

# Addressing climate change in high school in Senhor do Bonfim - BA: a commitment to a sustainable future

## Abstract

This article discusses the need to address climate change in high school education in Senhor do Bonfim, Bahia, focusing on Cartography as an educational tool. Initially, it presents the global relevance of climate change and emphasizes the importance of addressing it at the local level. The general objective of this article is to discuss how the approach to climate change in Senhor do Bonfim's high school can contribute to a sustainable future. The specific objective is to demonstrate how the use of Cartography as an educational tool can increase students' awareness of local and global climate change. The article highlights the global relevance of climate change, highlighting that this is a challenge that affects the entire planet. However, it underscores the importance of addressing climate change at the local level, as local communities are also affected by extreme weather events and environmental degradation. To this end, the methodology used follows the dialectical critical line with a qualitative approach. To work on the concepts, a bibliographic survey was conducted, focusing on issues such as climate change, Cartography, and environmental preservation. The methodological procedure used was a case study of a field trip to Serra do Gado Bravo with high school students in the municipality in question, which served as the basis for the development of this work.

**Keywords:** climate change, cartography, environmental preservation

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## Introduction

Climate change represents one of the biggest threats to the sustainability of our planet. As renowned climatologist Michael E Mann<sup>1,2</sup> stated, climate change is the greatest threat facing humanity this century and this statement echoes around the world, where the effects of climate change have manifested themselves in the form of extreme temperatures, intensified climate events and significant impacts on ecosystems.

However, understanding climate change must transcend global concerns. It is critical to address these issues at a local level, as this is where the impacts are most tangible and where solutions can be implemented most effectively. Senhor do Bonfim in Bahia, is no exception to this global reality. In recent years, this community has experienced noticeable climate change, with changes in rainfall patterns, higher temperatures and more frequent extreme weather events.

In this context, Cartography emerges as a crucial tool for understanding and tackling climate change. Maps are more than geographic representations; they are powerful visual languages that allow us to see and understand the complexities of climate change. As Susan Schulten,<sup>3</sup> professor of History and History of Cartography, states, maps are a powerful visual language that allows us to see and understand the complexities of climate change.

Furthermore, Brazilian geographer Aziz Ab'Sáber<sup>4</sup> emphasizes the importance of understanding climate change at a local level, stating that knowing geography means understanding the relationships between society and the environment. This further highlights the need to address these issues in the specific context of Senhor do Bonfim in Bahia.

This article explores the importance of addressing climate change

with high school students, which can contribute to a commitment to a sustainable future. Furthermore, it examines how students from Colégio Estadual de Senhor do Bonfim had the opportunity to experience these climate changes first-hand during an ecological walk to Serra do Gado Bravo. By bringing together knowledge about climate change, the powerful tool of Cartography and the local reality of climate change in Senhor do Bonfim, this article demonstrates how education can inspire a new generation of environmental defenders and agents of change in search of a sustainable future.

## Fundamentals of climate change

To understand the importance of addressing climate change in Senhor do Bonfim, it is crucial to first understand the fundamentals of climate change. The increase in Greenhouse Gas (GHG) emissions is causing global warming, resulting in devastating effects such as droughts, floods and rising sea levels.

As noted by Rajendra Pachauri,<sup>5</sup> former chairman of the Intergovernmental Panel on Climate Change (IPCC) said that climate change is a crisis that threatens our planet, our only home. Furthermore, as highlighted by Susan Solomon,<sup>6</sup> an atmospheric scientist argues that the increase in concentrations of carbon dioxide (CO<sub>2</sub>) and other greenhouse gases is altering the Earth's climate balance, leading to unpredictable consequences.

These elevated CO<sub>2</sub> concentrations are the result of human activities such as the burning of fossil fuels, deforestation and industrialization. Understanding these fundamentals is essential for Senhor do Bonfim students to recognize the urgency of climate change and the impact it has on their community. These extreme weather events, such as intense rains and prolonged droughts, directly affect the daily lives of local inhabitants, affecting agriculture, food security and water availability.

