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Impact of the COVID-19 pandemic on environmental awareness, sustainable consumption and social responsibility: Evidence from generations in Brazil and Portugal

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ABSTRACT

The COVID-19 Pandemic has become a major public health concern worldwide, which can impact environmental sustainability and social responsibility, as well as people's quality of life. In this context, environmental awareness, sustainable consumption and social actions of people have been effectively changed, as a period of quarantine, social isolation and health crisis caused by Pandemic has been experienced. This study aims to analyze the impact of the COVID-19 Pandemic on environmental awareness, sustainable consumption and social responsibility, in the perception of Baby Boomers, X and Y generations, residents in Brazil and Portugal. The method used was quantitative research, of a descriptive character, through a survey applied to 3236 people, which was analyzed with the use of Structural Equation Modeling. The results indicate that COVID-19 Pandemic is an important vector in people's behavioral change, which reflects on environmental sustainability and social responsibility. It is noteworthy that the impact of the COVID-19 Pandemic had a greater influence on sustainable consumption, followed by environmental awareness, and to a lesser extent, on social responsibility. There was also greater relevance in Portugal, as well as the perception of the Baby Boomers generation. This study also provides a framework such as metrics to measure a transformational event, which is the COVID-19 Pandemic in socio-environmental aspects and conscious consumption.

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1. Introduction

Since the new Coronavirus disease outbreak (COVID-19) originated in Wuhan, Hubei province, China, in December 2019, it has become a threat to the health and life of the world population, as a global Pandemic has unleashed, and it is a severe acute respiratory syndrome (SARS-CoV2). Although this COVID-19 Pandemic reached South America a little later than other regions, such as Europe and the United States of America (USA), all countries on the continent recorded cases of COVID-19 (Chen et al., 2020; Jamaati et al., 2020; Kirby, 2020; Mansoor et al., 2020; Sun et al., 2020). The outbreak of a new Coronavirus, COVID-19, is challenging international public health and medical care efforts (Popescu, 2020).

The global expansion of COVID-19 has put increasing pressure on the World Health Organization (WHO). In this context, several strategies have been taken to tackle the Pandemic, including increased funding for WHO. However, according to Jeyabaladevan (2020), the increase in funding in itself does not facilitate the workload of health professionals, because, in addition to the high number of patients, there is a large number of contaminated employees, which causes problems for the meeting the demand of infected patients. These are unprecedented times and are affecting many health services. Among people infected with COVID-19, the intensive care of critically ill patients in the Intensive Care Unit (ICU) needs substantial medical resources (Li et al., 2020).

In this scenario, the resources of the Health Systems have been

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shown to be fragile, insufficient, with several bottlenecks and inadequate, especially in the case of underdeveloped countries (Chattu and Yaya, 2020), as in the case of Brazil, and unlike Portugal, which also has a smaller territorial scope. Pandemic has been present in Brazil on a large scale, due also to its territorial size, which has caused different preventive measures in the States, due to a large number of infected people, such as: personal protection measures (hand washing, cough etiquette, and facial coverage), closing trade and non-essential services, online education, conference calls, case detection, isolation, contact tracking, quarantine, social detachment, and the Lockdown. According to Chen et al. (2020) and Khanna et al. (2020), a single policy of social distance can reduce the spread of epidemics. Still, generally several policies - including more restrictive measures, such as social isolation and quarantine - are implemented in combination to increase effectiveness.

In Brazil, Pandemic data is alarming, the country confirmed the first case of contamination on 02/25/2020. As a result of COVID-19, March 06, 2020 there were 555383 people infected, 31199 deaths (Coronavírus Brasil, 2020), and with a lethality rate of 5.6%, however, there is a great underreporting of infected cases, as well as deaths, as many patients do not they are subjected to the COVID-19 detection tests, and others die in their own homes. In addition to this chaos, hospitals in Brazil are overcrowded in most states, as well as a shortage of ICU beds, mechanical ventilators, and respirators.

Regarding the strategies adopted in Brazil by the State and Municipal Health Secretariats, new Field Hospitals were created, new health equipment was purchased, health professionals (technicians, nurses, and doctors), idle beds were unblocked in hospitals (infirmary and ICU), as well as the decontamination of environments.

It is up to the federal, state and municipal governments, managers, universities and researchers to integrate more, aiming at the development of actions, public policies and research to address the deficiency of the Health Systems, the adequate treatment for the infected, the maintenance of the quality of life of conservation of jobs and income, as well as the development of medicines and vaccines for COVID-19.

In Portugal, the first case registered by the General Directorate of Health (DGS), of COVID-19 infection, was on February 03, 2020. As of this date, the government started discussions to outline strategies to combat Pandemic in the parents. The main measure implemented on March 18 was the State of Emergency Decree 14-A/2020, which establishes the terms of the exceptional measures to be implemented during the term of this decree, which was renewed until May 4 (Dpr, 2020).

Given this pandemic context in Portugal, and until May 06, 2020, the number of deaths is 1465, with a lethality rate of 4.3%. Also, in this period, 33969 confirmed cases were registered by the General Health Directorate (DGS) (Dgs, 2020). Table 1 shows the evolution and comparison of the Epidemic and cases of COVID-19 in Brazil and Portugal, in the period in which the research was carried out (June 05, 2020).

In this problematic scenario of Pandemic, people can develop or worsen mental illnesses (Zhai and Du, 2020), such as anxiety and panic attacks (Blake et al., 2020), insomnia, increase the consumption of psychotropics and alcoholic beverages, because besides to be socially isolated, there is a concern with the contamination and loss of family members who are at risk groups.

The implications of the COVID-19 pandemic on sustainability have not yet been seen, but profound and pervasive social changes are likely to occur in the coming months and years (Sarkis et al., 2020). It is noteworthy that the production of household and hospital waste increased at significant levels. According to Zambrano-Monserrate et al. (2020), Wuhan hospitals produced an average of 240 tons of medical waste per day during the outbreak, compared to the previous average of less than 50 tons. According to Wuang and Su (2020), Pandemic also significantly reduced the concentration of nitrogen dioxide (NO^2) in the atmosphere, the decline initially occurred near Wuhan and eventually spread across the country as the decline in economic activities and restrictions traffic leads directly to changes in China's energy consumption and further avoids polluting the environment, so quarantine measures can not only protect the public of COVID-19, but also have a positive impact on the environment.

According to Wang and Wang (2020), energy efficiency has been neglected in economic recovery plans to respond to COVID-19 in several countries, and trade protectionism is on the rise, especially in developed countries, so it is of great importance avoiding a retaliatory recovery in post-COVID-19 carbon emissions, therefore improving energy intensity can also help to reduce carbon emissions after the COVID-19 pandemic.

The importance of environmental awareness and sustainable consumption by generations is highlighted, as these generations are responsible for current and future actions in organizations and society (Severo et al., 2018), which impacts on the regional economy (De Guimarães et al., 2014; Severo et al., 2017), the preservation of the environment (Dorion et al., 2012) and in people's quality of life.

For Jribi et al. (2020), there was a positive impact on the social block of COVID-19 on the awareness, attitudes, and behaviors of Tunisian consumers related to food waste. For Cohen (2020), the COVID-19 Pandemic marks the beginning of a sustainable consumption transition. Although sustainable production has been absorbed in the past three decades by the prevailing social commitments, governance structures, and business models, the associated notion of sustainable consumption has been striving to obtain equal attention (Cohen, 2019).

Accordingly, there is a theoretical research gap, as the COVID-19 Pandemic is in the midst of a natural experiment, in which the impact of COVID-19 is on environmental awareness, sustainable consumption, and the social responsibility of generations. Translated by the following research questions: What is the impact of COVID-19 on environmental awareness, sustainable consumption, and social responsibility for generations in Brazil and Portugal? And yet, is there a difference in the perceptions of the Brazilian and Portuguese generations?

Given the above, the study aims to analyze the impact of the COVID-19 Pandemic on environmental awareness, sustainable consumption, and social responsibility of the generations in Brazil and Portugal. Coherently, it is intended to stimulate additional scientific thinking for sustainability scientists and academia in general, to overcome this unprecedented epidemiological moment,

Table 1
Evolution of the Epidemic and cases of COVID-19 in Brazil and Portugal until May 06, 2020.

