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Climate perception in Mato Grosso amazonian cities, Brazil

Percepción climática em ciudades amazónicas de Mato Grosso, Brasil

Percepção climática em cidades amazônicas de Mato Grosso, Brasil

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Abstract

The purpose of this research was to identify the perception of climate change by the population residing in the cities of Colíder, Guarantã do Norte, Matupá and Peixoto de Azevedo, located in the state of Mato Grosso. The application of a semi-structured questionnaire in 1,328 randomly selected houses made it possible to confirm a generalized perception about the occurrence of climate changes in the global and regional scales, evidenced in the behavior of precipitations and temperatures. The population associates these changes with regional anthropic activities and emphasizes health, water availability and loss of biodiversity as the main effects of these. The main measures they propose to face these effects are aimed at the most recurrent problems in the region: reforestation, halting deforestation and preventing rural fires.

Keywords: Climate changes; Anthropization; Affects; Adaptation.

Resumen

Esta investigación buscó identificar la percepción climática de la población residente en las cidades mato-grossenses de Colíder, Guarantã do Norte, Matupá y Peixoto de Azevedo. Fue aplicado un cuestionario semiestruturado en 1.328 domicilios, seleccionados aleatoriamente. Los resultados indican una percepción generalizada sobre la ocurrencia de cambios climáticos globales y alteraciones del clima regional, evidenciadas en el comportamiento de las precipitaciones y las temperaturas. Las personas asocian esas alteraciones a las actividades antrópicas regionales y destacan a la salud, la disponibilidad de agua y la perdida de biodibersidad como sus principales afectaciones. Las principales medidas que proponen para enfrentar esos efectos están dirigidas a

los problemas más recurrentes en la región: reforestar, detener la deforestación y evitar los incendios rurales.
Palabras clave: Cambio climático; Antropización; Afectaciones; Adaptación.

Resumo

Esta pesquisa objetivou identificar a percepção climática da população residente nas cidades mato-grossenses de Colíder, Guarantã do Norte, Matupá e Peixoto de Azevedo. Para tanto foi aplicado um questionário semiestruturado em 1.328 domicílios, selecionados aleatoriamente. Os resultados indicam uma percepção generalizada sobre a ocorrência de mudanças climáticas globais e alterações no clima regional, evidenciadas no comportamento das precipitações e as temperaturas. As pessoas associam essas alterações às atividades antrópicas regionais e destacam à saúde, disponibilidade de água e perda de biodiversidade como principais afetações das mesmas. As principais medidas que propõem para enfrentar esses efeitos estão dirigidas aos problemas mais recorrentes na região: reflorestar, deter o desmatamento e evitar as queimadas.

Palavras-chave: Mudanças climáticas; Antropização; Afetações; Adaptação.

Introduction

Given that human perception derives from the human-nature interaction in the process of spatial construction, its study is important to understanding human behaviour (DAY, 1979). These studies also contribute to understanding people's willingness to participate in strategies and actions to improv the rational appropriation and use of natural resources (JIMÉNEZ, 2018).

Authors such as Mertz et al. (2009), Retamal; Rojas; Parra (2011) and Campos et al. (2013) highlight the role of climate change risk perception studies to know the level of information, understanding and awareness about the topic, which influences people's reactivity; in oyher words, in developing social and environmental resilience.

Without disregarding that, in this perception, cultural issues (such as values, attitudes and identity) influence the judgement of hazards and risks, as by Beck (2010); Douglas e Wildavsky (2012) and Pedrini et al. (2016) pointed out. In addition, the environment in which people live must be taken into account, since climate perception derives from life experience; these experience forms a mental map about the pattern of

variation of meteorological parameters in the region, as listed by Bursztyn and Eiró (2015) and Silva (2012).

Examples of changes in the standard behavior of meteorological parameters are the increase of the planet's temperature by 1.2^{0}C since the pre-industrial stage (BANCO MUNDIAL, 2017), the fact that the decade 2002-2011 was the hottest ever observed in Europe (CANTERO, 2015), and the increase in the average temperature in Brazil of about 0.75^{0}C at the end of the 20th century, compared to the annual average for the period 1961-1990 (HAMADA; GONÇALVES; GHINI, 2009). Therefore, changes are occurring in the natural variability of the climate, understood as the fluctuation of meteorological conditions in the short term, in relation to the climatological normals of a given region (IPCC, 2014). These changes are manifested on a global scale in precipitation and temperature patterns, as well as in the greater frequency of extreme weather events (FLANNERY, 2007; MARENGO, 2007; SÁENZ-ROMERO et. al., 2010, apud GARCIA, 2017). These changes also reflect the vulnerability of the population and ecosystems to the risk of disasters due to natural disasters (MARENGO; TOMASELLA; NOBRE, 2010).

For the Amazon region, whose forest is essential for carbon storage (OBERMAIER and ROSA, 2013) because it contains an amount equivalent to more than 10 years of global emissions (CORDEIRO; SOUZA; MENDOZA, 2008), the combined effect of global warming and local deforestation interferes with natural climatic variability (alternating rainy and dry seasons).

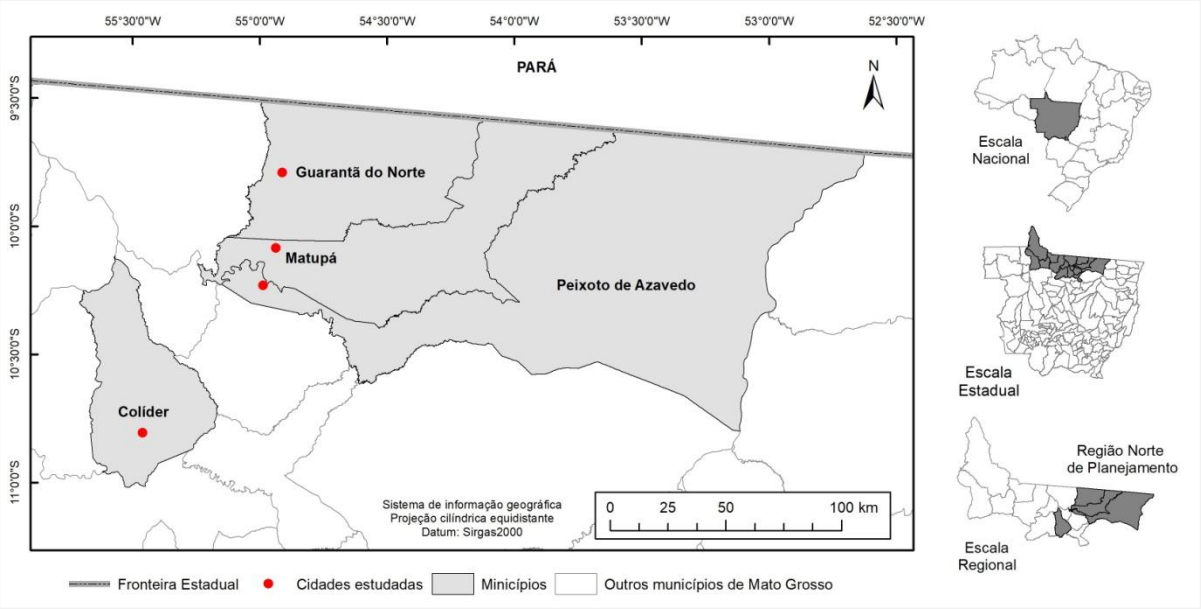
Seasonal simulations for future climate scenarios in the Amazon (period 2071-2100) point to negative precipitation anomalies and positive temperature anomalies (AMBRIZZI, et. al., 2007; MARENGO, et. al., 2007). W. Li and collaborators (2008) also identified, for the last thirty years of the 20th century, a significant trend toward drier conditions in the south of the Amazon region (a fact confirmed by MARENGO and BETTS, 2011). At the same time, since the 1970s, the acceleration of the process of occupation of the Amazon has increased the climate risk and may lead to its

savannisation, which would have a significant impact on food production and water and energy the supply (FRANCHINI and VIOLA, 2019).