Therefore, it is critical that climate change education includes not only global information, but also careful analysis of local implications, empowering students to act in an informed and responsible way in their own context.

### Cartography and climate change

Cartography is a valuable tool in understanding climate change, allowing an accurate visual representation of climate phenomena and their implications. Maps are tools that transcend linguistic and cultural barriers, making climate data accessible and understandable to a diverse audience. By representing climate change through maps, we can convey complex information more clearly and effectively.

As Mann<sup>2</sup> highlights, climate maps are crucial instruments for assessing and communicating risks related to climate change. This information is crucial for urban planning and disaster management, enabling local authorities to take proactive measures to protect their communities.

Additionally, maps can be used to visualize changes in Senhor do Bonfim's landscape over time. This includes identifying changes in vegetation areas, water bodies and land use, all of which are important indicators of climate change and how human action is impacting the local environment.

Local weather patterns can also be represented through maps, allowing students to better understand region-specific weather trends. This is particularly valuable in an educational context, as students can relate these weather patterns to their personal experience, observing how the weather directly affects their daily lives.

According to Hansen<sup>7</sup> maps can highlight the interconnection between human actions and climate change. They can show the sources of greenhouse gas emissions in the region, such as the burning of fossil fuels and deforestation. As the climatologist argues, climate maps make visible the direct impact of human activities on the global climate.

This helps raise students' awareness of how their own actions and choices can contribute to or mitigate climate change, encouraging more responsible and sustainable behavior.

In summary, cartography plays a crucial role in climate change education in Senhor do Bonfim, making complex climate concepts accessible and relevant to students. The maps not only illustrate risk areas and weather patterns, but also highlight the direct connection between human action and climate change, empowering young people to become advocates for a sustainable future.

### Educational approach

Addressing climate change in high school should be an enriching multidisciplinary experience for students. Incorporating Cartography as an integral part of the curriculum allows students to not only understand, but also experience the complexities of climate change in a practical and engaging way. According to Sobel<sup>8</sup> innovative pedagogical strategies can be developed to engage students in a meaningful learning journey. Education is key to environmental action and sustainability.

By expanding the educational approach to climate change, it is possible to create a learning environment that promotes critical thinking, collaboration and environmental awareness. Incorporating mapping projects is a valuable approach as it allows students to actively engage in collecting local climate data, creating interactive maps, and analyzing climate trends.

Through these hands-on activities, students can develop research, data analysis, and communication skills while gaining a deeper understanding of climate change in their own community.

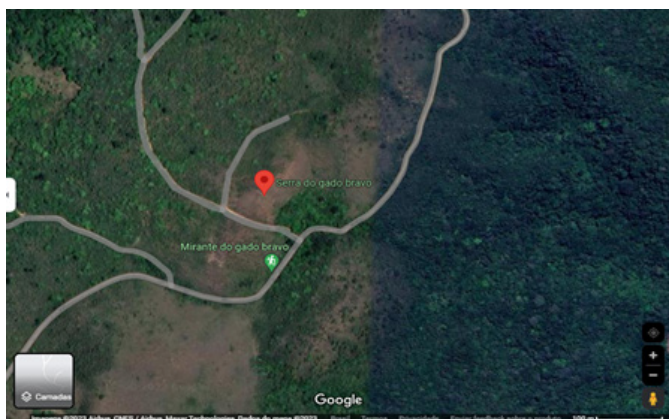
Furthermore, by integrating Cartography into teaching, students can realize the practical relevance of Geography and Environmental Sciences in their everyday lives. They can explore how weather patterns affect local agriculture, influence economic activities, and shape urban planning decisions. This creates a direct connection between curriculum content and real-world issues, making learning more meaningful and inspiring.

For Dewey<sup>9</sup> when working on mapping projects, students can collaborate with local experts in Climatology and Geography, which strengthens connections between formal education and practical knowledge. Experience is not what happens to a man; It's what a man does with what happens to him.