Country	First confirmed case of COVID-19	Number of people infected	Number of deaths	Fatality rate
Brazil	02/25/2020	555383	31199	5.60%
Portugal	February 03, 2020	33969	1465	4.30%

Table 2
Normality and reliability tests.

	COVID-19 Pandemic (COV)	Environmental Awareness (EA)	Sustainable Consumption (SC)	Social Responsibility (SR)
Cronbach's Alpha	0.472	0.826	0.705	0.745
KMO	0.635	0.797	0.728	0.787
Bartlett's Test of Sphericity	1945.089*	7862.328*	4783.705*	3606.584*
Variance Explained	61.72%	72.75%	72.77%	50.15%
Composite Reliability	0.611	0.888	0.717	0.826

* Significance level $p < 0.001$.

in favor of environmental sustainability and quality of life for people.

2. Theoretical background

The theoretical framework will be based on the Hypotheses that support the Theoretical Research Model (Fig. 1).

2.1. COVID-19 pandemic and environmental awareness

Hallema et al. (2020), emphasize that the environmental responses to the economic slowdown, triggered by the Pandemic, resulted in a negative effect of human beings and organizations on the environment. In this scenario, the analysis of environmental awareness about water consumption represents an essential tool for water efficiency and decision-making procedures, aligned with the challenges that have arisen due to the scarcity of water resources (Gómez-Llanos et al., 2020).

Another important element is air pollution, according to Zambrano-Monserrate et al. (2020), there is a significant association between COVID-19 Pandemic contingency measures and the improvement of air quality, clean beaches and reduction of environmental noise. According to Tahir and Batool (2020), the COVID-19 Pandemic decreased 0.3% in global carbon dioxide emission, after the collapse of 2009, due to the confinement of the local transport and aviation sector, which brings improving air quality for the next generation (Rugani and Caro, 2020). However, according to Zambrano-Monserrate et al. (2020), there are also negative secondary aspects, such as the reduction of recycling and the increase of waste, compromising the contamination of physical spaces, where the greatest waste and reduction of recycling are negative side effects of COVID-19.

According to Fattorini and Regoli (2020), long-term air quality data correlated significantly with cases of COVID-19 in 71 Italian provinces (updated on April 27, 2020), providing further evidence that chronic exposure to contamination atmospheric exposure may represent a favorable context for the spread of the virus. Coherently, Pirouz et al. (2020a) report that population density and climate conditions can affect COVID-19 cases. However, Sarkis et al. (2020) highlight that the Coronavirus outbreak also has positive environmental consequences, that is, significant reductions in air pollution, due to the large-scale slowdown in economic activity.

For Sofo and Sofo (2020), regardless of the COVID-19 Pandemic, there is an untapped potential for domestic plants and gardens, which can impact environmental results, people's awareness, and market trends. According to the authors, home gardens can provide

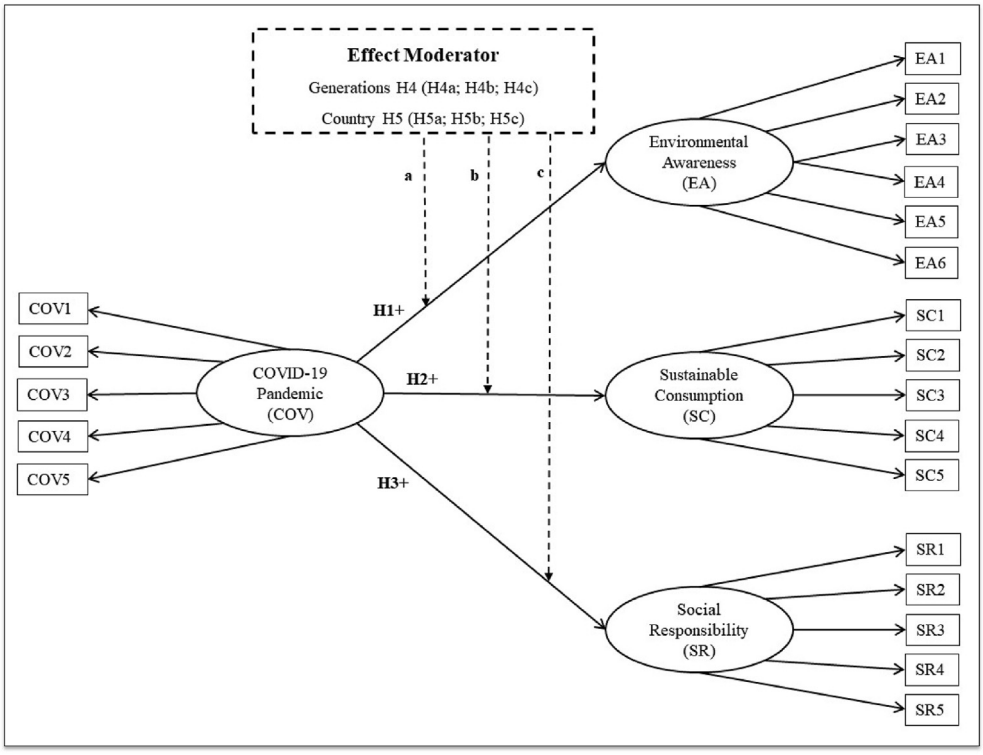

Fig. 1. Theoretical model (Framework).

a small-scale approach to the sustainable use of natural resources, leading to self-sufficiency, self-regulation, sustainability, and environmental protection.

For El Zowalaty et al. (2020), positive environmental effects are likely to be temporary, but can serve as an example of changes in society's way of life. In this scenario, Sarkis et al. (2020) and Cohen (2020) present a new existing link, in which a window of opportunity opens up to accelerate environmental awareness, after the COVID-19 Pandemic, towards broader sustainability transitions. Accordingly, H1 is present.

H1. COVID-19 Pandemic positively influences Environmental Awareness.

2.2. COVID-19 pandemic and sustainable consumption

The research by Jribi et al. (2020), demonstrated that the social block for COVID-19 improved the performance of food purchases and led to a positive behavioral change about food waste, where an economy, storage, and leftover consumption strategy occurred. However, according to the authors, the changes of consumers in the prevention of food waste may be more motivated by the socio-economic context of the blockade of COVID-19 (that is, availability of food, restricted movements, loss of income), than by a pro-environmental concern.

According to Muhammad et al. (2020), the blockade due to COVID-19 has drastic effects on social and economic fronts, however, this blockade also has some positive effect on the natural environment. Still, according to the authors, data released by NASA (National Aeronautics and Space Administration) and ESA (European Space Agency) indicate that pollution in some of the epicenters of COVID-19, such as Wuhan, Italy, Spain and the USA, has been reduced by up to 30%. The study by Wang and Su (2020) highlights that the COVID-19 Pandemic reduced the concentration of nitrogen dioxide (NO^2) in the atmosphere, as well as the research by Shehzad et al. (2020), where there was also a significant decline in NO^2 in renowned states of India, namely Delhi and Mumbai.

However, the research by Collivignarelli et al. (2020) points out that in the metropolitan area of Milan, where there was a severe limitation in the movement of people, after the partial and total blocking measures, it determined a significant reduction in the concentration of pollutants, mainly due to vehicle traffic, about sulfur dioxide (SO^2). The research by Lal et al. (2020), there was a substantial reduction in the level of NO^2, a low reduction in carbon monoxide (CO) and a low to moderate reduction in the optical depth of the aerosol, in the main hot spots of the COVID-19 outbreak during February–March 2020, which can also be attributed to mass blocks.

In this scenario, the study by Bashir et al. (2020) indicates that environmental pollutants such as PM^{10}, $PM^{2.5}$, SO^2, NO^2 and CO have a significant correlation with the COVID-19 epidemic in California, just as it becomes relevant to encourage regulators to promote changes in environmental policies, because controlling the source of pollution can reduce the harmful effects of environmental pollutants.

According to Hsu et al. (2020), many lessons learned will serve as a model for dealing with future Pandemics, but a new sustainable model is needed for the immediate future. Quarantine policies have led consumers to increase their demand for online shopping for home delivery. Consequently, the organic waste generated by households has increased; also, food purchased online is shipped packaged so that inorganic waste also increased (Zambrano-Monserrate et al., 2020).

