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knowledge and misconceptions about the causes of climate change: a cross sectional study

Conocimientos e ideas erróneas sobre las causas del cambio climático: un estudio transversal

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Andy Jossimar Alvarado Yepéz[1,2] & Fredy S. Monge Rodríguez[1,2]

[1] *Universidad Nacional San Antonio de Abad del Cusco*
[2] *Research Center Environment Behavior and Society*
Contact: fredy.monge@unsaac.edu.pe

Abstract:

Knowledge of climate change is a necessary condition for the understanding of this phenomenon and thus for the generation of environmental behaviors, however, the knowledge of the causes is still a debatable area regarding correct and erroneous conceptions. The present research aims to analyses the correct knowledge and misconceptions about the anthropogenic causes that contribute to climate change. The sample consisted of N= 250 subjects from the city of Cusco, Peru. Regarding the knowledge that causes climate change, it is observed that most of the participants identify the burning of fossil fuels, the increase of carbon dioxide, deforestation, and the fact of driving a car as the most relevant. On the other hand, misconceptions related to climate change were toxic waste, nuclear power plants, aerosol cans, ozone hole. In the group analysis, significant differences were found with respect to occupation (between housewives and professionals), and education (secondary and technical level). However, gender, age and income were not significant. Finally, the implications of misconceptions and misconceptions on the development of awareness of climate change risks, and levels of engagement and participation in adaptation and mitigation strategies are discussed.

Keywords: knowledge, misconceptions, causes, climate change.

Resumen

El conocimiento del cambio climático es una condición necesaria para la comprensión de este fenómeno y por ende para la generación de comportamientos ambientales, no obstante, el conocimiento de las causas aún es un área discutible respecto a las concepciones correctas y erróneas. La presente investigación tiene como objetivo analizar los conocimientos correctos e ideas erróneas sobre las causas de origen antropogénico que contribuyen al cambio climático. La muestra estuvo conformada por N= 250

sujetos de la ciudad Cusco, en Perú. Respecto a los conocimientos que causan el cambio climático, se observa que la mayoría de los participantes identifica la quema de combustibles fósiles, el aumento de dióxido de carbono, la deforestación, el hecho de conducir un coche, como lo más relevantes. Por otro lado, las concepciones erróneas relacionadas con el cambio climático fueron, los residuos tóxicos, las centrales nucleares, latas de aerosol, el agujero de la capa de ozono. En el análisis de grupo, se encontró diferencias significativas respecto a la ocupación (entre amas de casa y profesionales), y educación (nivel secundario y técnico). Sin embargo, el sexo, la edad, el ingreso económico no fueron significativos. Finalmente, se discute las implicancias de las concepciones correctas y erróneas, en el desarrollo de una conciencia sobre los riesgos del cambio climático, y los niveles de compromiso y participación en estrategias de adaptación y mitigación.

Palabras clave: conocimiento, ideas erróneas, causas, cambio climático.

Introduction

Climate change is one of the main threats facing humanity, this environmental phenomenon represents a complex event full of challenges (Helgenson, Linden and Chabay, 2012; Clayton, 2019); In this sense, knowing the factors that are associated with the degree of knowledge that people have about climate change is essential to determine coping strategies (adaptation and mitigation) from a participatory approach (Corona, 2018; Brugger, Morton & Dessai, 2015). Studies on knowledge of climate change allow an approximation to the degree of understanding and sensitivity that exists on the subject (Marino, 2011; Retamal, Rojas & Parra, 2011). Likewise, knowing the primary causes of climate change allows us to understand the evolution of the recognition of this phenomenon not only in the context of the scientific community, but also in ordinary people (Camarasa & Moreno, 1994). Considering that the concept of climate change is a collective cultural construction (Meira, 2007), therefore, to face its negative impacts, it will be necessary to identify the levels of understanding, participation and social consensus. In addition, the study on the causes of climate change makes it possible to propose possible climatic scenarios, according to sociodemographic factors (Useros, 2012, IPCC, 2008). Despite the importance of the subject, there is still a limited role regarding the information and knowledge that people reflect on the phenomena that give rise to climate change, given its cognitively complex nature, and which is also perceived as psychologically distant for the most people (Clayton, 2019).