This not only enriches the learning experience, but also helps students realize that they can play an active role in solving local climate challenges. Thus, the educational approach to climate change, enriched by Cartography, not only equips students with practical knowledge, but also inspires them to become conscious and active citizens who contribute to a sustainable future.

### Exploring serra do gado bravo in senhor do bonfim: a journey of environmental analysis and awareness

In Senhor do Bonfim, Bahia, located in the Northeast, 484 km from Salvador, the capital, there is a natural treasure of great ecological and cultural value - the Serra do Gado Bravo, 15 km from Bonfim. This stunning geographical landmark, which spans vast expanses of land, is not only home to a rich diversity of flora and fauna, but also plays a key role in the region's environmental balance.



**Source:** <https://maps.app.goo.gl/3BhZBA2inepHoISX8>, 2023.

On July 7, 2023, students, teachers, management and coordination from Colégio Estadual Senhor do Bonfim embarked on a walk to Serra do Gado Bravo, with the aim of carrying out a detailed analysis of the landscape, climate change, vegetation and environmental preservation of the Bonfinense community in relation to this unique natural setting.

This educational excursion not only provided a hands-on learning opportunity, but also promoted awareness of the importance of environmental preservation. The students, guided by teachers from all areas of the school, explored the Serra do Gado Bravo, where they were able to observe the nuances of the landscape first-hand.



**Source:** Teachers and students at Colégio Estadual Sr. do Bonfim, 2023.

### Landscape analysis

The journey began with an analysis of the landscape of Serra do Gado Bravo. The panoramic view from the top of the mountain offered students a spectacular view of the region. They were able to observe the topography, waterways, surrounding vegetation and human settlements. This analysis allowed students to better understand how geography influences climate, biodiversity and human activities in the area.

This initial landscape analysis also provided a valuable opportunity for students to apply the cartographic concepts they had learned in class. They were able to identify geographic elements, such as rivers and hills, and begin to mentally map the region. In doing so, they began to understand how landscape configuration plays a crucial role in local climate change, influencing wind patterns, areas susceptible to flooding, and even ideal conditions for vegetation growth.

This practical experience of analyzing the landscape not only enriched their knowledge of the local environment, but also prepared them for the next stage of the journey, in which they would produce classroom work based on observations.



**Source:** Teachers and students at Colégio Estadual Sr. do Bonfim, 2023.

### Climate change and local impacts

Climate change is an extremely relevant global issue, but its influence on local regions is an equally critical aspect that deserves attention. During the visit to Serra do Gado Bravo, students not only

appreciated the beauty of the landscape, but also became aware of the climate changes observed in Senhor do Bonfim and how these changes may be connected to Serra do Gado Bravo.

Collecting local climate data was a key part of the exploration. Because Schneider<sup>10</sup> explains that collecting local climate data is the basis for understanding climate change and its implications. In this context, students and teachers worked to record variations in climatic conditions over time, observing changes in average temperatures, precipitation patterns and extreme weather events. This collection of empirical data allowed for a more accurate analysis of climate trends in the region.

By studying these trends, students were able to see how human actions play a critical role in local climate change. The burning of fossil fuels, urban expansion and deforestation are factors that contribute to climate change in Senhor do Bonfim and many other regions.

Schneider<sup>11</sup> highlights that understanding the human causes of climate change is the first step towards combating it. Raising awareness about how human activities directly affect local climate is an important step towards action and mitigation.

Furthermore, the analysis of climate change also revealed its specific impacts and challenges for Serra do Gado Bravo and its surrounding communities. Students were able to discuss how changes in temperatures and rainfall patterns affect local agriculture, water availability and even the health of biodiversity. Understanding these direct impacts has helped create a connection between global climate change and local realities, making the problem more tangible and urgent.

Ultimately, the analysis of climate change in Senhor do Bonfim, Bahia, during the visit to Serra do Gado Bravo, demonstrated that global issues have profound implications at the local level. This awareness is a fundamental step towards involving students and the community in the search for more sustainable solutions and practices. It is a testament to the power of environmental education in empowering future generations to deal with challenges as critical as climate change.