In this context, sustainable consumption has been the subject of several scientific studies. For Baier et al. (2020), the constant increase in sustainable consumer behavior leads companies to strengthen their efforts to become socially and ecologically more sustainable, as sustainability offers are developed, for example, through recycled materials, circular business models, as well as adapted product, ranges with fewer fashion cycles. According to Lo and Liu (2018), for efficient, sustainable consumption, the disposal, and separation of domestic solid waste, as well as recycling is essential for the local community.

About inputs and natural resources, Rauf et al. (2020) point out that energy consumption in the high-tech industry and economic growth deteriorates environmental quality. Still, financial development and consumption of renewable energy have a favorable effect on the environment. The research by Liu and Song (2020) highlights that producing more food with limited water resources, as well as improving the efficiency of water use, is an urgent task, especially in arid and semi-arid areas with fragile ecosystems and severe water shortages. O'Brien and Bringezu (2017), on the other hand, report that the levels of wood consumption have increased considerably in recent years, being considered sustainable forest management practices, aiming at changes in the terrestrial system and the global distribution of common good resources, so that consumption levels are linked to sustainable supply capacities.

In this context of the global COVID-19 Pandemic, sustainable development is considered a key concept and solution in the creation of a promising and prosperous future for human societies (Pirouz et al., 2020b), where sustainable consumption must be global policies (Cohen, 2020), since the maintenance of natural resources must be sustainable so that the next generations have their needs met (Severo et al., 2018). Therefore, H2 is listed.

H2. COVID-19 Pandemic (COV) positively influences Sustainable Consumption (SC).

2.3. COVID-19 pandemic and social responsibility

According to Sarkis et al. (2020), the COVID-19 Pandemic is a time when people are oriented to unite and support each other in society, and they must be learned to do it from a distance. However, according to the authors, behavior and changes are necessary, and some of them can provide useful insight into how it is possible to facilitate transformations towards more sustainable projects and supply and production. Another aspect is the need for eminent new forms of learning (Signori et al., 2018) in schools, favoring distance learning to guarantee physical distance.

Various measures, such as mobility restrictions, physical distance, hygienic measures, socioeconomic restrictions, communication mechanisms and international support have been used in several countries to minimize the impact of COVID-19 (De Bruin et al., 2020). According to Bengtsson et al. (2018), consumption and production volumes are closely associated with environmental impacts, indicating the need to reduce these volumes in order to safeguard social responsibility, which is unlikely to be possible without a restructuring of the existing socio-economic arrangements.

However, low- and middle-income countries remain vulnerable to Pandemics, as well as experiencing dramatic social and economic consequences (Chattu and Yaya, 2020). In this scenario, for the effectiveness of social responsibility actions, it will be necessary to work to ensure the emergence and success of the adoption of new types of economic development and governance models, and these social changes will require reflection, new behaviors, and thoughtful action (Sarkis et al., 2020). Tisdell (2020) points out that the moral and ethical issues raised by the control policies of COVID-19, seem to have received little attention in the relevant economic

literature. According to Kelley et al. (2020), outbreaks can worsen existing vulnerabilities, inequities and mistrust in society. Also, according to the authors, when implementing public health interventions, it is important that the authorities respect human rights and the dignity of people, giving necessary attention to gender violence, protection and exploitation of underpaid workers.

The COVID-19 Pandemic is changing people's behavior and social awareness (Orcutt et al., 2020), as several social campaigns, such as the distribution of food, clothing, personal protective equipment and medicines are emerging in society (Al-Reyaysa et al., 2019; Francis and Pegg, 2020; Khan et al., 2020; Tekleab et al., 2020). What can be evidenced in the campaigns of Institutions that help countries and people who are socially vulnerable, focused on homeless people, migrants, and refugees, drug users, the elderly, children, and people deprived of their freedom (Unhcr/Acnur 2020; Médicos sem Fronteiras, 2020; Cruz Vermelha Brasileira, 2020; Actionaid, 2020).

H3. COVID-19 Pandemic (COV) positively influences a Social Responsibility (SR).

2.4. Moderating effect

As a moderating effect, it is admitted that intervening variables may occur in the dependency relations between the constructs. In this study, the possibility of the Generations and the country in which the respondents reside was evaluated, as they may interfere in the intensity of the relationships, which alters the influence of COVID-19 on Environmental Awareness, Sustainable Consumption and Social Responsibility.

The generations were classified according to personal, behavioral characteristics and year of birth, as according to studies Severo et al. (2018), there is a difference in the perception of the Baby Boomers, X and Y generations, on behavioral aspects related to socio-environmental dimensions and conscious consumption. The criterion used to classify the generations was the period of year of birth: before 1965 (Baby Boomers); from 1965 to 1981 (generation X); and, after 1981 (generation Y). Based on this premise, the hypotheses of the moderating effect of generations (H4a, H4b, H4c) were evaluated:

H4a. Generations has a moderating effect on the relationships between COV and EA.

H4b. Generations has a moderating effect on the relationships between COV and SC.

H4c. Generations has a moderating effect on the relationships between COV and SR.

Countries have different levels of socioeconomic development, as in the case of Brazil and Portugal. It is noteworthy that Brazil is under development and Portugal is already a developed country. Thus, social and public health policies are differentiated, as well as the number of Health Assistance Institutions, qualified professionals, availability of specialized equipment to deal with Pandemic, in addition to the population's awareness of social isolation. In this sense, the research hypotheses (H5a, H5b, H5c) that presupposes the existence of a moderating effect on the country in which the respondent resides emerges, which are described below:

H5a. The respondent's country of residence has a moderating effect on the relationships between COV and EA.

H5b. The respondent's country of residence has a moderating effect on the relationships between COV and SC.

H5c. The respondent's country of residence has a moderating effect on the relationships between COV and SR.

Fig. 1 presents the Theoretical Research Model (Framework), with the hypotheses that foresee the influence relations between the constructs and the Moderating Effect of Generations and the Country.

3. Method

The method used was a quantitative and descriptive research (Hair Jr. et al., 2013), through a survey, with the perception of different generations, 2676 Brazilians, and 560 Portuguese. The sample is non-probabilistic, for convenience (Hair Jr. et al., 2013), which meets the sample size requirements (Hair Jr. et al., 2013), in which 154 respondents were obtained per observable variable, as well, the sample surpasses the premise of more than 200 to 400 valid cases (Kline, 2011; Hair Jr. et al., 2013), in which a total of 3272 responses were collected, 11 cases were eliminated (univariate outliers) and 25 cases by multivariate outliers (Mahalanobis distance), resulting in 3236 valid cases.

The questionnaire (Table 3) presents 21 questions, 8 related to the profile of the respondents, 3 about behavior due to COVID-19 and 21 statements divided into 4 Constructs, which were developed by the researchers: i) COVID-19 Pandemic (COV); ii) Environmental Awareness (CA); iii) Sustainable Consumption (CS); and, Social Responsibility (SR). The questionnaire consists of statements, in which the respondent chooses an alternative answer on a 5-point Likert scale (1- totally disagree to 5 totally agree).

The questionnaire was validated by three doctors who are experts in the thematic area of study (Sustainability and Medicine). First, there was a pre-test with 23 respondents to understand the questions. The data were collected from May 11, 2020 to May 06, 2020 in Brazil, and December 05, 2020 to May 06, 2020 in Portugal. The questionnaires were applied online, using Google Forms, through social networks (Facebook, LinkedIn, Instagram and WhatsApp) and e-mail. The research used the snowball method, in which the researchers sent the questionnaire to their contacts, and they subsequently passed on the research to other individuals (Severo et al., 2018), as well as the effectiveness of the sampling technique, modified snowball using social media (Lee and Spratling, 2019), which holds for this Pandemic moment. The use of social networks on the internet contributed to the randomness and diversity of respondents' characteristics.

