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Climate Challenges and the Evolution of Bioethics: Perspectives and Practices from a Brazilian Disaster

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Abstract
This article examines the bioethical implications of extreme climatic events using the disasters that occurred in Rio Grande do Sul, Brazil in May 2024 as a case study. We propose an expansion of the scope of bioethics beyond classic (bio)medical dilemmas, encompassing environmental and climatic challenges that affect planetary health. Through the "One Health" perspective, we discuss how bioethics can contribute to understanding and reducing the impacts of climate change by integrating human, animal, and environmental health perspectives. The article revisits the contributions of Fritz Jahr and Van Rensselaer Potter to the formation of the concept of bioethics, emphasizing the need for a "deep bioethics" that stresses intergenerational responsibility and environmental justice. We highlight the urgency of policies that not only respond to immediate crises but also anticipate future catastrophes, promoting an ethic of precaution and sustainability. Finally, it is proposed that bioethics, by adopting a more comprehensive approach, can offer appropriate responses to the ethical challenges posed by climate change, ensuring that preventive and damage reduction measures are implemented to protect vulnerable populations and promote sustainable cohabitation on the planet.

Keywords: Ethics. Climate Change. One Health. Environmental Justice.

Desafios Climáticos e a Evolução da Bioética: Perspectivas e Práticas a Partir de um Desastre Brasileiro

Resumo
Este artigo examina as implicações bioéticas dos eventos climáticos extremos, utilizando como estudo de caso os desastres ocorridos no Rio Grande do Sul, Brasil, em maio de 2024. Propomos uma expansão do escopo da bioética para além dos dilemas (bio)médicos clássicos, englobando os desafios ambientais e climáticos que afetam a saúde planetária. Por meio da perspectiva "One Health", discutimos como a bioética pode contribuir para a compreensão e a redução dos impactos da mudança climática, integrando as perspectivas de saúde humana, animal e ambiental. O artigo revisita as contribuições de Fritz Jahr e Van Rensselaer Potter na formação do conceito de bioética, enfatizando a necessidade de uma "bioética profunda" que destaca a responsabilidade intergeracional e a justiça ambiental. Ressaltamos a urgência de políticas que não apenas respondam a crises imediatas, mas que também antecipem futuras catástrofes, promovendo uma ética da precaução e da sustentabilidade. Finalmente, propõe-se que a bioética, ao adotar uma abordagem mais abrangente, possa oferecer respostas adequadas aos desafios éticos impostos pela mudança climática, assegurando que medidas preventivas e de mitigação de danos sejam implementadas para proteger as populações vulneráveis e promover uma coabitação sustentável no planeta.

Palavras–chave: Ética. Mudança Climática. Saúde Planetária. Justiça Ambiental.

Desafíos Climáticos y la Evolución de la Bioética: Perspectivas y Prácticas a partir de un Desastre Brasileño

Resumen
Este artículo examina las implicaciones bioéticas de los eventos climáticos extremos, utilizando como estudio de caso los desastres ocurridos en Rio Grande do Sul, Brasil, en mayo de 2024. Proponemos una expansión del alcance de la bioética más allá de los dilemas (bio)médicos clásicos, abarcando los desafíos ambientales y climáticos que afectan la salud planetaria. A través de la perspectiva "One Health", discutimos cómo la bioética puede contribuir a la comprensión y reducción de los impactos del cambio climático, integrando las perspectivas de salud humana, animal y ambiental. El artículo revisita las contribuciones de Fritz Jahr y Van Rensselaer Potter en la formación del concepto de bioética, enfatizando la necesidad de una "bioética profunda" que destaca la responsabilidad intergeneracional y la justicia ambiental. Resaltamos la urgencia de políticas que no solo respondan a crisis inmediatas, sino que también anticipen futuras catástrofes, promoviendo una ética de precaución y sostenibilidad. Finalmente, se propone que la bioética, al adoptar un enfoque más amplio, pueda ofrecer respuestas adecuadas a los desafíos éticos impuestos por el cambio climático, asegurando que se implementen medidas preventivas y de mitigación de daños para proteger a las poblaciones vulnerables y promover una convivencia sostenible en el planeta.

Palabras clave: Ética. Cambio Climático. Salud Única. Justicia Ambiental.