**Source:** Teachers and students at Colégio Estadual Sr. do Bonfim, 2023.

### Vegetation and biodiversity

Serra do Gado Bravo is a precious natural ecosystem in terms of vegetation and biodiversity. This environment is home to an



impressive richness and diversity of plant and animal species, making it a place of immense ecological value. During the students' visit, this biodiversity became an essential part of the exploration, providing a hands-on and immersive learning experience.

The native vegetation of Serra do Gado Bravo is a testament to its natural exuberance. With the guidance of their teachers, students had the opportunity to study the local flora, identifying a variety of species of trees, shrubs, flowers and native plants. They learned about the distinct characteristics of these plants, their adaptations to the environment, and their roles in the ecosystem.



**Source:** Teachers and students at Colégio Estadual Sr. do Bonfim, 2023.

Furthermore, the local fauna also enchanted and captivated the students. They had the opportunity to observe and identify a variety of animal species, from colorful birds to small mammals and reptiles. Interaction with wildlife provided a deeper understanding of the interdependence between all forms of life in the natural environment of Serra do Gado Bravo.

However, this experience also confronted them with the reality of threats to biodiversity. During discussions with teachers, students learned about the pressures that fauna and flora face due to human activities, such as deforestation, illegal hunting and habitat degradation. This made them reflect on the importance of conservation and the role of each individual in protecting biodiversity.

In summary, Serra do Gado Bravo, with its lush vegetation and impressive biodiversity, provided an educational experience that inspired a deeper appreciation for nature and a sense of responsibility for preservation. By exploring the wonders of local flora and fauna, students connected with Paulo Brandão's words and recognized the importance of preserving Brazilian biodiversity for future generations.

### **Environmental preservation and community engagement**

An important part of this educational journey was understanding the importance of environmental preservation and student involvement. As Nobre<sup>12</sup> highlights, preserving the environment is not an option, but a necessity to guarantee a sustainable future for future generations. And on this visit to Serra do Gado Bravo, it was much more than a school trip. It was an opportunity to immerse myself in a precious natural environment, where learning merged with awareness.

Students and teachers returned with a deeper understanding of local environmental complexities and a renewed passion for preserving Senhor do Bonfim's natural heritage. They were inspired by the words of Brazilian ecologist Nogueira-Neto<sup>13</sup> that nature is not a matter of choice, but of responsibility. Being a testimony to the power of education to inspire future environmental defenders and community change agents.

Awareness of the environmental challenges faced by the Bonfinense community and Serra do Gado Bravo created a sense of shared responsibility. As highlighted by Marina Silva<sup>14</sup> Minister of the Environment of Brazil, environmental preservation requires the commitment of the entire society, working together to protect our natural heritage.



**Source:** Teachers and students at Colégio Estadual Sr. do Bonfim, 2023.

This unique experience not only enriched the students' education, but also planted seeds of environmental action and responsibility in their minds. By understanding how climate change affects their own community and the natural beauty of Serra do Gado Bravo, they became passionate about environmental preservation. This journey is an inspiring example of how education can catalyze positive and sustainable change in our society.

### **The fundamental role of cartography in the walk to serra do gado bravo**

Cartography played a crucial and revealing role in this educational journey. During the visit, the students not only walked along trails and enjoyed the panoramic views. With guidance, they viewed maps that represented the topography of the area, identifying rivers, hills and other geographic elements.

This provided a deeper understanding of the region's own geography and the complexity of its landscape, as argued by Aziz Ab'Sáber<sup>4</sup> who knows geography is to understand the relationships between society and the environment. Additionally, students mapped vegetation and changes in the landscape along the way. In doing so, they followed in the footsteps of notable figures in Brazilian Cartography, such as geographer Manuel Correia de Andrade<sup>15</sup> who described Brazil in great detail in his historical maps. Allowing students to visualize changes in the landscape and their relationship to the climate data collected. This understanding has become a valuable tool for analyzing the complex interconnections between the natural environment, climate change and the importance of conservation.