Several studies in Brazil have attempted to understand the perception of climate change as a subsidy for mitigation and adaptation strategies to face its effects. For example, searches performed by Oliveira and Nunes (2007), Menezes; Oliveira; El-Dier (2011), Limberger and Cecchin (2012), and Andrade; Silva; Souza (2014). In this context, the current study sougth to identify the climate perception of residents in the cities of Colíder, Guarantã do Norte, Matupá, and Peixoto de Azevedo, belonging to the State of Mato Grosso.

The study area corresponds to the urban boundaries of these towns, which are the capitals of the same-named municipalities (Map 1) which forms part of the Planning Region II-North – Alta Floresta, located in the southern section of the Amazon Basin.

Map 1- Location of the cities studied and the municipalities they represent



Source: Elaborated by Gonzalez (2019).

These municipalities emerged from the implementation of the federal government's policies for occupying the Amazon, under which route BR-163 (Cuiabá-Santarém) was created to facilitate the implementation of several colonization projects (PANNUTI, 2002). Colíder was the first municipality to be created, in 1979 (were later

dismembered of it: Peixoto de Azevedo, Guarantã do Norte and Matupá). The most important economic activities in all of them are: extractivism (vegetal and mineral), livestock and agriculture (MATO GROSSO, 2017).

Methodological procedures

The research universe was made up of heads of households in the cities mentioned, those who were selected on the basis that they are the capitals of the municipalities which develop the main economic activities of the region: agriculture, livestock and extractivism. The following selection criteria were adoted: (1) that at least 10% of the neighbourhoods in each city studied were represented; (2) the person sampled was one of the heads of the family; (3) that this responsible person is between 21 and 80 years og age (so that he can be considered a mature person, according to PEDRINI et. al., 2016).

Therefore, the selection of the sample should include those responsible for management of the residences, also given their age (each participant completed na informed consent form for the use of his/her personal information and responses). At the same time, the neighbourhoods in each town were randomly selected. Table 1 shows the demographics of the cities surveyed and the number of neighbourhoods and households sampled in each oh them.

Table 1- Urban population and households sampled in the cities studied.

City	Total population	Urban population	Total residences	No. of sampled neighborhoods	Houses sampled
Colíder	30.766	25.014	9.927	5	408
Guarantã do Norte	32.216	23.940	9.397	4	380
Matupá	14.174	10.927	4.276	4	240
Peixoto de Azevedo	30.812	19.804	8.707	3	300

Source: Prepared using IBGE data (2015, apud MATO GROSSO, 2017).

The data collection to determine the perception of the heads of households was carried out by means of a semi-structured questionnaire (which went through the testing, review and validation phases), prepared on the basis of authors such as Whyte

(1977, apud ABREU and ZANELLA, 2015); Menezes; Oliveira; El-Dier (2011), and Lindoso; Eiró; Rocha (2013).

The questionnaire was organized in blocks with questions aimed at knowing: (1) the profile of the people sampled, their period of residence in the municipality and in their private domicile; (2) the perception of climate change and its incidence in the region; and (3) the perception of the contribution of human activities in the region to generate climate change, the social and economic sectors that may be most affected in the future and the actions required to mitigate (or adapt) to the effects of climate change.

Climate perception information from the application of the questionnaire was compared to the precipitation and temperature records from the Gleba Celeste Weather Station (situated withing the study area), covering the periods 1978-1987 and 2009-2018. All data was processed in Excel spreadsheets for graphics and statistical analysis.

Profile of the surveyed population

The distribution by gender and age group (Table 2) shows that, in general, there is a relative balance between men and women in the sampled population

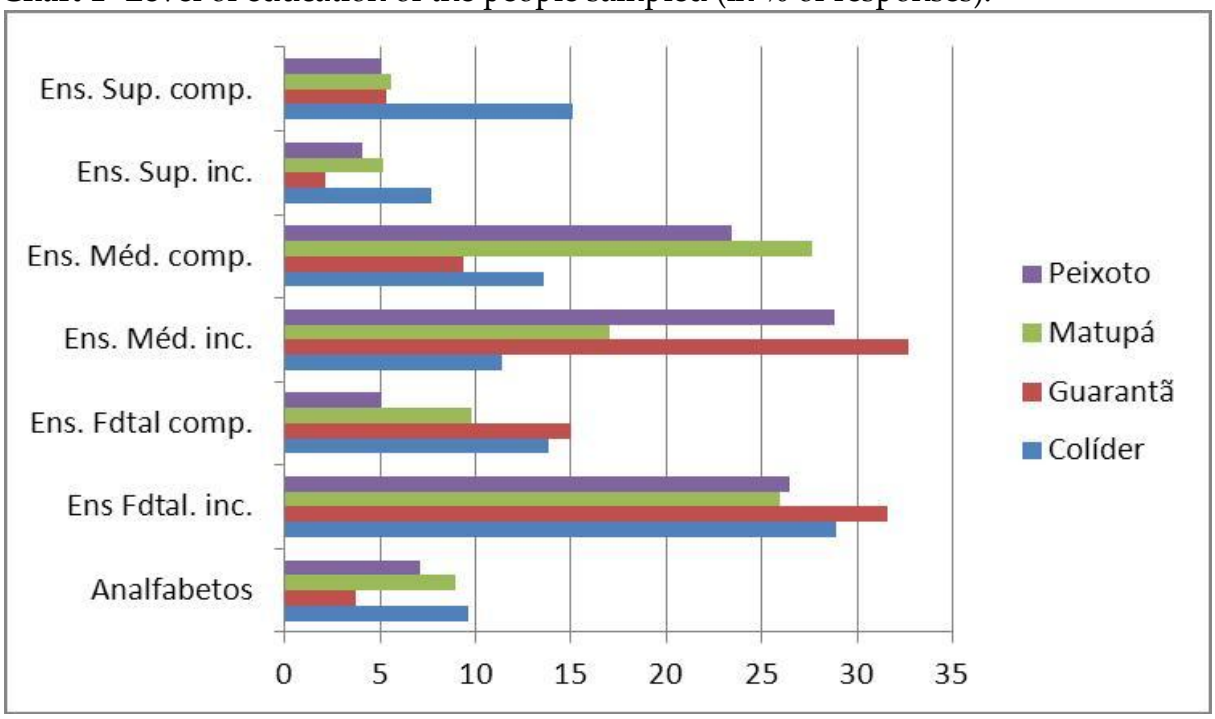
Table 2- Distribution by gender and age group of the people sampled

City	Gender composition (%)		Age distribution in years (% of population sampled)					
	Masc.	Fem.	21-30	31-40	41-50	51-60	61-70	71-80
Colíder	52,58	47,42	2,52	20,71	22,98	23,73	19,70	10,35
Guarantã do Norte	40,37	59,62	15,65	28,91	26,79	18,30	8,22	2,12
Matupá	43,75	56,25	8,75	27,91	17,50	26,25	12,08	7,50
Peixoto de Azevedo	49,0	51,0	23,23	29,29	15,15	13,13	10,10	9,09

Source: Field research survey (2019).