Despite growing scientific evidence, the population still does not have objective or empirical knowledge regarding the causes of climate change (van der linden, 2015). In addition, some people have misconceptions, which are characterized by the tendency to combine one or more environmental problems and link them with the causes of climate change, this is known as the green effect or ecological beliefs (Dryden, Morgan, Bostrom & Bruine de Bruin, 2018), this is due to a bias in the process of differentiating the causes that give rise to environmental

and climate change, for example, the hole in the ozone layer generated deep public concern due to the relative ease of understanding the risk it represented, however, is not a cause of climate change (Ungar, 2000). Another error that people present is to think that climate change is mainly due to the natural variability of the climate system, for example, considering natural phenomena such as the phenomenon of the child as the cause of climate change, which is wrong, because this represents a natural variation, such as ocean currents or wind currents (Quintero et al, 2012). According to Reynolds et al (2010), in recent years, non-professional survey and interview responses have made reference to natural climate variability more frequently than before (van der linden, 2015).

Regarding the causes of climate change, it is necessary to recognize those of anthropic origin as the most relevant and that are mainly related to the greenhouse effect, which is characterized by the large amount of gas emissions, which began with the industrial era (Corona, 2018). In addition, some studies report that they are associated with economic factors, for example, energy production, industry, agriculture and transportation (Useros, 2012). Knowing how people identify these differences to recognize the causes of climate change could help us in the development of policies that allow us to significantly influence the management of the risks that climate change implies (Leiserowitz, 2005).

The present study aims to make an approximation about the level of knowledge and erroneous ideas about the causes and anthropogenic determinants of climate change, it also aims to observe if there are significant differences between the sociodemographic variables proposed for this study.

Methodology

Participants

The sample consisted of a total of N = 250 subjects, who having decided to participate voluntarily in the study, continued to fill out the questionnaire, the participants are mostly women, 148 participants (59.2%), men 102 participants (40.8%); the majority are in an age range of 18 to 30 years, with 163 participants (65.2%). Regarding economic income, the majority receive an income between 600 and 1500 soles, with 115 participants (46%); the level of instruction is mainly the secondary level 97 (38.8%), the higher technical level 65 (26%), the higher level 53 subjects (21.2%). Regarding occupation, most have a trade (carpentry, bricklayer, etc.) 94 subjects (37.6%), 49 subjects with university profession (19.6%), housewives 61 (24.4%) and students 46 (18.4%) . Regarding the religious exercise, the majority is Catholic with 198 participants (79.2%), then evangelical with 24 subjects (9.6%), leaving a percentage less than 10% in the other religions, these data and more are seen in table 1:

Table 1

Socio-demographic characteristics

Gender	Frequency	Percentage
Male	102	40.8
Woman	148	59.2
Economic Income	Frequency	Percentage
300 to 500 Soles	105	42.0
600 to 1500 soles	115	46.0
1500 to 4000 soles	28	11.2
Over 4000	2	0.8
Level of education	Frequency	Percentage
No Studies	3	1.2
Primary Education	32	12.8
Secondary Education	97	38.8
Technical Superior	65	26.0
University Superior	53	21.2
Ocuppation or Profession	Frequency	Percentage
Housewife	61	24.4
Student	46	18.4
Ocuppation	94	37.6
University Profession	49	19.6
Religion	Frequency	Percentage
Catholic	198	79.2
Evangelist	24	9.6
Mormon	2	0.8
Adventist	4	1.6
Other	22	8.8
Time of residence in the place where you live	Frequency	Percentage
1 to 5 years	69	27.6
6 to 10 years	42	16.8
11 to 20 years	33	13.2
21 to 40 years	22	8.8
I've always lived here	84	33.6
Number of people living in your household	Frequency	Percentage
2 to 4 people	141	56.4
5 to 8 people	99	39.6
9 to 12 people	7	2.8
More thab 12 people	3	1.2
Edad	Frequency	Percentage
18 to 30 years	163	65.2
31 to 50 years	64	25.6
50 years and over	23	9.2
Total	250	100.0

Data collection processing

Participants were invited to fill out the survey voluntarily, filling out an informed consent form, following the recommendations of the Helsinki protocol (Manzini, 2000), a systematic convenience sampling was used; the data was processed in the

programming language software in R, in its R-Studio console, a program that allows powerful statistical processing and high visualization graphics (Grolemund & Wickham, 2016).

