POPULATION'S PERCEPTION OF THE AMOUNT AND PERIODS OF RAINFALL IN VILHENA, RONDÔNIA

PERCEPÇÃO DA POPULAÇÃO SOBRE A QUANTIDADE E OS PERÍODOS DE CHUVAS EM VILHENA, RONDÔNIA

PERCEPCIÓN DE LA POBLACIÓN SOBRE LA CANTIDAD Y PERIODOS DE PRECIPITACIÓN EN VILHENA, RONDÔNIA

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Rafael Norberto de Aquino[1], Gisely Storch do Nascimento Santos[2], Mateus do Nascimento Cardoso[3], João Paulo de Castro Tolentino[4]

ABSTRACT

This article aims to analyze the population's perception of changes in the amount and periods of rainfall in the southern region of Rondônia, focusing on the city of Vilhena-RO. The theme is relevant in the face of the growing debate on the effects of climate change on regional dynamics and on the daily lives of local populations. The methodology used was descriptive, with a qualitative-quantitative approach, based on the application of structured questionnaires containing closed questions. The instruments were applied in person in different parts of the city and virtually through the Google Forms platform, being disseminated on social networks. The data revealed that 70.3% of the participants noticed a significant decrease in the amount of rainfall in recent years, while 60.4% indicated that the dry periods are longer. Also, 34.7% reported that the rains have occurred outside the periods considered traditional. These results indicate a collective perception of change in the local rainfall regime, which is consistent with scientific studies on the subject in the Amazon region. Analysis of the open responses allowed the identification of concerns related to water supply, agriculture and rising temperatures. It is concluded that the environmental perception of the population of Vilhena represents an important source of information for the formulation of public policies and educational actions aimed at mitigation and adaptation to climate change. The study reinforces the importance of considering local knowledge and the dialogue between science and society as a strategy for building sustainable and socially engaged responses to contemporary environmental transformations.

Keywords: Environmental Perception. Climate Change. Precipitation. Rondônia. Amazon.

[1]Dr. in Agronomy São Paulo State. University Júlio Mesquita (UNESP).
E-mail: rafael.norberto@ifro.edu.br Orcid: https://orcid.org/0000-0001-9423-3742
Lattes: http://lattes.cnpq.br/3745450552005911
[2]Master in School Education. Federal University of Rondônia (UNIR).
E-mail: gisely.storch@ifro.edu.br Orcid: https://orcid.org/ 0000-0002-9665-6594
Lattes: http://lattes.cnpq.br/5170046811738476
[3]Student of the technical course in Buildings. Federal Institute of Education, Science and Technology of Rondônia (IFRO). E-mail: cardoso.m@estudante.ifro.edu.br Lattes: http://lattes.cnpq.br/0469863277745857
[4]Student of the technical course in Buildings. Federal Institute of Education, Science and Technology of Rondônia (IFRO). E-mail: j.castro @estudante.ifro.edu.br Lattes: http://lattes.cnpq.br/0239144044097265

RESUMO

Este artigo tem como objetivo analisar a percepção da população em relação às mudanças na quantidade e nos períodos de chuvas na região sul de Rondônia, com foco na cidade de Vilhena-RO. O tema se mostra relevante diante do crescente debate sobre os efeitos das mudanças climáticas nas dinâmicas regionais e no cotidiano das populações locais. A metodologia utilizada foi de caráter descritivo, com abordagem quali-quantitativa, a partir da aplicação de questionários estruturados contendo perguntas fechadas. Os instrumentos foram aplicados presencialmente em diferentes pontos da cidade e virtualmente por meio da plataforma Google Forms, sendo divulgados em redes sociais. Os dados revelaram que 70,3% dos participantes percebem uma diminuição significativa na quantidade de chuvas nos últimos anos, enquanto 60,4% indicaram que os períodos de estiagem estão mais longos. Ainda, 34,7% relataram que as chuvas têm ocorrido fora dos períodos considerados tradicionais. Esses resultados indicam uma percepção coletiva de alteração no regime pluviométrico local, a qual é coerente com estudos científicos sobre o tema na região amazônica. A análise das respostas abertas permitiu a identificação de preocupações relacionadas ao abastecimento de água, à agricultura e ao aumento da temperatura. Conclui-se que a percepção ambiental da população de Vilhena representa uma importante fonte de informação para a formulação de políticas públicas e ações educativas voltadas à mitigação e adaptação às mudanças climáticas. O estudo reforça a importância de considerar o conhecimento local e o diálogo entre ciência e sociedade como estratégia para a construção de respostas sustentáveis e socialmente engajadas às transformações ambientais contemporâneas.