As for the distribution of age groups, Table 2 shows that 79.6% of the sampled people are aged between 31 and 70 years, which indicates that they are mature subjects (a requirement established in this research, as explained above). In terms of their level of education, the same is low: most say they did not finish their elementar education (Chart 1).

Chart 1- Level of education of the people sampled (in % of responses).



Caption: Ens.- Teaching; Fdtal - Elementary; Med.- Medium; Sup.- Superior; inc.- Incomplete; comp. Complete.
Source: field research, 2019

However, the fact that few people participate in higher education can be explained both by the financial difficulties of accessing distance education courses offered by private establishments, as well as by the problems of access to public higher education offered at the Colíder campus of the University of the State of Mato Grosso (UNEMAT). These access difficulties may also be associated with the significant difference between those who have completed high school and those who have completed higher education, as shown in Chart 1. This result differs from that found in other studies, such as Bursztyn and Eiró (2015) and Souza and Castro (2017).

Regarding the length of residence in the current municipality, the responses of the people sampled show notable differences (Table 3).

Table 3: Residence time of the persons sampled in the current municipality (in % of respondents).

Period	City			
	Colíder	Guarantã do Norte	Matupá	Peixoto de Azevedo
1973-1984	50,2	5,08	3,84	37,5
1985-1996	28,7	36,9	33,05	39,0
1997-2017	21,1	58,02	63,1	23,5

Source: Field research data (2019).

ote that the highest percentage of older residents is found in Colíder (whose territory was delimited by colonizing Lider in 1973), followed by Peixoto de Azevedo (apparently due to of the role that mining has played as a fundamental economic activity in this municipality since its inception until now). At the same time, Table 3 shows that many people arrived in the municipalities of Guarantã do Norte and Matupá between 1997 and 2017, which can be explained by the rapid expansion of their economic activities during this period.

However, in all these cities, the residence time in the current household of the sampled persons exceeds 10 years (79,2% of the sample in Colider; 67,2% in Guarantã do Norte; 61,7% in Matupá, and 64,3% in Peixoto de Azevedo); this fact confers a greater degree of confidence in the answers given about climate perception, considering that the time of residence is an important factor in the formation of the identity with the place (MARANDOLA JÚNIOR; MODESTO, 2012).

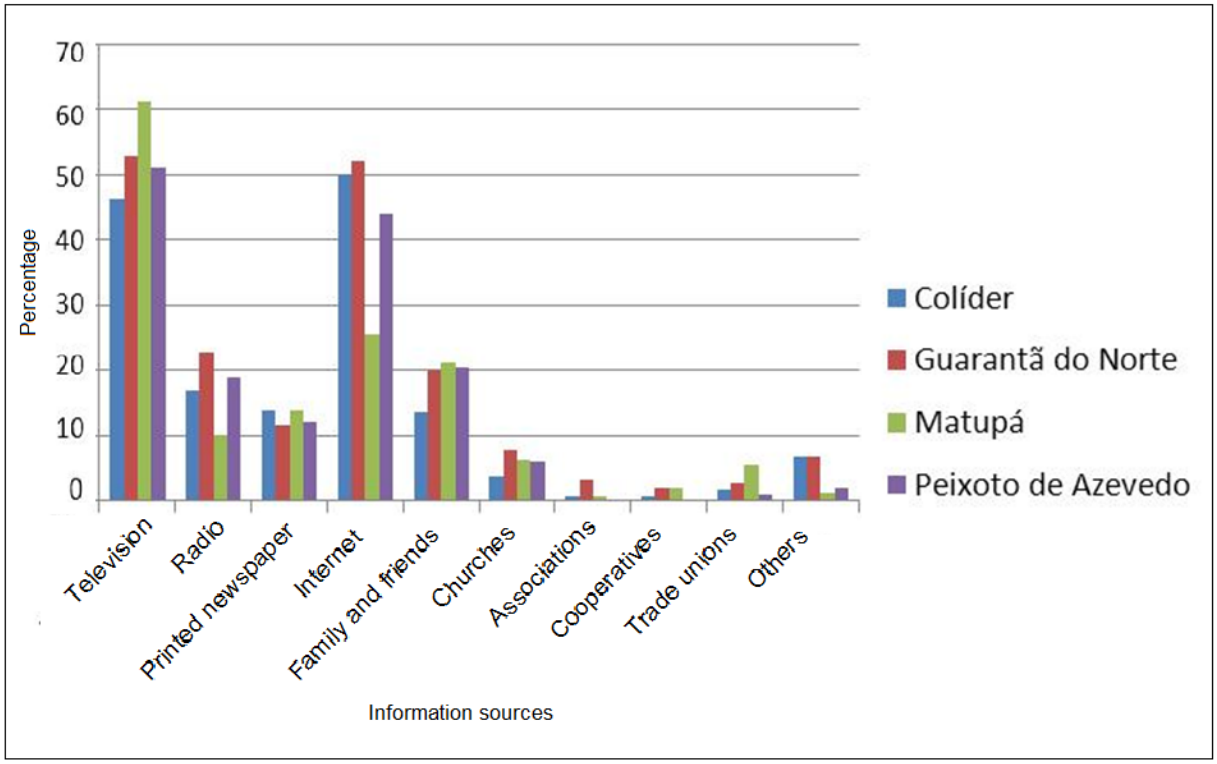
The population's perception about the climate changes

With respect to the perception of the occurrence (or not) of global climate change, it is important because the vast majority of people surveyed responded in the affirmative: 93,6% in Colíder; 90,9% in Guarantã do Norte; 93,8% in Matupá, and 91,7% in Peixoto de Azevedo. Researche conducted in Brazil (e. g., PIRES et. al., 2014; BURSZTYN and EIRÓ, 2015) obtained similar results. The same happened with the researches of Aicón and Goic (2011) in Chile, Olmos-Martínez; González-Ávila; Contreras-Loera (2013) in Mexico, and Martín; Lopez; Iglesias (2017) in Spain.

To analyze the possible relevance between gender and education in the distribution of perception, the responses were crossed with these variables. The outcomes indicates that the influence of gender is not relevant to the perception of climate change in the cities studied. However, the level of education proved to be relevant because all those with a secondary or higher education replied in the affirmative (they represent between 50 and 66% of affirmative answers in all cities).

Considering that the media transpose the scientific representation of climate change into the common culture (JODELET, 1986) people were asked what media they used to get information on the topic. The answers indicate that the main factor responsible for the homogeneity of perception found in this research is television (the most important information channel in Brazil, according to OLIVEIRA and NUNES, 2007), and the internet was also highlighted out in the cities of Colíder, Guarantã do Norte e Peixoto de Azevedo, principally (Chart 2).

Chart 2- Sources of information on climate change (in % of responses-2019)



Source: Field research data (2019).

Television is also the main source of information on the topic in the world, according to Jiménez (2018). In the case of the Internet, radio and printed newspapers, the study carried out by Mello et al. (2012, apud MATOS, 2018) also identified these media as the most important for receiving information about climate and environmental changes.