Fig. 2 presents the description of the method that provided: i) Normality and Simple Reliability of the Observable Variables; ii) Validation of Constructs; iii) Assumptions of the relationship between Constructs; iv) Quality assessment of the measurement model and structural model; and, v) Moderating effect of generations and countries. The Method was developed based on studies of Mardia, (1971) Fornell and Larcker (1981), Bentler and Bonett (1980), Tanaka and Huba (1985), Bollen (1989), Bentler (1990), McDonald and Marsh (1990), Byrne (2010), Marôco (2010), Kline (2011), De Guimarães et al. (2016), Hair Jr et al. (2013) and Severo et al. (2018)

It should be noted that the innovation in the methodology is represented in two aspects: i) use of constructs and observable variables in combination with a situation of the sudden change of context (pandemic), in addition to verifying the direct influence of the context of COVID-19 Pandemic (COV) about people's awareness and socio-environmental behaviors, which is expressed in the Framework (Fig. 1); ii) Another aspect is the availability to the academic and scientific community of the Statistical Analysis Method (Fig. 2), which guarantees the methodological rigor of the research and can be used by other researchers in different applications of

Table 3
Factor loadings of observable variables - Varimax Rotation.

Observable Variables	Factorial Loads	Communality	Mean	Standard Deviation
COVID-19 Pandemic (COV)				
COV1) The COVID-19 Pandemic makes me worried about the future life.	0.761	0.598	4.366	0.9127
COV2) The large number of people infected with COVID-19 made me change my social behavior.	0.756	0.594	4.508	0.7817
COV3) The large number of deaths related to COVID-19 has scared me.	0.781	0.647	4.044	1.1665
COV4) I believe that in 2020 an effective vaccine will be found for the treatment of COVID-19.	0.771	0.626	3.049	1.3682
COV5) I believe that COVID-19 Pandemic Prevention Campaigns have reduced the number of infected people.	0.709	0.543	3.693	1.1241
Mean 3.932; Standard Deviation 1.071				
Environmental Awareness (EA)				
EA1) The COVID-19 Pandemic has made me increase the separation of organic and recyclable waste.	0.739	0.556	2.493	1.3242
EA2) The COVID-19 pandemic has caused me to reduce water consumption further, as this is a finite environmental resource.	0.700	0.523	2.575	1.3305
EA3) The COVID-19 Pandemic made me worry even more about the natural resources for future generations.	0.768	0.652	3.268	1.3403
EA4) The COVID-19 Pandemic made you realize the reduction in air pollution.	0.803	0.697	3.930	1.2307
EA5) - The COVID-19 Pandemic made me realize, even more, the environmental impact caused on the planet.	0.736	0.698	4.006	1.2002
EA6) The COVID-19 Pandemic has increased my environmental awareness.	0.488	0.686	3.349	1.2842
Mean 3.270; Standard Deviation 1.285				
Sustainable Consumption (SC)				
SC1) The COVID-19 Pandemic caused me to change my consumption habits to be more sustainable.	0.743	0.624	3.006	1.2135
SC2) The COVID-19 Pandemic made me buy even more environmentally friendly products.	0.775	0.634	2.497	1.1926
SC3) The COVID-19 Pandemic caused me to reduce waste production through prevention, reuse, and recycling.	0.816	0.703	2.661	1.2177
SC4) The COVID-19 pandemic has reduced atmospheric impacts by reducing gases (CO2) that cause the greenhouse effect.	0.747	0.571	4.037	1.1345
SC5) The COVID-19 Pandemic has reduced deforestation and loss of biodiversity.	0.540	0.350	2.807	1.2881
Mean 3.002; Standard Deviation 1.209				
Social Responsibility (SR)				
SR1) The COVID-19 Pandemic has made me even more sensitive to issues of social vulnerability.	0.507	0.435	4.341	0.9046
SR2) The COVID-19 Pandemic made him donate food or clothes.	0.800	0.680	3.648	1.3667
SR3) The COVID-19 Pandemic caused me to make a financial donation to needy people or entities.	0.802	0.651	3.178	1.5545
SR4) The COVID-19 Pandemic made me consume products/services from companies known for practicing social responsibility.	0.744	0.622	3.463	1.2647
SR5) The COVID-19 Pandemic contributes to welcoming people who are socially vulnerable.	0.533	0.348	3.459	1.2575
Mean 3.618; Standard Deviation 1.270				

Structural Equation Modeling (SEM), since Fig. 2 presents the statistical tests that precede the application of SEM and the parameters used to assess the viability of the data set and the hypothesis tests.

The choice of SEM for data analysis, considered that this method uses a set of methodological procedures for statistical analysis, to make the examination of simultaneous dependency relationships (Hair Jr. et al., 2013; De Guimarães et al., 2016). SEM is a recommended method for testing hypotheses of dependency relationships, correlations and multigroup analysis to determine moderating variables (Long et al., 2017; Cai et al., 2019), as it assesses the measurement model and the structural model (Jin et al., 2019; De Guimarães et al., 2020).

4. Results

The final sample of 3236 respondents is composed of 2676 (82.7%) residents in Brazil and 560 (17.3%) residents in Portugal, noting that the sample from Portugal exceeds the minimum (between 200 and 400 valid cases) suggested by Kline (2011) and Hair Jr. et al. (2013) for the use of Structural Equation Modeling (SEM) and other multivariate data analysis. The characteristics of the respondents identified: i) Generations: 12% Baby Boomers, 34.1% of Generation X and 53.9% of Generation Y; ii) Declared gender: 33.9% Male, 65.9% Female and 0.2% another gender; iii) Work: 85.4% work in the following positions: Auxiliary (6.8%), Analyst/Technical (19.7%), Manager (18.2%), Teacher (23.3%), Others (10.7%), and it stands out that 21.3% work in the health field. Iv) Education: 9.3% with high school, 33.1% undergraduate, 20.9% post-graduate (specialization), 20.4% with a master's degree, and 16.3% with a doctorate, which reflects the high participation of professors and researchers.

Regarding the strategies adopted in Brazil by the State and Municipal Health Secretariats, new Field Hospitals were created, new health equipment was purchased, health professionals (technicians, nurses, and doctors), idle beds were unblocked in hospitals (infirmary and ICU), as well as the decontamination of environments.

In Brazil, it is up to the federal, state, and municipal governments, managers, universities, and researchers to integrate more, aiming at the development of actions, public policies and research to address the deficiency of the Health Systems, the adequate treatment for the infected, the maintenance of the quality of life of conservation of jobs and income, as well as the development of medicines and vaccines for COVID-19.

In Portugal, among the primary measures during the State of Emergency period, there was the duty of home collection, establishments serving the public should remain closed, with the exception of grocery stores and supermarkets, gas stations, pharmacies, and bakeries. Public transport had a reduction in the maximum number of passengers, in addition to the non-mandatory payment of tickets. The transition between the Portuguese states was conditioned to a relevant justification with the National Republican Guard. These territorial restrictions, extended to the borders with Spain and the closing of the main airports. All limitations, if they were breached, were under penalty of the crime of civil disobedience.

Due to the evolution of the Pandemic in Portugal and the capacity of the National Health Service (SNS), on May 4, the government published the Plan of Deflation, taking care of the transition from the State of Emergency to the State of Calamity, with a schedule of measures, in a phased manner, which provides for the gradual reopening of sectors of social and economic activities that have been closed, maintaining the mandatory use of masks and