Palavras-chave: Percepção Ambiental. Mudanças Climáticas. Precipitação. Rondônia. Amazônia.

RESUMEN

Este artículo tiene como objetivo analizar la percepción de la población sobre los cambios en la cantidad y períodos de precipitaciones en la región sur de Rondônia, con foco en el municipio de Vilhena-RO. El tema es relevante a la luz del creciente debate sobre los efectos del cambio climático en la dinámica regional y la vida cotidiana de las poblaciones locales. La metodología utilizada fue de carácter descriptivo, con enfoque cualitativo-cuantitativo, basada en la aplicación de cuestionarios estructurados que contienen preguntas cerradas. Los instrumentos se aplicaron de forma presencial en diferentes puntos de la ciudad y de forma virtual a través de la plataforma Google Forms, siendo difundidos en redes sociales. Los datos revelaron que el 70,3% de los participantes percibe una disminución significativa de las precipitaciones en los últimos años, mientras que el 60,4% indicó que los periodos secos son más prolongados. Además, el 34,7% reportó que se han presentado precipitaciones fuera de los periodos considerados tradicionales. Estos resultados indican una percepción colectiva de cambios en el régimen pluviométrico local, lo cual es consistente con estudios científicos sobre el tema en la región amazónica. El análisis de las respuestas abiertas permitió identificar preocupaciones relacionadas con el abastecimiento de agua, la agricultura y el aumento de las temperaturas. Se concluye que la percepción ambiental de la población de Vilhena representa una importante fuente de información para la formulación de políticas públicas y acciones educativas dirigidas a la mitigación y adaptación al cambio climático. El estudio refuerza la importancia de considerar el conocimiento local y el diálogo entre la ciencia y la sociedad como estrategia para construir respuestas sostenibles y socialmente comprometidas a las transformaciones ambientales contemporáneas.

Palabras clave: Percepción Ambiental. Cambio Climático. Precipitación. Rondonia. Amazonas.

1 INTRODUCTION

Climate change has been widely recognized as one of the greatest environmental and social challenges of the twenty-first century, mainly due to changes in precipitation patterns, temperature, and the occurrence of extreme events, such as floods and droughts (IPCC, 2014; Motta et al., 2011 apud Mesquita et al., 2019).

In Brazil, these changes have significant regional impacts, especially in areas of climate and agroecological transition, such as southern Rondônia, where there are reports of intensified rainfall and prolonged drought, directly affecting local life and livelihoods (Pires et al., 2014; Magistro et al., 2001 apud Mesquita et al., 2019).

The social perception of these climate transformations is essential to support public policies and adaptation strategies, since the recognition of changes by the residents themselves can influence resilient behaviors and collective claims (Spence et al., 2011; Zahran et al., 2006 apud Mesquita et al., 2019). Studies carried out in the Brazilian Northeast, for example, reveal that most farmers recognize the increase in the frequency of extreme events and the reduction of rainfall during critical periods (Pitton, 2009; Menezes et al., 2011 apud Andrade et al., 2014).

Within this context, Pires et al. (2014) identified that rural producers in Minas Gerais have been adapting agricultural practices, such as changes in planting dates and expansion of the use of irrigation, in response to changes in the water regime. In urban and peri-urban environments, the perception varies according to sociodemographic aspects, but it still demonstrates that a significant portion of the population notices relevant variations in the amount and period of rainfall (Pedrini, 2016).

The Brazilian Panel on Climate Change (PBMC), in its 2013 report, presents robust evidence on the vulnerability of various ecosystems and communities to changes in the hydrological cycle, especially in regions of the Midwest, such as Rondônia (PBMC, 2013).