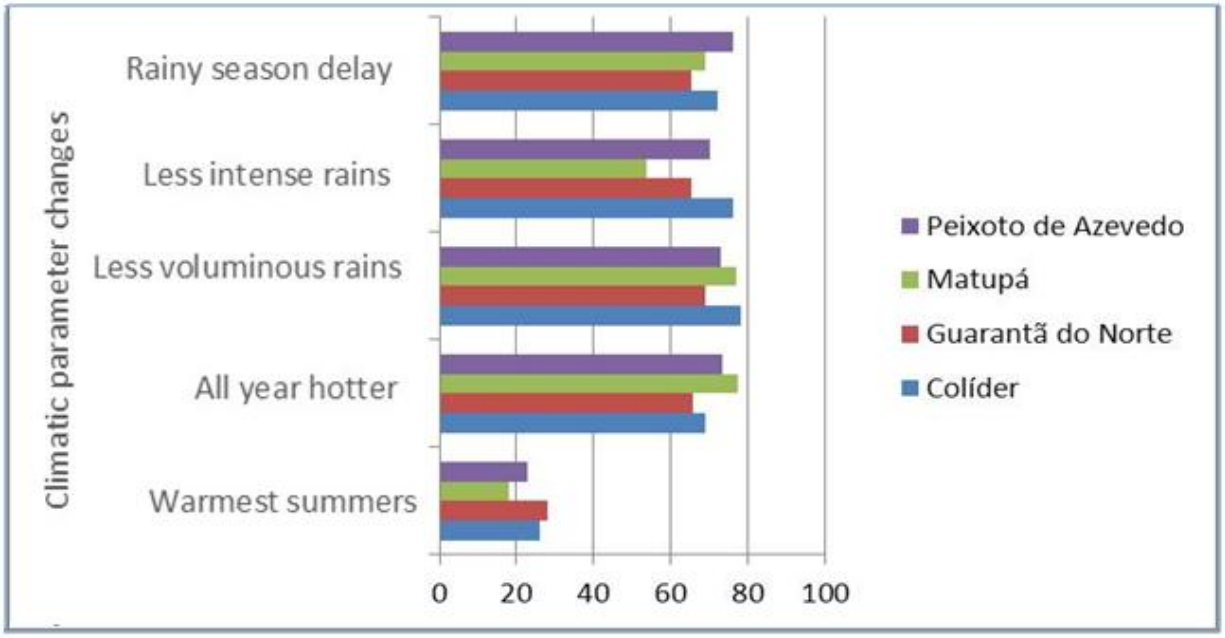
However, the role attributed to family and friends is interesting, which is apparently due to the incidence of regional environmental issues in the lives of the

people residing in the north of Mato Grosso (which could also explain the treatment of the subject by the churches, shown in the Chart 2).

When asked if they have noticed any change in the region's climate over the last few decades, the vast majority of people sampled responded in the affirmative: 86,0% in Colíder; 85,3% in Guarantã do Norte; 93,3% in Matupá, and 83,3% in Peixoto de Azevedo.

In order to identify the forms of manifestation of these climate changes, people were asked if they perceive changes: in the volume and intensity of rainfall and its seasonal behavior, as well as in temperatures. According to the answers provided (Chart 3), most people have noticed changes in rainfall patterns in recent decades, which are manifested both in the reduction of its volume ("in the rainy season it rains less") and in its intensity ("the rains today are weaker").

Chart 3- Perception of changes in the regional climate (in % of responses-2019).



Source: Field research data (2019).

At the same time, over 75% of the sample, in all cities, noticed a delay in the arrival of the rains. Similar results have been obtained by other researchers, such as Menezes; Oliveira; El-Dier (2011), Martinez et al. (2017), and Souza and Castro (2017).

In the study of these last authors, 96.77% of persons say that the longest period currently is the drought.

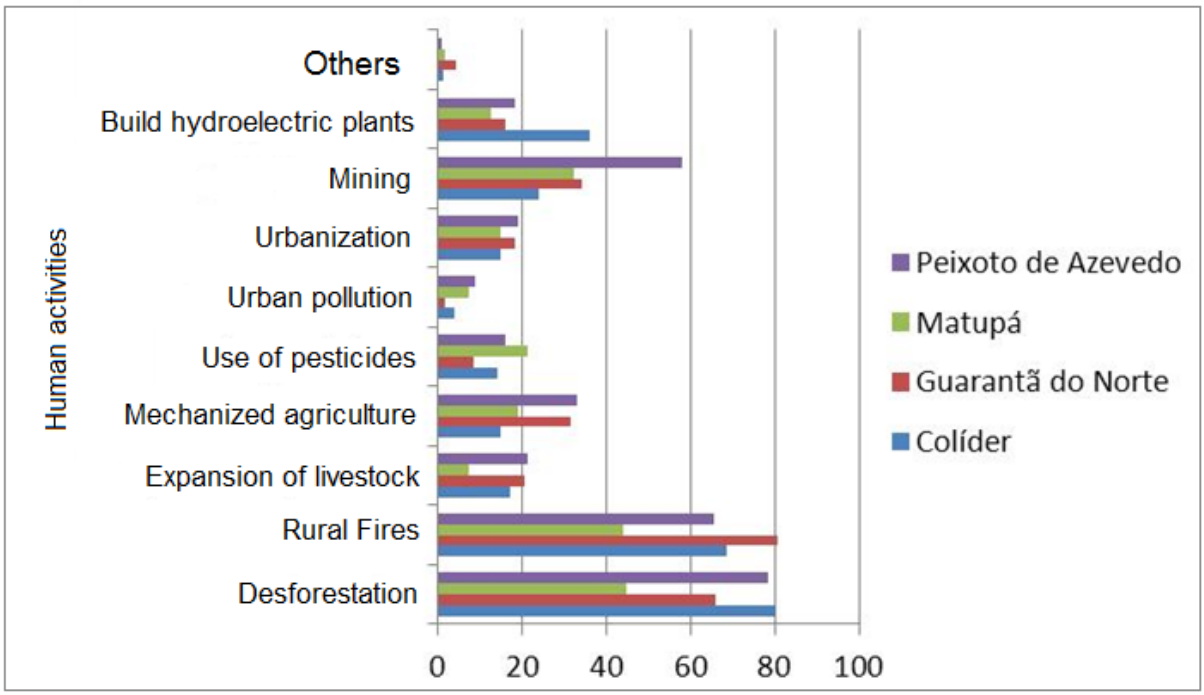
To confirm the authenticity of precipitation perception, the records of the Gleba Celeste Weather Station surveys wew analyzed for two periods: 1978-1987 and 2009-2018. The result is a 17.06% decrease in precipitation volume between these two periods: from 2.87,31 mm to 1.731,17 mm.

Regarding the perception of temperatures, most recognized that changes have occurred in recent decades, because currently "the whole year is warmer compared to the past". The records from the aforementioned meteorological station show increases in annual temperatures in the period 2009-2018: average maximum (2.68^{0}C), average minimum (1.48^{0}C), average (2.1^{0}C) and the thermal amplitude (1.21^{0}C).

