootULCI
constant 3.6969 3.6971 .0326 3.6329 3.7597
X1 -.0088 -.0094 .0558 -.1198 .0994
X2 -.0324 -.0329 .0515 -.1327 .0675
X3 -.0969 -.0972 .0777 -.2455 .0599
X3 -.0170 -.0174 .0773 -.1657 .1338
----------
OUTCOME VARIABLE:
CN
----------
OUTCOME VARIABLE:
PS
Coeff BootMean BootSE BootLLCI BootULCI
constant .3065 .3048 .2218 -.1309 .7437
X1 .0543 .0547 .0503 -.0442 .1535
X2 .1154 .1157 .0487 .0205 .2121
X3 .0845 .0859 .0751 -.0648 .2326
CS .0232 .0236 .0313 -.0384 .0852
VS .2102 .2098 .0428 .1285 .2960
CRS .4398 .4409 .0525 .3400 .5451
IvA .1818 .1808 .0486 .0851 .2761
CN .1460 .1463 .0467 .0546 .2380
************************ ANALYSIS NOTES AND ERRORS ************************
Level of confidence for all confidence intervals in output:
95.0000
Number of bootstrap samples for percentile bootstrap confidence intervals:
5000
```

APPENDIX F

Output of Cronbach's Alpha

```
[DataSet1] /Users/mariananeves/Downloads/M20211257.sav
```

Scale: Alpha

Case Processing Summary

		N	%
Cases	Valid	430	100.0
	Excluded[a]	0	.0
	Total	430	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.614	.613	5

Inter-Item Correlation Matrix

	CS	VS	CRS	IvA	CN
CS	1.000	.393	.082	.299	.131
VS	.393	1.000	.285	.366	.237
CRS	.082	.285	1.000	.315	.143
IvA	.299	.366	.315	1.000	.158
CN	.131	.237	.143	.158	1.000

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.593	3.373	4.069	.696	1.206	.085	5
Item Variances	.272	.182	.414	.232	2.269	.011	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
CS	14.5683	1.661	.361	.188	.573
VS	13.8976	1.539	.522	.275	.466
CRS	14.5156	2.123	.296	.142	.593
IvA	14.5932	1.896	.447	.216	.525
CN	14.2911	2.164	.245	.067	.614

```
NOTE: Standardized coefficients for dichotomous or multicategorical X are in
partially standardized form.
NOTE: The contrast option is not available with a multicategorical X.
------ END MATRIX -----
```

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação

Universidade Nova de Lisboa