In this sense, the National Policy on Climate Change (Law No. 12,187/2009), regulated by Decree No. 9,578/2018, establishes guidelines for emission mitigation and adaptive actions, highlighting the importance of a regional and local perspective (BRASIL, 2009). Although the legislation brings advances, there are gaps in the integration of participatory processes and the incorporation of social perception in regional plans, which limits the effectiveness of climate policies in the countryside and in cities (SEDEP, 2025).

In Vilhena-RO, a municipality characterized by intense agricultural and urban-rural activity, the monitoring of impacts and residents' perception of changes in precipitation are little explored, especially in scientific studies. The scarcity of local evidence justifies the realization of this study, whose objective is to analyze the perception of urban residents of Vilhena in relation to changes in the amount and period of rainfall, contributing to territorial planning and climate adaptation.

The study contributes by filling a gap in the regional literature, complementing investigations in other parts of Brazil, as demonstrated by Pires et al. (2014) in Minas Gerais and previous studies in the Northeast (Andrade et al., 2014; Fuentes et al., 2015).

Data collection was carried out via virtual and face-to-face questionnaire in public spaces in Vilhena, enabling access to different population profiles, as recommended by Lemos et al. (2002) and Obermaier; Rosa (2013) for inclusive climate policies. Perception analysis, in addition to capturing the subjective understanding of climate change, can be complemented by indices such as those proposed by Filmer and Pritchett (2001) and adapted to climate phenomena (Fuentes et al., 2015).

Understanding how the residents of certain regions perceive changes in the rainfall regime is essential to assess the level of local environmental awareness and the capacity to respond to climatic events. This perception can also indicate the degree of social and economic vulnerability of the population in the face of direct impacts such as flooding, prolonged droughts or losses in urban and family agriculture. In medium-sized cities such as Vilhena, urban growth, combined with pressure on natural resources, can enhance the effects of climate change, especially when there is no adequate planning. At the same time, the empirical knowledge of the population, often neglected in technical planning, can reveal important patterns and indications of environmental transformation.

The daily observation of weather and climate is part of the experience of various social groups, and recording these impressions helps to build a more complete picture of the environmental reality.

By valuing this type of knowledge, the present study also contributes to integrating popular and academic knowledge in the approach to climate issues.

Therefore, this article aims to identify and analyze the population's perception of possible changes in the amount and period of rainfall in the municipality of Vilhena,

located in the south of Rondônia, considering daily experiences and direct observations of residents about the local climate. Thus, by investigating the local perception of changes in precipitation, this article intends to offer subsidies for the formulation of regional adaptation strategies, as well as to promote reflections on social participation in the construction of climate policies in the south of Rondônia.

2 THEORETICAL FRAMEWORK

Environmental perception is understood as the process by which individuals interpret and attribute meaning to natural phenomena, resulting from a complex interaction between sensory experiences, social and cultural contexts (Reigota, 2007; Pedrini; File; Viana, 2016). In Brazil, this perception varies significantly between urban and rural spaces, given that the environment in which the individual is inserted influences the way in which the environment and its changes are perceived.

Munhoz et al. (2009) identify preservationist approaches in places with high schooling, in contrast to utilitarian views in rural regions, which emphasize the economic use of natural resources. This divergence is amplified by Reigota (2007), who emphasizes the need for integration between traditional knowledge — which interprets the environment as a source of subsistence — and scientific knowledge, which provides the basis for environmental planning, both in urban and rural areas.

The concept of topophilia, introduced by Tuan (1980), refers to the affection and emotional bond that people create with their place of origin or experience, which can intensify sensitivity to environmental changes, such as variations in rainfall patterns. Brazilian studies, such as those by Santos et al. (2018), demonstrate that students from Itajubá-MG do not associate atmospheric phenomena with the climatic dimension, revealing an emotional distance between people and their habitat. By breaking this distance and valuing popular perceptions — including through environmental education — it becomes possible to build a more effective dialogue between science and the community, promoting greater engagement in adaptive actions.

A common challenge in perception studies is the confusion between climate and weather, which can distort respondents' responses and compromise the interpretation of data (Silva, 2012). The lack of conceptual clarity generates perceptions that reflect

specific events — such as heavy rainfall or long days of drought — instead of systematic changes in the climate regime. This suggests that any research instrument must have conceptual clarity and contextualize the terms for respondents to identify, for example, when it comes to a "prolonged drought" versus a naturally drier season.