It should be noted that the influence of demographic variables (such as gender and education) was not observed in the perception of regional climate change and its causes, which could be explained by the fact that such changes are part of the life experience of the population residing in the region. Aicón and Goic (2011) and Garcia (2017) also identified the perception of changes in temperature and precipitation by local populations in Latin America, which affected their activities (especially agricultural).

Concerning the following question: Can human transformations in nature cause climate change? again the vast majority of people responded in the affirmative: 88,9% in Colíder; 90,3% in Guarantã do Norte; 83,8% in Matupá, and 89,0%, in Peixoto de Azevedo. When asked about which specific human activities are contributing to the occurrence of such changes in the region, they first reported deforestation and rural fires in the first place, followed by mechanized agriculture (expressive in the municipality of Matupá) and gold mining (still remarkable in Peixoto de Azevedo) (Chart 4). Note the current perception of hydroelectric power plant construction at Colíder, where a UHE was recently built on the Teles Pires River.

Chart 4- Perception about the main human activities that contribute to climate change (in % of responses-2019).

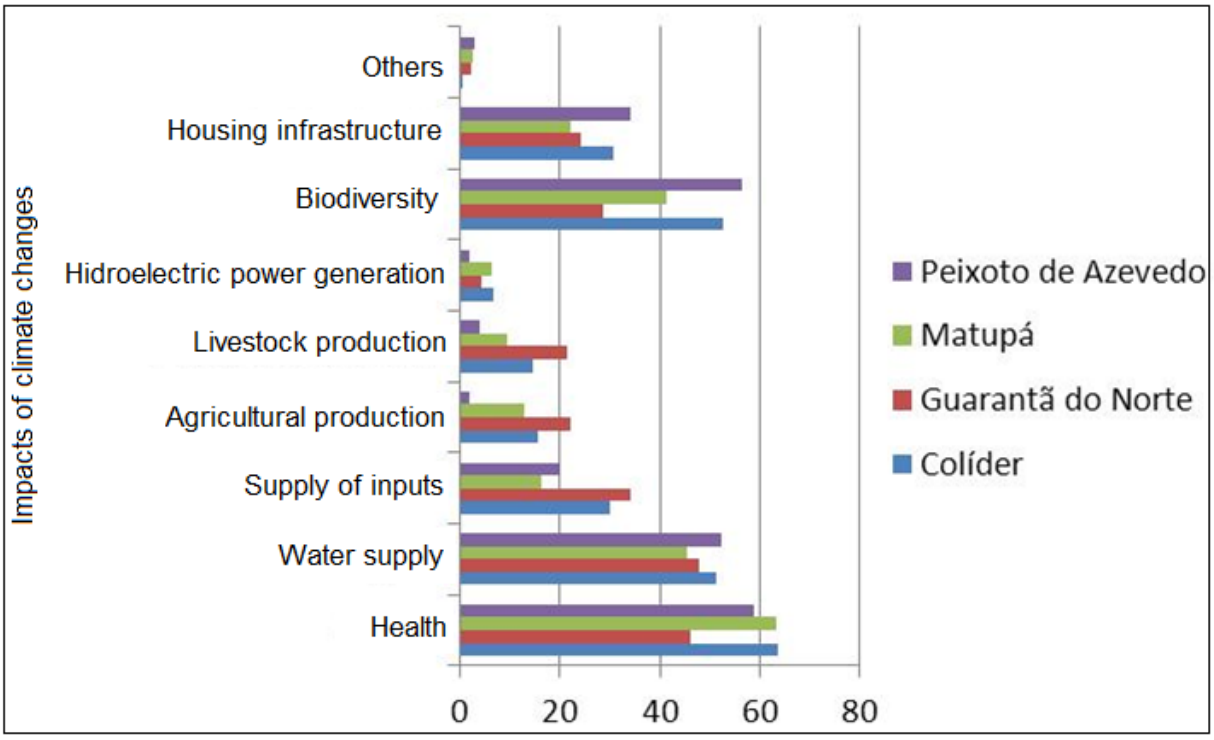


Source: Field research data (2019).

This result reaffirms the regional problem of nature degradation found in researches such as Lacerda et al. (1999), Souza et al. (2008) and Neto and Carmo (2018). Pinheiro; Cavalcanti; Barros (2018) also found a link between climate change and traditional environmental problems such as: the lack of conservation of the environment (expressed in this study on deforestation and rural fires) and pollution (expressed in both pesticide use and urban pollution). When this information was cross-referenced with the level of education, it was found that all people with high school or higher education replied in the affirmative (more than 50% of yes responses were received in all cities).

Another question sought to identify the perception of the sectors and activities that could be most affected by climate change. The answers (Chart 5) show concerns about negative impacts on human health and drinking water supply (effect of perceived climate change) as well as on the region's biodiversity (effect of their experiences on deforestation, rural fires and expansion of livestock and agriculture).

Chart 5- Perception of potential regional impacts of climate change (in % of responses).



Source: Field research data (2019).

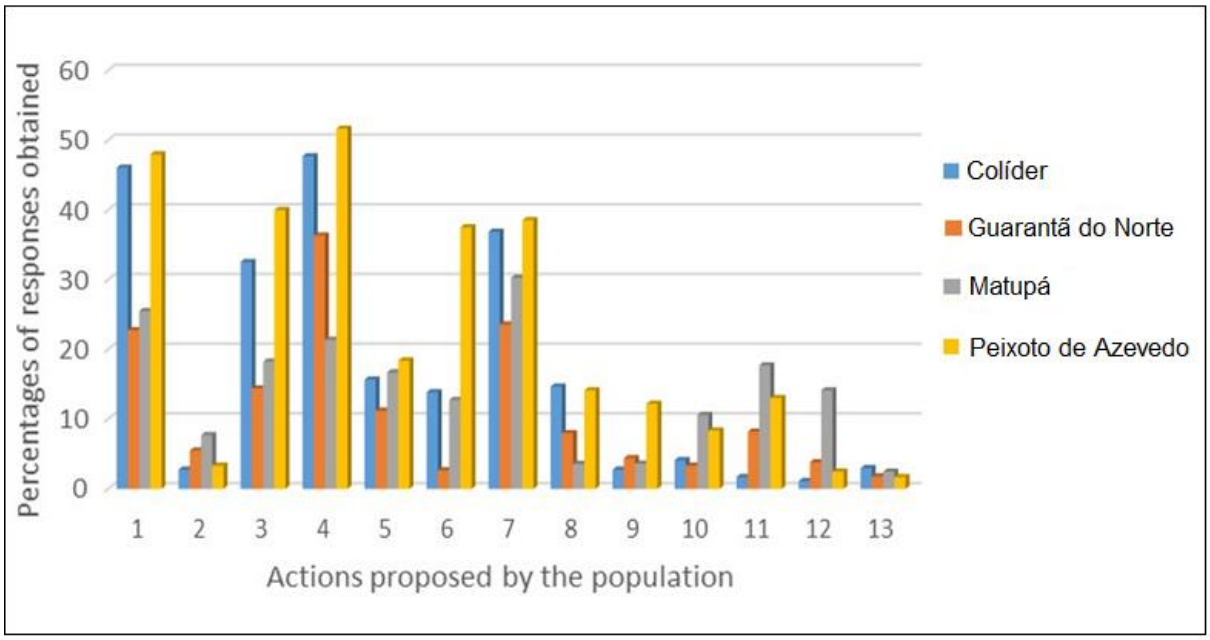
Studies such as Ishaya e Abaje (2008), Mesquita; Wittman; Mota (2016) e Martinez et al. (2017) also revealed people's concerns about the adverse impacts of climate change (on biodiversity, health and the economy) that could jeopardize the future availability of water and food.