Measurements

Questionnaire on knowledge of the causes of climate change.

The questionnaire on knowledge of the causes of climate change is an instrument adapted to the Cusco context, used for the first time in Brügger, Tobias & Monge in 2016, it is an instrument designed to analyze the level of knowledge of the causes of climate change, comprised of 13 items of possible causes of climate change, it has an internal consistency of .84, proving to be adequate for the study, it includes response options from 0 to 2, where 0 = nothing, 1 = little, 2 = a lot. The scores to measure knowledge are followed according to the recommendations in van der Linden (2015) and in Leiserowitz, Smith & Marlon (2010), who indicate that the higher the score, the greater the knowledge of the causes of climate change. In addition, the scale has two dimensions, the first is divided into 7 correct items on the causes of climate change (driving a car, burning fossil fuels, air travel, CO_2 emissions, aerosol cans, agricultural activities such as cattle raising and deforestation) and, the second presents 6 incorrect items (the sun, the hole in the ozone layer, the phenomenon of the child, toxic waste, nuclear power plants, and acid rain).

Statistical Processing

The present study makes use of descriptive statistics to determine the levels of knowledge of cause, later, for the inferential part, it makes use of analysis of comparison of groups through sociodemographic variables, to observe if there are significant differences, through the Kruskal Wallis tests for variables with more than 3 categories and U-Mann Whitney tests for variables with 2 categories.

Results

Descriptive analysis

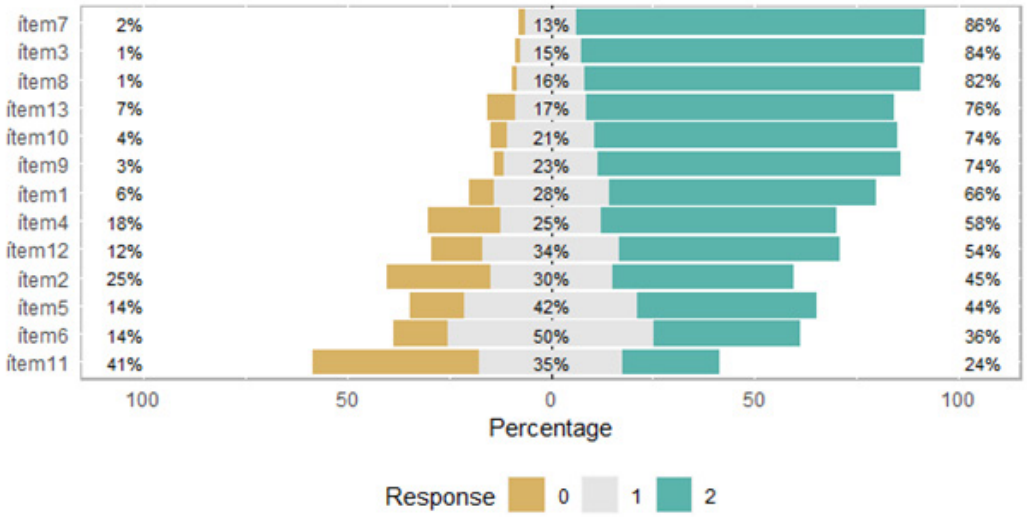
Figure 1 shows the frequencies of knowledge of the cause of climate change, comprised of 13 items, to measure how much they know about the possible factors that cause climate change in 3 response levels 0 = nothing, 1 = little and 2 = a lot. Regarding the items that denote correct knowledge of the causes of climate change, item 3 “The burning of fossil fuels (coal, oil, gas)”, the participants indicated 84% that climate change contributes a lot, not so, 15% who indicated that it causes little and 1% who indicated the opposite, then, item 8 “Constant increase in CO_2 emissions”, the respondents indicated by 82% that the increase in CO_2 contributes a lot as a cause of change climatic, while 16% indicate that it causes only a little, while 1% indicates the opposite; for item 13 “Deforestation (for example, the destruction of tropical forests)” the participants indicated that deforestation causes a lot of climate change in 76%, and only 17% indicated that it causes little, not 7% which indicates that deforestation does not cause climate change at all; in item 1 “Driving a car”, respondents answered that it is a cause that contributes a lot to climate change in 66%, leaving 28% who indicated that it causes little, however, 6% indicated the opposite, it is say that driving a car does not cause climate