Research in Brazilian urban centers shows that, although there is general recognition of problems such as global warming (Oliveira, 2008; Sturmer; Trevisol; Boton, 2010), this does not always translate into a clear perception of changes in the daily climate, such as changes in the rainy season. A survey carried out in a public square in Rio de Janeiro showed that a large part of the participants associated the term "global warming" with general environmental problems, without directly relating it to their experiences with local rainfall (Pedrini; File; Viana, 2016; Oliveira, 2008).

In rural areas, the perception of changes in rainfall patterns is often accompanied by adaptation of agricultural practices, as observed by Pires et al. (2014) in Minas Gerais. Local producers adjusted sowing dates, intensified the use of irrigation and started to use crop varieties that are more resistant to water variability. This process is reinforced by Retamal et al. (2011), which highlight the methodological value of qualitative approaches — interviews, life stories — to capture the subjective dimension of perception while incorporating farmers' narratives about changes in rainfall patterns.

To quantify the subjective perception of climate aspects, Cunha, Carlos and Menezes (2019) adapted indices originally proposed by Filmer and Pritchett (2001), using varimax factor analysis techniques. These indices allowed the creation of robust indicators, capable of measuring variables such as: perception of rainfall intensity, frequency of extreme events (floods, droughts) and temporal changes in rainfall seasons.

Thus, qualitative data are converted into quantitative indicators that can be statistically analyzed, providing subsidies for public policies and adaptive plans with clarity and numerical definition.

The National Policy on Climate Change (PNMC), instituted by Law No. 12,187/2009 and regulated by Decree No. 9,578/2018, highlights the integration between mitigation, adaptation, and social participation (BRASIL, 2009). Its article 4 establishes objectives such as making economic and social development compatible with the protection of the climate system and implementing adaptation actions with the

involvement of public and private agents. Article 5, on the other hand, emphasizes the need for active participation of government, academia and civil society in climate action.

In addition, Law No. 9,433/1997, which institutes the National Water Resources Policy, reinforces the participatory management of watersheds, offering a normative framework that supports participatory monitoring initiatives of rainfall quality and quantity, including community actions such as those in this study in southern Rondônia.

Environmental education plays a fundamental role in strengthening the critical perception of populations about climate change and its consequences. According to Carvalho (2004), the critical approach to environmental education should articulate science, politics and culture, promoting reflections on ways of life and their relations with natural cycles. This perspective fosters the formation of conscious and participatory subjects, who understand the importance of environmental preservation and mitigation and adaptation actions in the face of climate change. In communities where this approach is worked on continuously, there is greater discernment about local climate changes, such as changes in rainy periods or increased extreme events, as well as greater engagement in sustainable practices (Jacobi, 2003).

The way the media presents information about the climate directly influences social perception on the subject. According to Capra (2006), environmental communication can both clarify and confuse, depending on the quality of the information transmitted and the sociocultural context of the receivers. In Brazil, media coverage is often limited to extreme phenomena, such as floods or droughts, without deepening the structural relationships with global climate change (Martins, 2015). This creates a fragmented and timely perception, making it difficult to recognize broader patterns of climate change. On the other hand, community and popular media initiatives have shown potential to strengthen local understanding and encourage participation in actions to address the impacts of climate change (Silva; Nascimento, 2021).

Traditional populations and rural communities often have their own ways of observing and interpreting climate cycles, based on signs from nature, such as the behavior of animals, the flowering of certain plants and the movement of clouds. This knowledge, transmitted orally between generations, constitutes an important body of empirical knowledge about the rainfall regime in different Brazilian regions (Diegues,

2000). Although often disregarded by technocratic approaches, this knowledge can be integrated into scientific studies, enriching analyses of local climate perception and strengthening adaptation strategies. As Berkes (2009) points out, the dialogue between science and traditional knowledge is one of the keys to building more resilient socio-ecological systems, especially in times of climate instability.

3 METHODOLOGY

This study is characterized as a qualitative and quantitative research, of descriptive nature, with the objective of identifying and analyzing the population's perception of changes in the rainfall regime in the south of Rondônia, specifically in the city of Vilhena-RO. According to Gil (2008), descriptive research has as its main purpose the characterization of certain phenomena or the establishment of relationships between variables, which is in line with the proposal of this work, by investigating the individual and collective perception of the community in relation to the amount and period of rainfall in the region.