In a second group of responses, the concern is linked to the arrival of inputs (supply) and housing infrastructure (effects of extreme weather events that are part of the residents' life experience). Note the little concern about reducing hydroelectricity generation (even people are concerned about the potential lack of water, which could affect them "...due to the lack of energy supply in the country, linked [... to] the unavailability of water for energy generation" according to PBMC, 2016, p. 4). In other words, relying on hydroelectricity creates climate-related energy insecurity (CAF, 2014).

Finally, respondents were asked to suggest actions to address the effects of climate change. The responses (Chart 6) indicate that the proposals are essentially

aimed at the most recurrent problems in the region: reforestation, stopping deforestation and preventing rural fires.

Chart 6- Mitigation and adaptation measures proposed in view of the effects of climate change (in % of responses).



Legend: 1- Reforest; 2- To create Protected Areas (APPs); 3- To create ecological awareness; 4- Stop deforestation; 5- Environmental recovery of rivers and springs; 6- Decrease pollution; 7- Prevent rural fires; 8- Do not build hydroelectric power plants (UHEs); 9- Changes in livestock management; 10- Soil correction; 11- Changing customs and culture in general; 12- Decrease ecological aggressiveness; 13- It's too late. **Source:** Field research data (2019).

Concern with pollution is evident in Peixoto de Azevedo, which is explained by the effects of mining activity on the banks of the homonymous river, identified in the research developed by Souza et al. (2008). It should be noted that not building hydroelectric power stations as an expression of an energy paradigm shift was the seventh option (different from that found by PINHEIRO; CAVALCANTI; BARROS, 2018, where it was the second most cited mitigation solution by the sampled people).

It should be noted that, although recognizing changes in the regional climate, few people propose measures that could constitute individual contributions (like de modification of customs and cultural models, or the reduction of ecological aggression). If, as Guiddens (2011) has argue, most people are not willing to change their way of life to reverse the global warming causing climate change, then it would

be necessary to create what Iwama et al. (2016) call it "risk prevention culture". For Bérubé (2010), one of the possible causes of people's lack of involvement in the fight against global warming is the belief that the individual contribution is of little importance.

It was found that subjects with a higher level of education have more clarity in relation to the proposed mitigation and adaptation measures (a fact also confirmed by BURSZTYN and EIRÓ, 2015). Finally, some people responded that it is “too late”, a perception that was also found in the Research of Hansen et al. (2007, apud MEIRA-CARTEA and ARTO-BLANCO, 2014), which revealed a perception of the irreversibility of the changes in progress.

Final Considerations

This research evidenced a generalized perception about the occurrence of global climate change among people residing in the cities studied, as well as on changes in climatic conditions in the region during the last decades, evidenced in the behavior of precipitation and temperatures. In the regional context, people link these changes to the transformations of nature through activities such as: extractivism, deforestation, rural fires and mechanized agriculture. They also realize that the biggest impacts of climate change could occur in health, the supply drinking water supply and biodiversity. The measures they propose to address its effects are aimed at the most recurrent problems in the region: reforestation, stopping deforestation and preventing fires.

The information obtained about climate perception could contribute to design and implement public policies that support future mitigation and adaptation strategies to address the impacts of climate change in the region.

References

ABREU, N. J. A.; ZANELLA, M. E. Percepção de riscos de inundações: estudo de caso no Bairro Guabiraba, Maranguape - Ceará. **Revista OKARA:** Geografia em debate, V. 9, N. 1, p. 90-107, Universidade Federal da Paraíba, 2015.

AICÓN, C. N.; GOIC, C. E. Percepción de los efectos vivenciales del cambio climático en una muestra de habitantes urbanos australes. **MAGALLANIA**. Vol. 39(1), p. 93-102, Punta Arenas-Chile. 2011. http://dx.doi.org/10.4067/S0718-22442011000100006

AMBRIZZI, T.; ROCHA, R. P. da; MARENGO, J. A.; PISNITCHENKO, I.; ALVES, L. M.; FERNANDEZ, J. P. R. **Cenários regionalizados de clima no Brasil e América do Sul para o século XXI:** Projeções de clima futuro usando três modelos regionais. Relatório N. 3. Brasília: MMA, 112 p., 2007. Disponível em: http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/prod_probio/Relatorio_3.pdf Acesso em: 17 mai. 2018.

ANDRADE, A. J. P. de; SILVA, N. M.; SOUZA, S. R. de. As percepções sobre as variações e mudanças climáticas e as estratégias de adaptação dos agricultores familiares do Seridó potiguar. **Desenvolvimento e Meio Ambiente**, v. 31, p. 77-96, Universidade Federal do Paraná, 2014.

BANCO MUNDIAL. **Cambio Climático:** panorama general. 2017. Grupo Banco Mundial. Washington-DC (USA), 87 p., 2017. Disponível em: https://openknowledge.worldbank.org/bitstream/handle/10986/27986/211119SP.pdf Acesso em: 15 mai. 2019.

BÉRUBÉ, C. Changements climatiques et distorsion de la perception des québécois: de la communication à l'action. **Essai de maître en environnement**, Université de Sherbrooke, Quebec-Canada, 79 p., 2010. Disponível em: https://www.usherbrooke.ca/environnement/fileadmin/sites/environnement/documents/Essais2010/Berube_C__08-07-2010_.pdf Acesso em: 22 jun. 2019.

BECK, U. **Sociedade de risco:** rumo a uma outra modernidade. Tradução de Sebastião Nascimento. São Paulo: Editora 34 Ltda (edição brasileira), 2010, 384 p.

BURSZTYN, M.; EIRÓ, F. Mudanças climáticas e distribuição social da percepção de risco no Brasil. **Revista Sociedade e Estado**. Vol. 30, Nº. 2, p. 471-493, Universidade de Brasília, 2015. https://doi.org/10.1590/S0102-699220150002000010

CAF-Corporación Andina de Fomento**. Indice de vulnerabilidad y adaptación al cambio climático en la región de América Latina y el Caribe.** 212 p., 2014. Disponível em: http://www.lariocc.net/es/cambio-climatico-iberoamerica/impactos-vulnerabilidad/ Acesso em: 24 mar. 2019.

CAMPOS, M.; HERRADOR, D.; McCALL, M.; MANUEL, C. Estrategias de adaptación al cambio climático en dos comunidades rurales de México y El Salvador. **BAGE-Boletín de la Asociación de Geógrafos Españoles**, nº 61, p. 329-352, 2013. Disponível em: https://dialnet.unirioja.es/servlet/articulo?codigo=4157745 Acesso em: 28 out. 2019.

CANTERO, J. G. **El cambio climático en Europa:** Percepción e impactos 1950-2050. Madrid: Editorial Los Verdes-ALE / EQUO, 2015, 124 p.

CORDEIRO, S. A.; SOUZA, C. C. de; MENDOZA, Z. M. S. H. Florestas brasileiras e as mudanças climáticas. **Revista Científica Eletrônica de Engenharia Florestal**, Vol. 11, p. 1-20, Garça-SP, 2008.