change. Then, in item 9 “Aerosol cans”, the participants answered that the use of aerosol cans causes a lot in 74%, not so 23% indicated that aerosol cans only cause a little, while 3 % indicated that it does not cause anything. It is striking that item 6 “Travel by plane" the participants indicated that it causes a lot only in 36% and for item 11 “Agricultural activities such as raising livestock (cows raised for meat consumption)” , the participants indicated that it causes a lot only in 24%, being the items with the lowest report on the causes of climate change in the questionnaire, however, van der Linden (2015) and in Leiserowitz, Smith & Marlon (2010), indicate that These are causes of climate change, despite this, the participants indicated that it causes little in 50% and 35%, respectively and that it causes nothing in 14% and 41%, which denotes a lack of knowledge regarding these two causes.

Regarding the items of erroneous knowledge or erroneous ideas about the causes of climate change, it is striking that item 7 “Toxic waste” is the one most considered by the participants, indicating that it is the one that most causes climate change, responding a lot at 86%, leaving 13% who indicated that it causes little and 2% that indicates nothing; however, this item is not a cause of climate change. For item 10 “Nuclear power plants”, the respondents indicated that it causes a lot in 74%, leaving 21% who indicated that it causes only a little, while 4% indicated that nuclear power plants do not cause the change at all climate. In item 4 “The hole in the ozone layer”, respondents indicate that the hole in the ozone layer causes a lot of climate change by 58%, while 25% indicate that it causes little, and 18% indicate that the hole in the ozone layer does not cause climate change at all. For item 12 “Acid rain”, 54% of respondents indicated that acid rain causes a lot of climate change, while 34% think that only a little, and 12% indicate that acid rain is not the cause. of climate change. In item 2 “The sun”, the participants indicated that the sun causes much climate change only in 45%, noting a report lower than 50%, on the other hand, 30% indicate that it causes little climate change, while that, 25% indicates that the sun does not cause climate change. For item 5 “The phenomenon of the child”, the participants indicate that this phenomenon causes a lot of climate change in 44%. It is remarkable that respondents have answered that the incorrect causes of climate change exceed 44%, wrongly indicating that they are causes, this allows observing that there are still misconceptions about the causes of climate change that must be addressed, for their better understanding.

Figure 1

Descriptive Frequencies of Climate Change Knowledge



Note: 0 = Nothing, 1 = Little and 2 = a lot; Items 1, 3, 6, 8, 9, 11 and 13 represent correct knowledge about the causes of climate change, items 2, 4, 5, 7, 10, and 12 represent erroneous knowledge or misconceptions about the causes of climate change.

Group analysis

To establish the categories of low, medium, high, we follow the recommendations that the higher the score, the greater the knowledge of the causes of climate change, it is important to mention that we consider only the correct items of climate change, where the highest score is 14 indicating greater knowledge of the causes of climate change.