Data collection was carried out through a structured questionnaire, based on

in previous studies on environmental and climate perception, such as those by Pedrini, Lima and Viana (2016) and Cunha, Carlos and Menezes (2019). The questionnaire was composed of closed questions, which addressed aspects such as: perception of changes in the frequency and intensity of rainfall and changes in the seasons.

The application of the questionnaires took place in two complementary ways: in person, on the streets of the city of Vilhena-RO, and virtual, through the Google Forms platform, with dissemination on social networks. Both applications took place between the months of November and December 2024, with the face-to-face application carried out in different parts of the urban area of the municipality, seeking the diversity of socioeconomic and age profiles among the participants. The online version was shared in Vilhena's public and private groups on Facebook, WhatsApp and Instagram, with the aim of reaching a wider and more heterogeneous sample of the population. In all, 101 people were interviewed.

The choice to use mixed methods is justified by the possibility of obtaining a more comprehensive view of the social perception of local climate change, as defended by Minayo (2001), who points to the complementarity between quantitative (more objective and measurable) and qualitative (more subjective and interpretative) data as an effective strategy in social research. The combination of approaches also made it possible to compensate for any limitations associated with each technique individually, such as response bias in virtual environments and time and access barriers in face-to-face approaches.

The geographic area of the research is limited to the city of Vilhena, located in the extreme south of the state of Rondônia, in the northern region of Brazil. With an estimated population of around 105 thousand inhabitants (IBGE, 2022), Vilhena has striking environmental and climatic characteristics, being part of the transition between the Amazon biome and the Cerrado, which directly influences its rainfall regime. This geographic location, associated with a recent history of urban growth and changes in land use, makes the municipality a favorable field for investigations on the perception of changes in the climate, since it has constantly suffered from floods and in the year 2024 with a lot of smoke resulting from fires in the region.

The sampling adopted in the research was non-probabilistic for convenience, since the participants were selected based on access to the streets and social networks, respecting minimum criteria of diversity of age, gender and occupation. Although this type of sampling does not allow statistical generalization of the results to the entire population, it is widely used in exploratory and perception research, as Marconi and Lakatos (2017) point out, as it provides quick and direct access to subjects who express relevant experiences and opinions about the object of study.

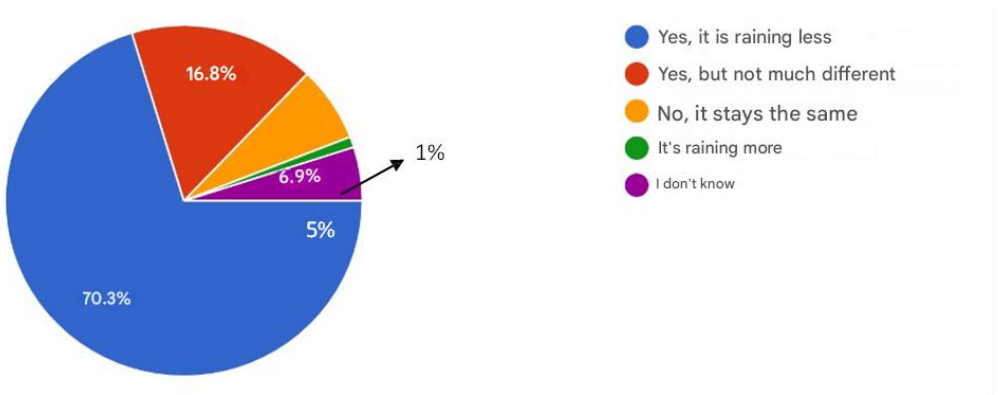
After collection, the data were organized and analyzed, and the answers were submitted to percentage analysis using electronic spreadsheets and Excel software. All collection procedures respected the ethical principles of research with human beings, as determined by Resolution No. 510/2016 of the National Health Council, which specifically deals with research in the Human and Social Sciences. The questionnaire was preceded by a Free and Informed Consent Form (ICF), available in both printed and digital versions, ensuring the anonymity and voluntariness of the participants.