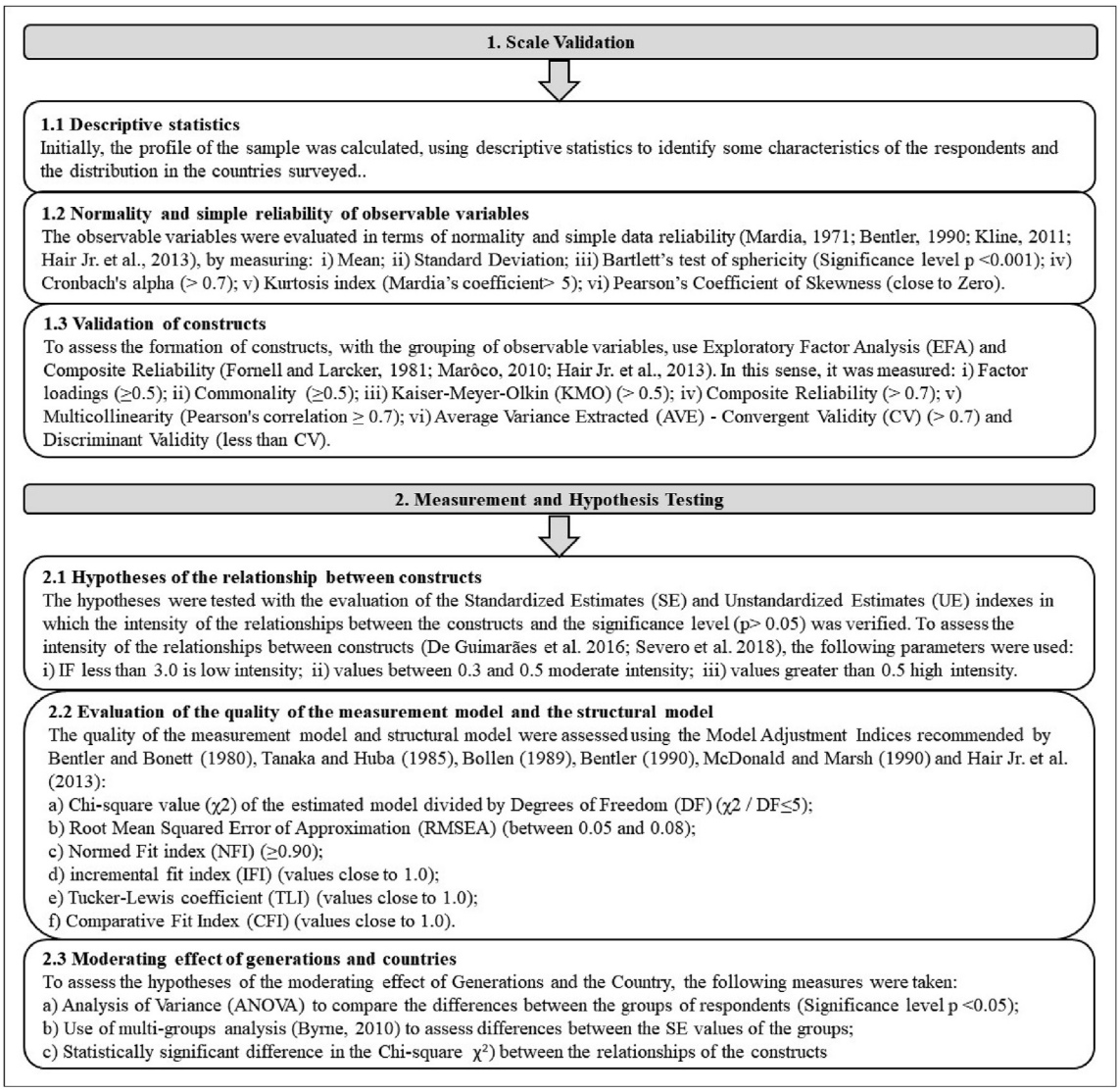

Fig. 2. Statistical analysis method.

extolling the collaboration of citizens with the civic duty of recollection.

In this sense, regarding the understanding aspect of the questionnaire, it was highlighted that 90.7% of the respondents have a minimum degree of education, so they are theoretically prepared to evaluate the topics covered and choose the 5-point Likert as the alternative that best expressions the opinion on what is questioned.

Still using descriptive statistics, responses on the topics were analyzed: i) Home Office; ii) Symptom of Psychological Disorder; and, iii) Alcoholic Beverage Consumption. The questionnaire was prepared with statements, in which the respondent should choose on a 5-point Likert scale (1- totally disagree to 5 totally agree). Values 3, 4, and 5 marked on the Likert scale were considered relevant responses, in which the percentage of these responses was added, which agree with the existence of the questioned situation.

On the theme of Home Office, the statement "The enterprise I'm working in has encouraged home office work to the detriment of COVID-19 Pandemic (if you work)" was used, which obtained the values of Mean = 4.011, Standard Deviation 1.369 and 84.6% (plus the answers in Likert 3, 4 and 5) admit that the company encourages Home Office work.

To measure the existence of possible Symptom of Psychological Disorder (insomnia, anxiety, panic, depression), the statement "I have had symptoms such as insomnia, anxiety, panic, or depression, to the detriment of the COVID-19 Pandemic" was used ", With the values of Mean = 2.737, Standard Deviation 1.416 and 52.9% expressed that they suffer from some Symptom of Psychological Disorder caused by the context of the pandemic.

In order to evaluate the possibility of increasing Alcoholic Beverage Consumption during COVID-19 Pandemic, the statement "I have been consuming more alcoholic beverages at this time of the COVID-19 Pandemic" was used, which obtained the values Mean = 1,791, Standard Deviation 1265 and 23.5% replied that they increased alcoholic beverage consumption as a result of the situation caused by the pandemic.

Based on Fig. 2 of the Method, step 2.2. Normality and simple reliability of the observable variables, the Bartlett's test of sphericity, Kurtosis index and Pearson's Coefficient of Skewness were measured resulting in values within the parameters described in the Method. The results indicate that only the variables of the construct COVID-19 Pandemic (COV) presented Cronbach's alpha values (0.472) lower than desirable (>0.7), indicating that the

construct can still be improved with the inclusion of other variables that can contribute with the explanation of the construct.

The questionnaire statements and the preliminary results of the Exploratory Factor Analysis (EFA) are described in Table 3. The Total Variance Explained, which evaluates all variables together resulted in 59.24%, as the Variance Explained for each construct (Table 2) obtained values above 50% are indicated, indicating an adequate explanation of the variability of the constructs. The Factorial Loads and Communalities mostly present values above 5.0 recommended by Hair Jr. et al. (2013), the Factor Load of the variable EA6 has a value (0.488) very close to the recommended one, and the Communality values of the variables CS5 (0.350), SR1 (0.431) and SR5 (0.348) are considered low, indicating that these variables are little related to the other variables, however, due to the theoretical contribution to the construction of the constructs, it was decided to keep the variables, as this is an exclusive decision of the researcher (Hair Jr. et al., 2013).

The Mean values of the variables and the construct indicate an understanding that, in most statements, the respondents admit the existence, because in 16 questions the Mean values are greater than 3.0. Another aspect is the high agreement between the respondents, which can be assessed by the proximity of 1 in the Standard Deviation results, supporting the statement that there is a low variability in the responses of the observable variables.

Still in the step of Method 2.2. Validation of the constructs, in addition to the evaluation of the Factorial Loads and Communalities (Table 3), the Composite Reliability, Kaiser-Meyer-Olkin (KMO) (Table 2), Multicollinearity (Pearson's correlation) and Average Variance were measured Extracted (AVE). Composite Reliability and KMO have higher values than recommended. Pearson's correlation results indicated that only the SC2←→SC3 correlation (0.701), indicating the possibility of the existence of Multicollinearity, however, it was decided to keep both variables, due to the theoretical importance in explaining the construct, although statistically only one of these variables it would be enough to assess the construct.

The calculation of the Average Variance Extracted (AVE) resulted in Convergent Validity (CV) values lower than recommended, and the correlation between constructs, measured by Discriminant Validity (DC), presented adequate values, except for the SC←→EA relationship in which CV is less than DC, indicating that there is a high relationship between the variables of SC and EA, because conceptually SC behavior is the result of sustainable awareness.

Based on the parameters described in Fig. 2 (Method of Analysis of Statistical Results), it is evident that the observable variables and constructs meet the requirements of normality, reliability and statistical validation, therefore the data indicate feasibility for the application of the SEM methodology to evaluate the relationships between the constructs.

Based on the Theoretical Model (Fig. 1) and the possible correlations between the observable variables of each construct, the Integrated Model (Fig. 3) was developed. In this model, important correlations between COV1←→COV2 (0.35), COV4←→COV5 (0.35), EA4←→EA5 (0.46), EA5←→EA6 (0.35), SC1←→SC2 (0.36), SC1←→SC3 (0.26), SC2←→SC3 (0.45), SR2←→SR3 (0.27) and SR3←→SR4 (0.21), these correlations were evaluated by the conceptual proximity of each variable (Table 3) and the statistical measurement, which resulted in values significant ($p < 0.001$).