Table 2

Comparisons sex, age, income, education, trade or profession with knowledge of the cause of climate change

Variable	Sample Total (*N* = 250) *n*(%)	Low (*N* = 4) *n*(%)	Medium (*N* =94) *n*(%)	High (*N* = 152) *n*(%)	χ^2	*p*
Sex					8.97	0.553
Male	102 (40.8%)	2 (2%)	37 (36.3%)	63 (61.8%)		
Woman	148 (59.2%)	2 (1.4%)	57 (38.5%)	89 (60.1%)		
Economic Income					4.54	0.209
300 to 500 Soles	105 (42%)	3 (2.9%)	34 (32.4%)	68 (64.8%)		
600 to 1500 soles	115 (46%)	1 (0.9%)	49 (42.6%)	65 (56.5%)		
1500 to 4000 soles	28 (11.2%)	.	9 (32.1%)	19 (67.9%)		
More than 4000	2 (0.8%)	.	2 (100%)	.		
Level of instruction					10.25	0.036*
No studies	3 (1.2%)	.	1 (33.3%)	2 (66.7%)		
Primary education	32 (12.8%)	2 (6.3%)	13 (40.6%)	17 (53.1%)		
Secondary education	97 (38,8%)	2 (2.1%)	43 (44.3%)	52 (53.6%)		
Technical superior	65 (26%)	.	19 (29.2%)	46 (70.8%)		
University superior	53 (21.2%)	.	18 (34%)	35 (66%)		
Occupation					11.28	0.010**
Housewife	61 (24.45%)	2 (3.3%)	28 (45.9%)	31 (50.8%)		
Student	46 (18.4%)	.	20 (43.5%)	26 (56.5%)		
Ocuppation	94 (37.4%)	2 (2.1%)	34 (36.2%)	58 (61.7%)		
University Profession	49 (19.6%)	.	12 (24.5%)	37 (75.5%)		
Religion					8.86	0.065
Catholic	198 (79.2%)	4(2%)	68 (34.3%)	126 (63.6%)		
Evangelist	24 (9.6%)	.	12 (50%)	12 (50%)		
Mormon	2 (0.8%)	.	.	2 (100%)		
Adventist	4 (1.6%)	.	1 (25%)	3 (75%)		
Other	22 (8.8%)	.	13 (59.1%)	9 (40.9%)		
Age					2.07	0.356
18 to 30 years	163 (65.2%)	1 (0.6%)	66 (40.5%)	96 (58.9%)		
31 to 50 years	64 (25.6%)	1 (1.6%)	22 (34.4%)	41 (64.1%)		
50 years or more	23 (9.2%)	2 (8.7%)	6 (26.1%)	15 (65.2%)		

Note: * indicates p <.05. ** indicates p <.01. The Kruskal Wallis Test was used for more than 2 groups and the U-Mann Withney for 2 groups, both for non-parametric data.

Table 2 shows that the results of group analysis, which were made using the Kruskal Wallis tests for variables with more than 3 categories and U-Mann Whitney tests for variables with 2 categories, all of these used for non-parametric data It is observed that regarding the occupation (X^2 Kruskal Wallis (3) = 11.28, p = 0.010, $\varepsilon^2_{ordinal}$= 0.03); the differences between the group of housewives and that of university professionals are confirmed by the Bonferroni method and a Dunn pairwise test (p<0.011); regarding the level of education (X^2 Kruskal Wallis (4) = 10.25, p = 0.036, $\varepsilon^2_{ordinal}$= 0.04), We also observed that there are significant differences, using the Bonferroni method and Dunn's pairwise test (p <0.045), between those at the secondary and higher technical level.

On the other hand, there are no significant differences regarding sex, age, income andreligion, however, the percentages place women with greater knowledge of the

causes of climate change in terms of sex. Regarding age, young people present a higher percentage located between 18 and 30 years old. Respect to economic income, the percentage of responses from the participants places people with an income of 300 to 1500 soles with better knowledge. Finally, regarding religion, the frequency is marked by a majority Catholic population, this being the one that presents a greater knowledge of the causes of climate change.