4 RESULTS AND DISCUSSION

The following are the two representative figures with the answers of the research subjects. In figure 1, the graph shows the perception of the decrease or not of rainfall in recent years. Figure 2 shows the subjects' perception of the change in the period of occurrence of the periods of drought and rainfall.

Figure 1

Subjects' perception of the decrease or not of rainfall in recent years



Source: Prepared by the authors.

Figure 2

Subjects' perception of changes in drought and rainfall periods in recent years

Source: Prepared by the authors.

Regarding the Perception of the amount of rainfall, as observed in figure 1, the expressive majority (70.3%) perceives that it is raining less, signaling a collective perception of the decrease in precipitation. Only 1% said it is raining more, and 6.9% said

there was no change, which reinforces the predominance of a feeling of recent water scarcity.

In relation to the Perception of the periods of rain and drought, observed in figure 2, more than half (60.4%) perceive that the periods of drought are longer, while 34.7% indicate that the rainfall is unregulated (starting earlier or later). This suggests a widespread perception of alteration in local climate cycles, affecting the historical pattern of rainfall and drought in the region.

The data obtained reflect a widely shared perception among the residents of Vilhena-RO regarding the decrease in the amount of rainfall and the change in the traditional periods of rains and droughts. This collective perception may be associated with the increase in extreme weather events and the greater visibility of the topic in the media and in the daily lives of affected populations.

According to Nobre et al. (2016), changes in the rainfall pattern in the Amazon region have been observed over the last decades, with more intense droughts and long periods without precipitation. These phenomena are attributed both to natural causes such as the warming of the North Atlantic, and to anthropogenic factors, such as large-scale deforestation. The population's perception, in this sense, can be an important indicator of the local environmental reality, especially in areas that face socio-environmental pressures such as the south of Rondônia.

The perception that "it is raining less" (70.3%) indicates a feeling of water scarcity, which can directly impact agricultural activities, urban water consumption and the balance of ecosystems. This view is in line with studies such as that of Silva and Amorim (2020), which point to the crucial role of environmental perception as an instrument for the early diagnosis of regional climate change.

As for the perception of the rainy seasons, the data show that 60.4% consider that the droughts are longer, and 34.7% note that the rains are starting outside the expected time. This suggests that the local population identifies a disorganization in the seasonal cycles. According to Freitas (2018), this social perception may be linked to the intensification of El Niño and La Niña, in addition to other imbalances in atmospheric systems that directly affect the Amazon and its surroundings.

Another point to consider is the low percentage of people who said they "don't know" or that "everything remains the same", which indicates community engagement and attention to the issue, perhaps reinforced by concrete experiences of material losses, agricultural problems or even the presence of information in the local media.

Environmental perception, therefore, is not only a reflection of technical-scientific knowledge, but also of people's daily experiences. As Sato (2004) points out, understanding how the population perceives the environment is essential for the formulation of participatory and effective public policies, especially in contexts of increasing climate vulnerability.

5 CONCLUSION

The present research aimed to understand the perception of the population of Vilhena-RO in relation to the amount and periods of rainfall and drought in recent years. Through the application of structured questionnaires, face-to-face and virtual, it was possible to identify that there is a widely shared perception that the amount of rainfall has been decreasing and that periods of drought are becoming longer or more unregulated.

The analysis of the data showed that the local environmental perception is aligned with scientific studies on changes in the regional climate, especially with regard to the intensification of extreme events and the instability of rainfall regimes in the Amazon region. The fact that more than 70% of the participants stated that it is raining less, and that almost 95% indicated changes in the periods of rain and drought, reveals a growing awareness of the impacts of climate change on the daily lives of the population.

The perception of the community, although based on subjective experiences, constitutes a powerful tool for understanding the local environmental reality. She reinforces the need to consider popular knowledge in the processes of formulating public policies, especially in the areas of urban planning, water use, agriculture and environmental education. Attentive listening to the population can contribute to more effective mitigation and adaptation strategies, sensitive to the specificities of each territory.

Thus, it is concluded that investing in the expansion of the dialogue between science and society is essential to strengthen sustainable and participatory actions in the

face of climate change. It is recommended that future studies deepen the relationship between social perception, environmental impacts, and policies to combat climate change, especially in vulnerable regions such as southern Rondônia.

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