DAY, R.H. **Psicologia da Percepção**. Rio de Janeiro: Edit. José Olympio, 1979, 122 p.

DOUGLAS, M.; WILDAVSKY, A. **Risco e cultura:** um ensaio sobre a seleção de riscos tecnológicos e ambientais. Rio de Janeiro: Elsevier - Campus, 2012. 232 p.

FLANNERY, T. **Os senhores do clima**. Rio de Janeiro: Record, 2007. 294 p.

FRANCHINI, M.; VIOLA, E. Segurança climática na América Latina e o Caribe: agravante do risco de segurança pública doméstica no marco de baixo conflito interestatal. In: [ABDENUR, A. E.; KUELE, G.; AMORIM, A. (Eds.)]. **Clima e segurança na América Latina e Caribe**. Instituto IGARAPÉ, Rio de Janeiro, Brasil. p. 108-120, 2019. Disponível em: https://igarape.org.br/wp-content/uploads/2019/12/2019-12-02-publication-Clima-and-Security-PT-web.pdf Acesso em: 23 dez. 2019.

GARCÍA, S. B. Percepción del cambio climático en comunidades campesinas de la Reserva de la Biosfera La Encrucijada, Chiapas, México. **Cuadernos Geográficos**. Vol. 56, N. 3, p. 44-65, Universidad de Granada (España). 2017.

GIDDENS, A. **The politics of climate change**. 2nd. Edition. Great Britain: MPG Books Ltd, Bodmin, Cornwall, 2011. 269 p.

HAMADA, E.; GONÇALVES, R. R. do V.; GHINI, R. Método de elaboração de mapas dos cenários climáticos futuros para o Brasil. In: XIV Simpósio Brasileiro de Sensoriamento Remoto. [**Anais...].** Natal-RN: INPE, 25 a 30 de abril de 2009. p. 3891-3897. Disponível em: http://marte.sid.inpe.br/col/dpi.inpe.br/sbsr@80/2009/03.02.18.19/doc/@sumario.htm?languagebutton=en Acesso em: 15 mar. 2019.

IPCC- Grupo Intergovernamental de Expertos sobre as Mudanças Climáticas. **Climate Change 2014:** Impacts, Adaptation, and Vulnerability. Part B: Regional Aspects. Cambridge University Press. 176 p. Disponível em: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full_es.pdf Acesso em: 11 mai. 2019.

ISHAYA, S.; ABAJE, I. Indigenous people's perception on climate change and adaptation strategies in Jema, a local government area of Kaduna State, Nigeria. **Journal of Geography and Regional Planning**, Vol. 1, N. 8, p. 138-143, 2008.

IWAMA, A. Y.; BATISTELLA, M.; FERREIRA, L. da C.; ALVES, D. S.; FERREIRA, L. da C. Risco, vulnerabilidade e adaptação às mudanças climáticas: uma abordagem interdisciplinar. **Ambiente & Sociedade**. vol. XIX, n. 2, p. 95-118, São Paulo, 2016.

JIMÉNEZ, M. A. C. El conocimiento, la percepción y disponibilidad para afrontar el cambio climático em una población emergente, los migrantes de retorno. **Revista Estudios Sociales**. Vol. 28, N⁰. 52, julio-diciembre de 2018, 28 p., Sonora-México, 2018. http://dx.doi.org/10.24836/es.v28i52.578

JODELET, D. La representación social: fenómeno, concepto y teoría. In: MOSCOVICI, S. (Coord.). **Psicología social, vol. II**. Pensamiento y vida. Psicología social y problemas sociales. Barcelona: Páidos, p. 469-494, 1986.

LACERDA, L.D.; RIBEIRO JÚNIOR, M.G.; SOUZA, M.; AYRES, G.A. **Distribuição de mercúrio em solos e sedimentos lacustres na região de Alta Floresta, MT.** Rio de Janeiro: CETEM/MCT, Série Tecnologia Ambiental, 23 p., 1999.

LI, W.; FU, R.; ROBINSON, I.; JUÁREZ R, N.; FERNANDES, K. Observed change of the standardized precipitation index, its potential cause and implications to future climate change in the Amazon region. **Philos Trans R Soc Lond B Biol Sci**. Nº. 363, p. 1767-1772, London-UK, 2008. https://doi:10.1098/rstb.2007.0022

LIMBERGER, L.; CECCHIN, J. Percepção climática de moradores lindeiros ao reservatório da usina hidrelétrica de Itaipu. **Revista ACTA Geográfica**, Ed. Especial Climatologia Geográfica, p.11-29, Boa Vista – RR, 2012.

LINDOSO, D.; EIRÓ, F.; ROCHA, J. D. Desenvolvimento Sustentável, Adaptação e Vulnerabilidade à Mudança Climática no Semiárido Nordestino: Um Estudo de Caso no Sertão do São Francisco. **Revista Econômica do Nordeste**. vol. 44, n. especial, p. 301-332, Fortaleza – CE, jun. 2013.

MARENGO, J. A.; BETTS, R. (Coords.). **Riscos das mudanças climáticas no Brasil. Análise conjunta Brasil-Reino Unido sobre os impactos das mudanças climáticas e do desmatamento na Amazônia.** INPE (Brasil) / Met Office Hadley Centre (Reino Unido). 56 p., 2011. Disponível em: http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/destaques/relatorio_port.pdf Acesso em: 12 jun. 2019.

MARENGO, J, TOMASELLA, J. NOBRE, C. Mudanças Climáticas e Recursos Hídricos. Capitulo 12 (p. 200-215). In: [BICUDO, C. E. M.; TUNDISI, J. G.; SCHEUENSTUHL, M. C. B (Eds.)]. **Águas do Brasil***:* análises estratégicas. São Paulo: Instituto de Botânica, 2010, 222 p.

MARENGO, J. A. **Mudanças climáticas globais e seus efeitos sobre a biodiversidade, caracterização do clima atual e definição das alterações climáticas para o território brasileiro ao longo do século XXI**. Brasília: MMA, p. 12-25, 2007.

MARENGO, J.; AMBRIZZI, T.; ALVES, L. M.; NOBRE, C.; PISNITCHENKO, I. **Atlas de cenários climáticos futuros para o Brasil.** Ministério do Meio Ambiente. Cachoeira Paulista (SP), 2007, 124 p. Disponível em: http://mudancasclimaticas.cptec.inpe.br/~rmclima/pdfs/prod_probio/Atlas.pdf Acesso em: 13 jun. 2019.