1 Introduction

As we face an era of unprecedented environmental challenges, the consequences of climate change have become increasingly visible and devastating (EBI ,*et. al.* 2021). Among these events, the floods in Rio Grande do Sul in 2023 and 2024 stand out as a reminder of our collective vulnerability and the urgent need for

effective political action (UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, 2024). These events are not just natural phenomena but are products of human activity that alter the climate on a global scale, endangering biodiversity and the sustainability of human life (SHIVANNA, 2022).

In this context, traditional bioethics, which focuses on (bio)medical dilemmas and individual health issues, is challenged to broaden its scope of analysis. Integrating environmental and climatic perspectives into bioethics is crucial to address the intrinsic relationships between human health, animal health, and planetary health, an approach known as "One Health" (BOUDREAU LEBLANC ,*et. al.* 2022; LINDENMAYER ,*et. al.* 2022). This comprehensive view is fundamental not only to respond to immediate crises such as pandemics and natural disasters but also to positively influence the future of planetary health by guiding public and social policies toward a more sustainable and adequate path (CAPPS, 2022).

The need for a "deep bioethics" that encompasses these new dimensions is highlighted by the words of José Lutzenberger, a biologist from Rio Grande do Sul, who in the 1970s warned about the consequences of our environmental negligence according to past flooding in RS during the 1940s: "If today the damage is immense and the dead are counted by the hundreds, it will not be long before the stricken and dead will total millions. We are incapable of learning from our mistakes. Nature's increasingly dramatic warnings are of no use" (LUTZENBERGER, 1974). This anticipatory vision not only resonates today with renewed urgency but serves as a call to action to integrate ethical considerations into discussions on climate change and environmental management.

Ulrich Beck's risk society theory serves as a key reference for analyzing how modernity has created new types of global risks that transcend national and social boundaries (BECK, 1992). The sociologist argues that industrial modernity has brought a series of manufactured industrial risks that differ from natural risks due to their complexity, invisibility, and potential to cause catastrophic damage that does not respect the logic of geographically delimited territory (BECK, 1999). These risks require new forms of management and responsibility, highlighting the need for an ethical approach that incorporates precaution, intergenerational responsibility, and environmental justice into its considerations (BECK, 2013). This framework will be used to understand the ethical and social challenges posed by climate change and the political responsibilities associated with these challenges.

In light of this complex and challenging scenario, the objective of this article is to explore how bioethics can address contemporary environmental and climatic problems from a perspective that integrates human, animal, and planetary health. We aim to demonstrate the importance of an interdisciplinary approach that transcends the traditional boundaries of bioethics to include issues of environmental justice, intergenerational responsibility, and sustainability in its scope of analysis. By using the 2024 disaster in Rio Grande do Sul as a case study, this article aims not only to highlight policy failures and urgent action needs but also to propose ethically appropriate guidelines that can guide public policies and sustainable practices. In this way, we intend to contribute to a broader and deeper dialogue about bioethics' ability to propose a future in which planetary health and global justice are achieved, thus ensuring the well-being of present and future generations.

2 The Sociology of Ulrich Beck and Anthony Giddens: Risk Society and Climate Change Policy

As the contemporary world faces unprecedented challenges related to climate change and environmental degradation, bioethics finds itself at a critical point of transformation. Ulrich Beck, in his risk society theory, argues that modernity has created new types of global risks (BECK, 1992). Climate change exemplifies these risks, which are amplified by the uncertainty and complexity of ecological, economic, and social interactions and their impacts at local and global levels (BECK, 1999). Beck highlights that in a risk society, dangers are no longer limited to local accidents but become global threats that require new forms of risk and uncertainty management and responsibility (BECK, 2013). The risk society demands new ethical approaches to manage and reduce these global risks.

Beck's theory also emphasizes that modern risks are an inexorable consequence of industrialization and modernization (BECK, 1992). They are characterized by their invisibility, complexity, and potential to cause catastrophic damage on a global scale. These risks require a reassessment of traditional ethical principles and a greater emphasis on precaution, intergenerational responsibility, and environmental justice. Beck argues that risk management must be transparent and democratic, involving the active participation of all stakeholders, especially the most vulnerable communities (BECK, 1992; 1999; 2013).