Discussion

This research focuses on knowledge about the main causes of climate change, from a cognitive approach, in this sense, knowledge of climate change is considered an aspect that must be approached from cognitive indicators (Sundblad et al., 2007; van der Linden, 2015), a clear example of this is the use of mental models. Studies such as that of Leiserowitz, Smith & Marlon (2010), have questioned the role of knowledge about the most outstanding cognitive factors of this phenomenon, such as causes, effects and responses. Proper identification of these factors can contribute to generating greater awareness among people, and on this, they would be more willing to take actions to avoid negative impacts. The study by Kaiser & Fuhrer (2003), put into relevance that ecological behavior depended on knowledge and that this was a prerequisite in the approach to climate change, since people need to know what to do and what to act against. development of various forms of knowledge; similarly, Sundblad, Biel & Garling (2007), develop around knowledge of cause a perspective towards risk judgments, where knowledge of the causes is a predictor of risk behavior. However, Van der Linden (2015) indicates that the cognitive understanding of climate change remains somewhat unclear, since the knowledge that exists is posed in a "subjective" way, that is, from what people think it is true in the face of real evidence. In this regard, Leiserowitz (2010), conducted a study on the causes of climate change and the misconceptions that exist about this phenomenon, where it was observed that the participants confuse domains such as climate variability, environmental pollution and natural climate. As such, despite this, the author indicates that these misconceptions can generate a type of concern that can be useful in raising awareness about climate change. On the other hand, other studies (Huxster et al., 2015, Kahan et al., 2012) indicate that the confusion of the exact causes of climate change can generate skepticism about the human causes of climate change, leading to think about natural cycles as the main cause, relegating to second place greenhouse gas emissions that are caused by man, and have an impact on climate change, for example, a study by Monge, Tobias & Brügger (2019) , put this domain into relevance, a study in which it is determined that more than 80% of the population studied had knowledge of the causes of climate change, in the present study similar results are obtained, and being precise, the respondents indicated that the waste toxic substances, the burning of fossil fuels, and the emission of CO_2 are the main causes of climate change. According to experts, such as Leiserowitz (2010), only two are correct, that is, according to the Intergovernmental Panel for Climate Change (2007, 2008), the burning of fossil fuels represents the greatest cause, as it emits a large amount of Second, greenhouse gases (GHG), which leads to large emissions of CO_2 and other gases, in this regard, Useros (2012), when conducting a study of the causes and effects of climate change, indicated that carbon dioxide and other gases, in addition to being the cause of climate change, conditions the absorption, dispersion and emissions of radiation from the

atmosphere and the energy balances of the entire climate system, which, accompanied by human activities, are manifested in the elevation of the global temperature. Respect toxic waste, there is no evidence that they constitute a cause of climate change, however, our results showed that more than 80% have a wrong idea about it and indicate that it is, it is important to clarify that waste or toxic waste has become a serious pollution problem, but there is no evidence of causing climate change (Lopez & Sainz, 2011). Research such as that of Malka, Krosnick & Langer (2009), & Leiserowitz et al (2005) reinforce that misconceptions like this one (that of toxic waste, air pollution, or natural phenomena such as "the phenomenon of the child"), may lead to increased concern and awareness of climate change, however, misconceptions about the drivers of climate change have increased the amount of doubt about human contributions to climate change and have led to a lack of awareness with the risks that faces our raises, that is, those who are skeptical about the causes of climate change, even if they have more knowledge about the problem, show less concern.

In addition, obeying the category of correct knowledge about the causes of climate change, we can refer that, in Semmartin, Mazzeo & Verón (2014) and in Truelove & Parks (2012), they show results that expose a list of thirteen causes of climate change, where the results are similar to those obtained, that is, the use of fossil fuels, which turned out to be the most relevant item in the present study. These results, according to the IPCC (2008), indicated that the burning of fuels and the emission of CO_2 represented 56.6% of the generation of greenhouse gases (GHG), becoming one of the most outstanding responsible (causes) of the climate change (Useros, 2012). However, the study has shown that the participants mistakenly put toxic waste as the first cause of climate change, 86% indicated they agree. Studies such as that of Ahumada & García (2018) and that of Spence, Poortinga and Pidgeon (2012) suggest that the contrast with scientific information may be due to psychological distance, where experience plays a mediating role, making this result more perceptible to public opinion, also previous studies such as Dunlap's (1992), found similar results.