Table 4 presents the results of the hypothesis tests, which were evaluated based on the values of Standardized Estimate (SE) and Unstandardized Estimate (UE). All SE and UE values are positive and statistically significant ($p < 0.001$), resulting in important values, two of which stand out that in H1 the relationship COV→EA (SE = 0.979), and H2 the relationship COV→SC (SE = 1.090), in which these results are considered as a high-intensity relationship (De Guimarães et al., 2016; Severo et al., 2018). The H3 that evaluates the relationship between COV→SR (SE = 0.481) has a moderate intensity relationship. The results indicate that H1, H2, and H3 were confirmed.

From the parameters described in Fig. 2, in item 2.2Evaluation of the quality of the measurement model and structural model, the adjustment indexes of the model were verified (Table 5). The NFI, IFI, TLI and CFI indices were close to the parameters recommended by Bentler and Bonett (1980), Tanaka and Huba (1985), Bollen (1989), Bentler (1990), McDonald and Marsh (1990) and Hair Jr. et al. (2013). The RMSEA resulted in value within the established parameters.

The test results, Scale and Measurement Validation and Hypothesis Testing (Fig. 2) support the Integrated Model's statistical validation. Therefore, the Measurement model and the Structural Model, used in this research, are adequate for the measurement and evaluation of the data. However, the adjustment values of the model (NFI, IFI, TLI, CFI) indicate that the model can be improved, with the exclusion of variables contribute little to the explanation of the variability of constructs or inclusion of new observable variables.

To assess the possibility of a moderating effect on Generations, the SE and Chi-square Difference values were calculated. Table 6 indicates that the SE values present significant differences, which confirms the hypotheses H4a, H4b and H4c. It is noteworthy that in COV→EA relations Generation Y received less influence from COVID-19 Pandemic on EA (SE = 0.903), however, this is a very high intensity of influence. However, in the COV→SC relation, Generation Y has a higher intensity (SE = 1.139), in comparison with the values of Baby Boomers and Generation X, which are of high intensity. In the COV→SR relation, the Baby Boomers generation (SE = 0.701) presents a big difference in comparison with the other generations.

The evaluation of the interference of the generations on the averages of the responses, measured by ANOVA (Table 7), identified that significant differences occurred ($p < 0.001$) in all constructs (COV, EA, SC, SR). In the COV construct, Generations X and Y had higher response averages than Baby Boomers, demonstrating that they are more affected by the situation of COVID-19 Pandemic. In the EA, SC and SR constructs, Baby Boomers have higher mean response values compared to Generations X and Y. They are demonstrating that the Baby Boomers generation has socio-environmental behaviors that are more adequate to the principles of sustainability.

Table 8 shows the SE values for Brazil and Portugal. The results confirm the H4a and H4c hypotheses, so the multigroup analysis reveals that there is a difference in Chi-square and SE values, showing that in Portugal the COV→EA and COV→SR relations are higher compared to Brazil, highlighting them It is noted that the influence of COVID-19 Pandemic on Social Responsibility is considered a high intensity among residents in Portugal. The COV→SC relationship does not present significant differences in the SE and Chi-square values. Therefore, the H4b hypothesis has not been confirmed.

Analysis of variance (ANOVA) was used to verify the possibility of differences between the mean values of responses between groups of residents in Brazil and Portugal. Construct SC showed no differences between countries. ANOVA identified that the constructs COV, EA and SR present higher average responses in Brazil, which shows the concern with the situation of COVID-19 Pandemic, with the construction of a thought of greater socio-environmental responsibility.

Declared gender (Male, Female, another gender); ii) Work Position jobs (Auxiliary, Analyst/Technical, Manager, Teacher, Others, and work in the health field) iii) Education (high school,

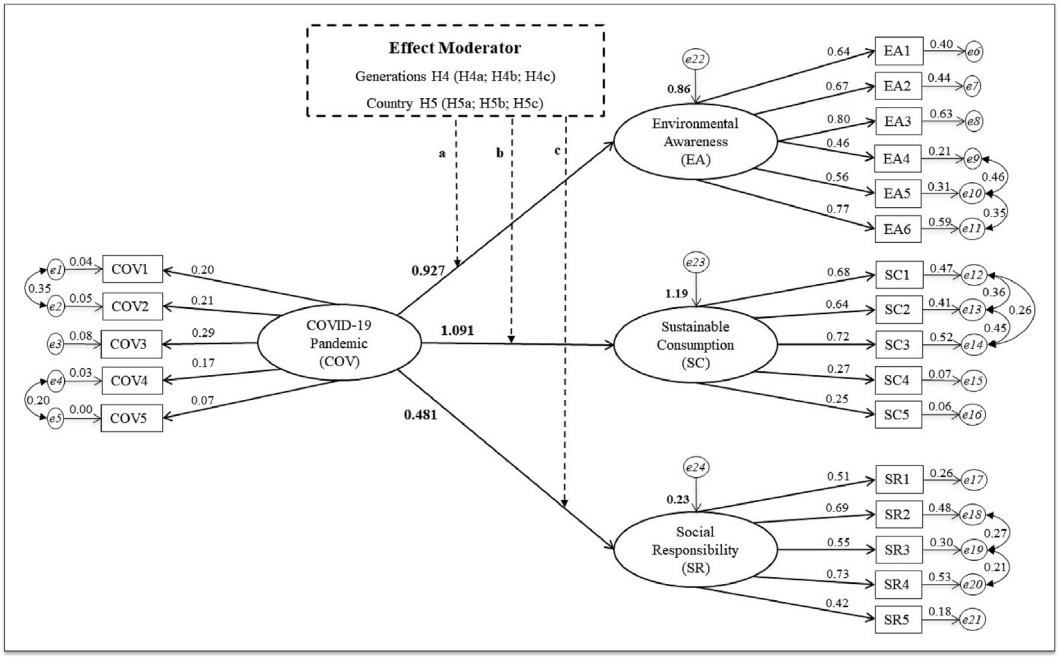

Fig. 3. Framework – integrated model.

Table 4
Hypothesis tests – Integrated model.

	Constructs			Integrated Model	
				SE[a]	UE[b]
H1	COVID-19 Pandemic (COV)	→	Environmental Awareness (EA)	0.927	10.383
H2	COVID-19 Pandemic (COV)	→	Sustainable Consumption (SC)	1.090	12.061
H3	COVID-19 Pandemic (COV)	→	Social Responsibility (SR)	0.481	3.413

* Significance level $p < 0.001$.
[a] Standardized Estimate (SE).
[b] Unstandardized Estimate (UE).

Table 5
Model adjustment indices.

Cronbach's Alpha*	Bartlett's Test of Sphericity*	AVE*	Composite Reliability*	KMO	X2/DF	RMSEA	NFI	IFI	TLI	CFI
0.842	23926.311	0.473	0.941	0.866	24.3	0.085	0.821	0.828	0.794	0.827

* Significance level $p < 0.001$ (All observable variables).

Table 6
Moderator effect of the generations – multi-groups analysis.

Hypothesis				Baby Boomers SE[a]	Generation X SE[a]	Generation Y SE[a]	Chi-square (^{2}) Difference p
H5a	COV	→	EA	0.963	0.947	0.903	***
H5b	COV	→	SC	1.053	1.041	1.139	***
H5d	COV	→	SR	0.701	0.461	0.464	***

***Significance level $p < 0.001$.
[a] Standardized Estimate (SE).

undergraduate, post-graduate/specialization, master's degree, doctorate). The ANOVA and Mean values of the Constructs of the Declared gender, Work Position Jobs, and Education groups are expressed in Table 9.

5. Discussion

Regarding the impact of the COVID-19 Pandemic, a significant increase in the Symptom of Psychological Disorder was identified: a high rate of 52.9% of respondents who admit to feeling Symptom of Psychological Disorder (insomnia, anxiety, panic, or depression) and 23.5% of respondents say they are consuming more Alcoholic Beverage Consumption. These indicators reinforce that the COVID-19 Pandemic, besides being a physical health problem, is a social phenomenon that promotes mobility restrictions, physical distance, hygienic measures and socioeconomic restrictions (De Bruin

Table 7
ANOVA between groups (Generations, Country).