MARANDOLA JÚNIOR, E; MODESTO, F. Percepção dos perigos ambientais urbanos e os efeitos de lugar na relação população-ambiente. **Rev. Bras. Estud. Popul**., vol. 29, n. 1, p. 7-35, Rio de Janeiro-RJ, jan./jun. 2012. https://doi.org/10.1590/S0102-30982012000100002

MARTÍN, M. B. G.; LÓPEZ, X. A. A. IGLESIAS, M. C. Percepción del cambio climático y respuestas locales de adaptación: el caso del turismo rural. **Cuadernos de Turismo**, Nº 39, p. 287-310, Universidad de Murcia – España, 2017. http://dx.doi.org/10.6018/turismo.39.290571

MARTÍNEZ, S. L. G.; GARCÍA, J. T. S.; MELÉNDEZ, L. A. A.; MONCAYO-ESTRADA, R.; CÁRDENAS, G. C.; TORRES, L. F. C. El fenómeno de cambio climático en la percepción de la comunidad indígena purépecha del municipio de Chilchota, Michoacán, México. **Rev. Int. Contam. Ambie**. Vol. 33, N. 4, p. 641-653, Ciudad de México, 2017. http://dx.doi.org/10.20937/rica.2017.33.04.08

MATO GROSSO. Secretaria de Estado de Planejamento. **Regiões de Planejamento de Mato Grosso: 2017** / Secretaria de Estado de Planejamento – Cuiabá, MT, 245 p., 2017. [ABUTAKKA, A.; SILVA, E. C. da; GOMES, V. M. (Orgs.)]. ISBN 978-85-68279-02-1. Disponível em: http://www.seplan.mt.gov.br/-/4809749-perfil-das-regioes-de-planejamento?ciclo=cv_gestao_inf Acesso em: 28 mar. 2019.

MATOS, L. A. de. **Fatores condicionantes da disponibilidade hídrica em assentamentos do setor meridional da Província Serrana-MT, Brasil**. Dissertação (Mestrado em Geografia). Universidade do Estado de Mato Grosso, 2018, 97 p.

MEIRA-CARTEA, P. A.; ARTO-BLANCO, M. Representaciones del cambio climático en estudiantes universitarios en España: aportes para la educación y la comunicación. **Educar em Revista.** Edição Especial. n. 3, p. 15-33. Curitiba: Editora UFPR, 2014. http://dx.doi.org/10.1590/0104-4060.38041

MENEZES, L. C. P. de; OLIVEIRA, B. M. C. de; EL-DIER, S. G. Percepção ambiental sobre mudanças climáticas: estudo de caso no semiárido pernambucano. In: II Congresso Brasileiro de Gestão Ambiental. **[Anais...].** Londrina: Universidade do Oeste do Paraná, 06 a 09 de novembro de 2011, p. I-036 (10 p.). Disponível em: www.ibeas.org.br/congresso/Trabalhos2011/I-036.pdf Acesso em: 23 nov. 2018.

MESQUITA, P. S.; WITTMAN H.; MOTA J. A. Climate variability, agricultural livelihoods and food security in semiarid Brazil. **Sustentabilidade em Debate**, v. 7, Edição Especial, p. 38-51, Brasília-DF, 2016.

MERTZ, O.; MBOW, C.; REENBERG, A.; DIOUF, A. Farmers' perceptions of climate change and agricultural adaptation strategies in rural Sahel. **Environmental Management**. nº 43(5), p. 804-816, Springer Nature Switzerland, 2009. Disponível em: https://link.springer.com/journal/267/43/5 Acesso em: 16 out. 2019.

NETO, V. P. de O.; CARMO, J. de A. do. Ocupações na Área de Preservação Permanente do Córrego Jaracatiá em Colíder-MT e as ações do poder público municipal. **Revista Geografar**. vol. 13, n. 2, p. 209-230, Curitiba-PR, 2018. http://dx.doi.org/10.5380/geografar.v13i2.57990

OBERMAIER M; ROSA, L. P. Mudança climática e adaptação no Brasil: uma análise crítica. **Revista Estudos Avançados.** 27 (78), p. 155-176, Universidade de São Paulo, 2013. https://doi.org/10.1590/S0103-40142013000200011

OLIVEIRA, F. L. de; NUNES, L. H. A percepção climática no município de Campinas, SP: confronto entre o morador urbano e o rural**. Revista Geosul.** v. 22, n. 43, p 77-102, Florianópolis-SC, 2007.

OLMOS-MARTÍNEZ, E.; GONZÁLEZ-ÁVILA, M. E.; CONTRERAS-LOERA, M. R. Percepción de la población frente al cambio climático en áreas naturales protegidas de Baja California Sur, México. **Polis, Revista Latinoamericana**. Vol. 12, Nº 35, p. 459-481, Santiago (Chile), 2013.

PANUTTI, R. **História:** Introdução, Fascículo 1. Cuiabá: Editora UFMT, 72 p. 2002.

PBMC, 2016: **Mudanças Climáticas e Cidades**. Relatório Especial do Painel Brasileiro de Mudanças Climáticas [RIBEIRO, S. K.; SANTOS, A. S. (Eds.)]. PBMC, COPPE – UFRJ. Rio de

Janeiro, Brasil. 98 p. Disponível em: https://drive.google.com/file/d/1oumN42HHB_ko-fcL-6cLsviwKxVwhOV_/view Acesso em: 23 abr. 2019.

PEDRINI, A. de G.; BROTTO, D. S.; SANTOS, T. V.; LIMA, L.; NUNES, R. M. Percepção ambiental sobre as mudanças climáticas globais numa praça pública na cidade do Rio de Janeiro (RJ, Brasil). **Ciênc. Educ**., v. 22, n. 4, p. 1027-1044, Bauru-SP, 2016. http://dx.doi.org/10.1590/1516-731320160040012

PINHEIRO, J. Q.; CAVALCANTI, G. R. C.; BARROS, H. C. L. Mudanças climáticas globais: Viés de percepção, tempo e espaço. **Estudos de Psicologia** (Natal)**.** Vol. 23, N. 3, p. 282-292, 2018. http://dx.doi.org/10.22491/1678-4669.20180027

PIRES, M. V.; CUNHA, D. A.; REIS, D. I.; COELHO, A. B. Percepção de produtores rurais em relação às mudanças climáticas e estratégias de adaptação no estado de Minas Gerais, Brasil. **Revista de Ciências Agrárias**. Vol. 37, N. 3, p. 431-440, SCAP-Portugal, 2014. https://doi.org/10.19084/rca.16855

RETAMAL, M. R.; ROJAS, J.; PARRA, Y. O. Percepción al cambio climático y a la gestión del agua: aportes de las estrategias metodológicas cualitativas para su comprensión. **Ambiente & Sociedade**. Vol. XIV. N⁰. 1, p. 175-194, Campinas-SP, 2011. https://doi.org/10.1590/S1414-753X2011000100010

SILVA, A. A. de M. A. Reflexões sobre o conceito de clima e alterações climáticas: uma relação de equívoco?. **Revista GEONORTE**. Edição Especial. Vol. 2, N⁰. 4, p.1048-1061, Universidade Federal de Amazonas (UEA),2012.

SOUZA, T. F.; CASTRO, J. D. B. A percepção humana sobre meio ambiente e mudanças climáticas: Um estudo de valoração para os municípios: Silvânia, Abadiânia, Pirenópolis, Nerópolis e Goianápolis. In: IV Congresso de Ensino, Pesquisa e Extensão-CEPE. **[Anais...]**. Pirenópolis: Universidade do Estado de Goiás (UEG), 18 a 20 de outubro de 2017 (s/p). Disponível em: http://anais.ueg.br/index.php/cepe Acesso em: 22 set. 2018.

SOUZA, L. C. D. de; CARVALHO, M. A. C. de; CORRÊA, B. da S.; SILVA, M. P. da. Consequências da atividade garimpeira nas margens do Rio Peixoto de Azevedo no perímetro urbano do município de Peixoto de Azevedo – MT. **BIOTERRA-Revista de Biologia e Ciências da Terra**. Vol. 8, N. 2, p. 220-231. Universidade Federal de Sergipe (UFS), 2008.

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