The walk to Serra do Gado Bravo was an enriching educational journey that involved students in practical learning about climate change and Cartography. This unique experience not only brought them closer to nature, but also empowered them to understand and address the environmental challenges facing their community and the world.

Cartography has played a fundamental role in the study of climate change in different regions of the world. By mapping and analyzing different climate variables, it is possible to monitor and understand the changes that are occurring in the climate and their consequences. A place that has been showing significant changes in climate is Serra do Gado Bravo.

This region, which was previously known for its mild temperatures and humid climate, has undergone transformations in recent years. By collecting climate data, such as temperature, precipitation and evapotranspiration, it is possible to monitor the variations in these variables over time.

A gradual increase in average temperatures in the region can be seen, especially in the last 50 (fifty) years. Furthermore, a reduction in precipitation is also observed, which indicates a decrease in the amount of rainfall in the area. These climate changes have directly affected vegetation and agriculture in Serra do Gado Bravo. Plant species that previously adapted to the region's humid climate are suffering from high temperatures and lack of water.

Furthermore, farmers have faced difficulties in maintaining their plantations, due to the lack of rain and lack of regularity. Climate change is related to global phenomena, such as global warming and deforestation. The emission of greenhouse gases and the destruction of native vegetation contribute to increased temperatures and changes in rainfall.

Given this scenario, it is essential that mitigation and adaptation measures are adopted to face the impacts of climate change in Serra do Gado Bravo and other affected regions. The conservation of native vegetation, the reduction of greenhouse gas emissions and investment in infrastructure for the efficient use of water are some of the necessary actions.

In this sense, Cartography plays a fundamental role, as it allows continuous monitoring of climate change and helps to define adaptation and mitigation strategies. Furthermore, the maps that can be produced are important tools to raise awareness among the Bonfinense population and decision makers about the urgency of measures to combat climate change.

The analysis of climate change in Serra do Gado Bravo through cartography has revealed significant changes in the local climate. Rising temperatures and reduced precipitation have directly impacted vegetation and agriculture in the region. Adopting measures to mitigate and adapt to these changes is essential to guarantee the sustainability and preservation of this ecosystem.

By uniting the beauty of the natural landscape, climate change analysis and the art of cartography, this journey exemplifies how education can inspire a new generation of environmental defenders and conscious citizens.<sup>16</sup>

## Final considerations

The approach to climate change in secondary education in Senhor do Bonfim, through Cartography, represents a commitment to the sustainable future of the region and the world. Education is the key to awareness and action, and Cartography offers a tangible way to engage

students and empower them to make a difference. As we consider the global impact of climate change, it is essential to recognize that local action plays a key role in building a more sustainable future.

The study of climate change is not just an academic issue, but an urgent need. Understanding the complexities of climate change, along with the ability to map its impacts, is critical to taking informed and effective action. In Senhor do Bonfim in Bahia, as well as around the world, climate change is already affecting local communities. Rising temperatures, rainfall variability and extreme weather events are challenges that cannot be ignored. However, it is inspiring to see how education can be a driving force for change. Students at Colégio Estadual de Senhor do Bonfim are now better prepared to understand, face and mitigate the impacts of climate change in their region.

As we move towards an uncertain future, Cartography will continue to play an essential role. Through it, we can map not only the Earth's Geography, but also the climate changes that shape our world. This article highlights the importance of addressing climate change in public high school in Senhor do Bonfim and around the world, using Cartography as an essential educational tool. We face a future that depends on our ability to confront climate change with knowledge, resolve and action. As students become informed environmental advocates, they carry with them hope for a more sustainable future for the entire planet. Through education and Cartography, we are building the foundations for a better tomorrow.

## Acknowledgments

None.

## Conflicts of interest

The author declares there is no conflict of interest.

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