Construct	Generations		Country	
	Group	Mean	Group	Mean
COVID-19 Pandemic (COV)	Baby Boomers[a]	3.827	Brazil[a]	3.993
	Generations X[a]	3.959	Portugal[a]	3.644
	Generations Y[a]	3.939		
Environmental Awareness (EA)	Baby Boomers[a]	3.491	Brazil[a]	3.319
	Generations X[a]	3.185	Portugal[a]	3.038
	Generations Y[a]	3.274		
Sustainable Consumption (SC)	Baby Boomers[a]	3.206	Brazil[a]	2.991
	Generations X[a]	2.991	Portugal[a]	3.051
	Generations Y[a]	2.963		
Social Responsibility (SR)	Baby Boomers[a]	3685	Brazil[a]	3.725
	Generations X[a]	3655	Portugal[a]	3.105
	Generations Y[a]	3579		

[a] ANOVA – Significance level $p < 0.001$.

et al., 2020), which contributes to presenting symptoms mental illness and anxiety and panic attacks (Blake et al., 2020; Zhai and Du, 2020).

Another aggravating factor is that the activity in the Home Office modality, in which 84.6% of the respondents who work, received incentives from companies to perform professional activities at home, which aggravates the situation, because in the family context, in many cases, there is the problem that the children are at home (schools are not working) and therefore add to this demand for care, in addition to professional activity in Home Office.

The situation of Health Professionals is even more serious in terms of the occurrence of symptoms of insomnia, anxiety, panic, or depression (Symptom of Psychological Disorder), reaching 58.3% of this group of respondents. The pressure of working conditions and the high risk of infection are important reasons for Health Professionals to develop symptoms of psychological disorders, as well as studies by Jeyabaladevan (2020) warn that the workload of health professionals and the high number of patients, makes it difficult to meet the demand of infected people, increasing the psychological pressure on professional performance.

The results of the hypothesis tests (Table 4) prove the influence of COVID-19 Pandemic (COV) on EA, SC and SR constructs, confirming hypotheses H1, H2 and H3. In this regard, the research findings indicate that people are being influenced by the context of the Pandemic. Therefore, there has been increased concern about socio-environmental issues and the consumption of environmentally sustainable products, which can be evidenced by the high intensity of relationships COV→EA (SE = 0.979) and COV→SC (SE = 1.090). The growing increase in environmental awareness and sustainable consumption can be partly explained by the pandemic situation and also by studies by Cohen (2020) and Sarkis et al. (2020), as the Pandemic marks the beginning of a sustainable consumption transition, as well as a reduction in air pollution.

However, it is worth noting that the decrease in atmospheric

Table 8
Moderating effect of the country – multi-groups analysis.

	Constructs			Brazil SE[a]	Portugal SE[a]	Chi-square (^{2}) Difference p
H4a	COV	→	EA	0.894	0.943	***
H4b	COV	→	SC	1.165	1.078	ns
H4c	COV	→	SR	0.439	0.607	***

Ns (Not significant).
*** Significance level $p < 0.001$.
[a] Standardized Estimate (SE).

Table 9
ANOVA between groups (gender, work, education).

Construct	Declared gender		Work Position jobs		Education	
	Group	Mean	Group	Mean	Group	Mean
COVID-19 Pandemic (COV)	Male[a]	3.847	Auxiliary[a]	4.046	High school[a]	3.942
	Female[a]	3.974	Analyst/Technical[a]	4.014	Undergraduate[a]	3.965
	Another Gender[a]	4.600	Manager[a]	3.876	Post-graduate/Specialization[a]	3.976
			Teacher[a]	3.975	Master's degree[a]	3.922
			Others[a]	3.705	Doctorate[a]	3.847
			Health Field[a]	3.918		
Environmental Awareness (EA)	Male[a]	3.050	Auxiliary[a]	3.472	High school[a]	3.435
	Female[a]	3.378	Analyst/Technical[a]	3.419	Undergraduate[a]	3.327
	Another Gender[a]	4.583	Manager[a]	3.169	Post-graduate/Specialization[a]	3.364
			Teacher[a]	3.072	Master's degree[a]	3.283
			Others[a]	3.320	Doctorate[a]	2.938
			Health Field[a]	3.298		
Sustainable Consumption (SC)	Male[a]	2.834	Auxiliary[b]	3.050	High school[a]	3.142
	Female[a]	3.084	Analyst/Technical[b]	3.079	Undergraduate[a]	2.978
	Another Gender[a]	4.000	Manager[b]	2.910	Post-graduate/Specialization[a]	3.038
			Teacher[b]	2.971	Master's degree[a]	3.017
			Others[b]	3.066	Doctorate[a]	2.942
			Health Field[b]	2.995		
Social Responsibility (SR)	Male[a]	3.451	Auxiliary[a]	3.558	High school[a]	3.501
	Female[a]	3.703	Analyst/Technical[a]	3.695	Undergraduate[a]	3.557
	Another Gender[a]	3.750	Manager[a]	3.739	Post-graduate/Specialization[a]	3.796
			Teacher[a]	3.592	Master's degree[a]	3.674
			Others[a]	3.408	Doctorate[a]	3.502
			Health Field[a]	3.739		

[a] ANOVA – Significance level $p < 0.001$.
[b] ANOVA – Significance level $p < 0.05$.

pollution is partly due to the reduction in the use of vehicles, often through measures of social isolation and Lockdown, which is in line with the research by Zambrano-Monserrate et al. (2020), since COVID-19 Pandemic contingency measures improved air quality.

Another relevant factor in the research is the increase in respondents' environmental awareness, however, there is also an increase in the production of household waste, as well as infectious waste in health care units, as highlighted by Zambrano-Monserrate et al. (2020), the production of medical waste in Wuhan increased at significant levels. In the specific case of Brazil, this fact is worrying, since the treatment and final disposal of domestic and hospital waste are often not adequate since some States do not yet have a selective collection system and landfill, which is already recommended by the Brazilian legislation (Brasil-PNRS, 2010; Brasil-ANVISA, 2004).

The results of COV→SC (SE = 0.481) show the influence of Pandemic on social responsibility, however this relationship is the one that resulted in a less intense value, showing that respondents are less sensitive to social problems caused by COVID-19 Pandemic. These findings highlight that the respondents are not engaged or concerned with social issues, with people in social vulnerability, as well as with the least disadvantaged, diverging from the study by Orcutt et al. (2020), which shows that Pandemic is changing people's behavior and social awareness. Other research also points to these social changes, through the promotion of social campaigns, distribution of food, clothing, personal protective equipment and medicines (Al-Reyaysa et al., 2019; Francis and Pegg, 2020; Khan et al., 2020; Tekleab et al., 2020).

The measurement of the moderating effect of the Generations on the relationships between the constructs (Table 6) identified that there are significant differences in the SE values, which confirmed the hypotheses H4a, H4b and H4c. The research results showed the difference between the behavior of different generations, which corroborates the studies by Severo et al. (2018), who claim that Baby Boomers' behaviors tend to be more conservative and concerned with the quality of life of the family circle, and Generation X is focused on career and job maintenance, just as Generation Y is highly connected with new information technologies and are prone to taking risks. This view of the study by Severo et al. (2018) helps explain the Baby Boomers' responses that resulted in the high COV→EA (0.963) and COV→SR (0.701) ratio, as well as contributing to the explanation of the high COV→SC (1.139) ratio resulting from Generation Y responses.

ANOVA results show that Baby Boomers are more engaged in EA (Mean = 3.491) about Generation X (Mean = 3.185) and Generation Y (Mean = 3.275), the same occurs with the mean responses of SR (Baby Boomers Mean = 3.685; Generation X Mean = 3.655; Generation Y Mean = 3.579), also the Baby Boomers showed higher SE indices in the COV→EA (SE = 0.963) and COV→SR (SE = 0.701) ratios. It is noteworthy that Generation Y presented the greatest intensity in the COV→SC (SE = 1.139) ratio, which shows the social transformation in the consumption habits of this generation, which COVID-19 Pandemic acted as an influencing vector.