Likewise, the present research performs a group analysis, where, with respect to the sociodemographic variables, no significant differences were found regarding sex, age, income, indicating that the causes of climate change are of general domain, as suggested in the meta-analysis by García, Iglesias & Gradaílle (2019), where they concluded that there are no significant differences with respect to the conceptual category of knowledge, also indicated that the deficit of knowledge or that better knowledge does not ensure better behavior that contributes to the environmental crisis, indicating that the trade and the educational level are elements without significant differences. However, if significant differences were found for the occupation variable, between housewives and university professionals, this is similar to the study by Truelove & Parks, 2014. Despite these results, the study by Ahumada and García (2018), said that his study population had a lack of knowledge about the main aspects related to climate change, indicating that they do not recognize the causes of this topic. In this sense, we can indicate that studies on the knowledge of climate change is a preliminary element of human behavior, allowing to observe the level of awareness and concern about the problem (Clayton, 2019; Frometa and Guardado, 2016), the latter it is worrying regarding the fact that studies report that even the levels of knowledge are not ideal, for example, Parnalí, Haque & Drieger

(2012), indicated that the current literature on public opinion and knowledge about climate change provides considerable evidence that indicates that the public lacks a clear understanding of the precise nature and consequences of climate variability, which is evident from the responses of the participants in this study, the public commonly displays a variety of misunderstandings and confusion about the causes of climate change , where even very well-educated people tend to conceptualize climate change issues very different from scientists and specialists.

Finally, it is important to highlight that having a better knowledge about the causes of climate change will allow us to have an adequate level of risk perception and therefore develop adaptation and mitigation capacities (van der Linden, 2015; Gonzales and Maldonado, 2017; Lopez & Marvan, 2018). Additionally, Hugel & Davies (2019) report that perceptions and knowledge act as a predictor of appropriate ecological behaviors. On the other hand, it is recommended that in the face of the causes of climate change perceived as more relevant (toxic waste, the burning of fossil fuel and the emission of CO_2) the decision makers and the political part can actuate mechanisms to implement and educate, to reduce knowledge biases, which could lead to misinformation. As already indicated, the correct and erroneous conceptions generate greater confusion, and therefore less involvement towards coping actions in the face of the negative impacts of climate change (Dryden et al., 2018), as indicated by Fischhoff (2019), the educational and political strategies should be aimed at reducing the risk of climate change, through participatory action and risk management (Slovic, 2010; Slovic & Weber, 2002). Finally, it is important to recognize the role of perceptions, knowledge and information, being key to generating a greater understanding of climate change and therefore a greater commitment to strategies (van der Lin, 2015, Brúgger, Morton & Dessai, 2015, Clayton, 2019).

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Appendix

Appendix1

CC Awareness Scale

Do you think the following factors contribute a lot, little or nothing to climate change?

		Nothing	Little	A lot
		0	1	2
1	Drive a car			
2	Sun			
3	The burning of fossil fuels (coal, oil, gas)			
4	The hole in the ozone layer			
5	The phenomenon of "El Niño"			
6	Travel by plane			
7	Toxic waste			
8	Steady increase in CO2 (carbon dioxide) emissions			
9	Aerosol cans (containing CFCs)			
10	Nuclear power plants			
11	Agricultural activities such as raising livestock (cows raised for meat)			
12	Acid rain			
13	Deforestation (for example, destruction of rainforests)			

Correct:

n°	ítem
1	Drive a car
3	The burning of fossil fuels (coal, oil, gas)
6	Travel by plane
8	Steady increase in CO2 (carbon dioxide) emissions
9	Aerosol cans (containing CFCs)
11	Agricultural activities such as raising livestock (cows raised for meat)
13	Deforestation (for example, destruction of rainforests)

Wrong:

n°	ítem
2	Sun
4	The hole in the ozone layer
5	The phenomenon of "El Niño"
7	Toxic waste
10	Nuclear power plants
12	Acid rain