The statistical tests of multi-groups analysis and ANOVA, used to measure the moderating effect of the country in which the respondents are residents (Brazil, Portugal) confirmed the hypotheses H5a and H5b were confirmed. Noteworthy are the respondents from Portugal with greater intensity of COV→EA (SE = 0.943) and COV→SR (SE = 0.607) relations (Table 8). Respondents from Brazil stand out in the list due to the high intensity of COV→EA (SE = 1.165), however the H5b hypothesis has not been confirmed, since the Chi-square difference values are not significant when comparing the two countries. ANOVA also showed significant differences between the groups of respondents (Countries) in the constructs COV, EA and SR, but the construct SC did not show significant differences between the means of the responses of the groups. Table 10 presents the summary of the hypothesis results.

In the data analysis process, it wares identified that there are intervening variables, which can influence the results of the Framework (Fig. 3). ANOVA tests between the groups of respondents Declared gender, Work Position jobs and Education (Table 9), found that there are significant differences ($p > 0.001$ and $p < 0.05$): i) there are large variations in the means of responses of the Gender "Another Gender" in all constructs (COV, EA, SC, SR); ii) In the Work Position Jobs group, Teacher and Health Field stands out with more similarity of response in the VOC construct; iii) In Work Position Jobs, the categories Manager and Teacher have the lowest means of responses. However, all means were more than 3.0, indicating that respondents have the knowledge and moderate environmental awareness. In the SC and SR a construct, a low variation was found between the Work Position Jobs' means responses. The variables Declared gender, Work Position jobs, and Education are intervening, however they cannot be considered moderators of relationships, as further studies with the themes would be necessary to confirm this causal effect.

6. Conclusion

The main contribution of the research is the Framework (Fig. 3), which is composed of the measurement model, which are the observable variables gathered in constructs and the structural model, which predicts the influence relationships between the constructs. To validate the measurement model, tests of normality, reliability and internal consistency of the data were applied, which were statistically validated, as well as by the AFE. In this context, the structural model was validated with hypothesis tests. The framework developed in this research serves as a basis for new academic studies and contributes to the advancement of science, since it highlights the discussion of possible metrics to be applied with regard to a transformational event (COVID-19 Pandemic) on socio-environmental aspects and conscious consumption.

The research findings, through hypothesis testing, contribute to a positive environmental impact, as it proves that people are aware of Environmental Awareness (EA), Sustainable Consumption (SC) and Social Responsibility (SR), which are strongly influenced by the situation caused by COVID-19 Pandemic (COV). The negative social impact is the economic worsening of the most vulnerable people (informal workers), health problems, the inestimable loss with the death of infected people, in addition to other emotional situations and mental problems. However, COVID-19 Pandemic is expected to influence social relationships between individuals, although in this research the intensity was moderate in the COV→SR relationship.

It should be noted that the situation of the COV→SR relationship should be better addressed by the Governments, especially in Brazil, which can develop more assertive government policies, as the country has serious public health problems. During the Pandemic, two Ministers of Health and their technical teams were exchanged, there were cases of delay in the dissemination of updated data on the Pandemic, many cases were underreported, there was a lack of updated technical staff, lost tests (unsuitable for analysis), as well as the neglect and lack of empathy with scientific research, with the expertise of scientists and researchers, criticism with the press and media, which causes distrust in society. However, in Portugal, this situation is better resolved, in the COV→SR relationship, as expressed by the results (Table 8). In Brazil, the phenomenon of COVID-19 did not influence people's awareness of social responsibility, so it is the role of governments, educational institutions, and companies to foster this feeling of helping socially vulnerable people, as well as welcoming people in difficulties, and the achievement donation.

Table 10
Research hypothesis.

Hypothesis	Description	Results
H1	COVID-19 Pandemic (COV) positively influences Environmental Awareness (EA).	Confirmed
H2	COVID-19 Pandemic (COV) positively influences Sustainable Consumption (SC)	Confirmed
H3	COVID-19 Pandemic (COV) positively influences a Social Responsibility (SR)	Confirmed
H4a	Generations has a moderating effect on the relationships between COV and EA	Confirmed
H4b	Generations has a moderating effect on the relationships between COV and SC	Confirmed
H4c	Generations has a moderating effect on the relationships between COV and SR	Confirmed
H5a	The respondent's country of residence has a moderating effect on the relationships between COV and EA	Confirmed
H5b	The respondent's country of residence has a moderating effect on the relationships between COV and SC	Not Confirmed
H5c	The respondent's country of residence has a moderating effect on the relationships between COV and SR	Confirmed

The survey results indicate that there is a high consumption (23.5%) alcoholic beverage consumption and 52.9% admit to experiencing Symptom of Psychological Disorder (insomnia, anxiety, panic, or depression) due to the situation caused by Pandemic. Therefore, this finding indicates the urgency government action, for the development of public health programs, in support of people who are living in social isolation. In particular, the survey results point out that the group of Health Professionals (58.3%) are presenting Symptom of Psychological Disorder; therefore, managers of the Health Network must urgently establish intensive psychological support programs for this group of professionals.

Another important finding of the research is in the identification that Generation Y perceives with greater intensity the influence of COV → SC (Table 6), which is an optimistic data about the concern that the new generations have a more conscious consumption posture. Baby Boomers, on the other hand, are more sensitive to socio-environmental situations in the context of Pandemic, with greater intensity in COV → EA and COV → SR relations, highlighting that Baby Boomers are more sensitive to SR actions. On the other hand, Generation X, who, in most cases, are responsible for the personal and professional training of the new generations, as they occupy management positions, presented a perception very close to Generation Y, but without important highlights.

Another aspect that must be considered is the social and economic impacts of COVID-19 Pandemic, which are influenced by public policies adopted by countries to face the situation. In Portugal, the government has taken health precautions and contingency plans seriously, maintaining special care to maintain political unity in combating the pandemic. While in Brazil, the federal government took a long time to recognize the seriousness of the situation, and throughout the period of growth of the COVID-19 death and infection curve, it stayed away, with isolated actions, as well as left it up to the government's State and Municipal authorities the responsibility for the sanitary actions and of coping with the disease, which ended up causing a higher rate of contamination in the Brazilians. Portugal and Brazil had economic problems with the retraction of the economy and the increase of layoffs of workers. In both countries, businessmen were under strong pressure to reopen economic activities in companies, but both continued a gradual process of resumption to prevent the increase of new cases of infection. Specifically, in Brazil, state governments have determined rules for resuming social life and resuming economic activities.

The research, using multivariate data analysis, composed of the tests of normality, variability, AFE, and reliability, contributed to the validation of the measurement model (scale with observable variables grouped in constructs). These tests are essential to reduce the impact of the study limitation, which is associated with the risk of using the Likert type, which is made up of levels and there is no other source for data triangulation (opinions of respondents only), which may cause the formation of response biases, with the occurrence of Common Method Variance (CMV) and the Halo effect (wrong generalization) (Bagozzi and Yi, 1991; Podsakoff et al., 2003; De Guimarães et al., 2018). The statistical tests and the evaluation of multivariate outliers through the calculation of Mahalanobis distance, contributed to minimize the effect of CVM.

Another limitation of the study is directly related to the data collection that occurred using the Snowball technique, which can lead to similar characteristics among respondents, since the sample's origin is the researchers' contacts, however using social networks (Internet), the necessary randomness occurred to diversify the respondents, which can be seen in section 4.Results, in which the characteristics of the people surveyed are presented.

Based on this study, new research questions arise related to the investigation of other socio-environmental behaviors influenced by the Pandemic situation, such as: What is the influence of COVID-19 Pandemic on people's quality of life? What is the impact of COVID-19 Pandemic on eco-innovation? What influence does COVID-19 Pandemic have on corporate philanthropy? Above all, COVID-19 Pandemic is more than a public health problem, it is a factor of social, environmental and economic influence, which will change the way people relate to each other and in society, how we relate to natural resources, and how organizations and governments transformed economic logic for wealth generation after the advent of the pandemic.

Credit author statement

Eliana Andrea Severo: Data curation, Formal analysis, Development of research objectives and justification. Development of the theoretical model and substantiation of the research hypotheses. Description of the research method. Data collection in Brazil. Analysis and discussion of results. Research conclusions. Julio Cesar Ferro de Guimarães: Data curation, Formal analysis, Development of the theoretical model. Description of the research method. Data collection in Brazil. Statistical treatment of data. Analysis and discussion of results. Research conclusions. Mateus Luan Dellarmelin: Data curation, Development justification for research and data collection in Portugal.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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