Anthony Giddens also contributes significantly to the discussion on climate change policies. Giddens argues that climate change policy needs a "present-future politics," where long-term actions must be integrated into public and social policies immediately and effectively. The author emphasizes that climate risks are intrinsically global and require international cooperation and global governance to be effectively mitigated. Giddens notes that it is essential to develop new forms of democracy that allow the inclusion of future generations in current political decisions (GIDDENS, 2013).

Beck and Giddens' perspectives complement the bioethical approach by highlighting the importance of public and social policies that consider precaution, environmental justice, and intergenerational responsibility. By integrating these perspectives, bioethics can provide a theoretical framework that accounts for the complexity of the topic to address the ethical challenges of climate change, promoting preventive and mitigating actions that protect the most vulnerable populations and ensure a sustainable future for all.

3 The Evolution of Bioethics: From Classical Problems to the Perspective of Planetary Health

Several bioethicists have highlighted the necessity of integrating environmental concerns into bioethics, given the intrinsic link between human health and the health of our environment. The field has increasingly recognized that climate change is not only an environmental issue but also a bioethical emergency that demands immediate response. This perspective emphasizes the need for bioethics to transcend individual care and incorporate global environmental justice. The traditional principles of bioethics are being challenged by the complex

interdependence between humans and the environment, necessitating a new paradigm that reflects this interconnectedness (RESNIK, 2009; MACEDO, 2023; MACPHERSON, 2013). This point is reinforced by the Nuffield Council on Bioethics (NUFFIELD COUNCIL ON BIOETHICS, 2023), which proposes an ethics that integrates the social and ecological dimensions of health.

The case of Hurricane Katrina, as explored by Jonathan D. Moreno, is a recent historical example of how contemporary bioethics failed to foresee and adequately respond to crises with both individual and collective ethical dimensions (MORENO, 2005). Jennifer Bard (2005) suggests that bioethics and public health should work together to address inequalities and promote more equitable health, considering both individual and community needs in times of environmental and health crises. Finally, Warwick Anderson (2023) proposes a rethinking of bioethics that integrates indigenous knowledge and ecological philosophical practices, promoting safe and sustainable cohabitation on the planet. The approach proposed by these researchers reiterates the need for a bioethics that not only responds to immediate crises but also actively participates in the formulation of preventive and resilient sustainable public policies and practices that ensure planetary health and, by extension, human health. Therefore, the need for comprehensive bioethics that directly addresses the challenges posed by climate change and environmental degradation has never been more urgent.

To better understand how bioethics has a strong environmental component and can contribute to this discussion, it is important to revisit the contributions of Fritz Jahr (MUZUR & SASS, 2017) and Van Rensselaer Potter (1970), who coined the term "bioethics" in 1926 and 1970, respectively. The authors expanded the ethical discussion beyond the human, proposing to integrate biological/scientific and philosophical/humanistic knowledge (POTTER, 1971; SASS, 2007). It is an integrative perspective of life and living (GOLDIM, 2009).

By proposing "deep bioethics" (POTTER & WHITEHOUSE, 1998; WHITEHOUSE, 2001) in an interdisciplinary and pragmatic approach, Potter took up the discussion of human health challenges and environmental issues in their broadest sense in an anticipatory perspective of what is now known as "One Health" (CAPPS, 2022; LINDENMAYER *,et. al.* 2022). Additionally, Potter emphasized the need for an "ethical bridge" that connected biological sciences and human values, providing a way to address global challenges such as climate change and the survival of the human species and all living beings (POTTER, 1971). His vision of global bioethics, which could also be called comprehensive bioethics (CHURCHILL & SCHENCK, 2021), guided by the concept of sustainability, is more relevant than ever in the current context of extreme climate events and political decisions regarding addressing new events of this nature and magnitude.

Fritz Jahr's bioethics expanded the ethical discussion to plants, animals, and nature (GOLDIM, 2009; MUZUR & SASS, 2017; SASS, 2007). Potter's bioethics emphasizes the responsibility of governments and communities to future generations, promoting preventive and mitigating actions to preserve the environment (POTTER, 1971; POTTER & WHITEHOUSE, 1998). This vision is grounded in Hans Jonas' ethics of responsibility (JONAS, 1984), which was acclaimed at the United Nations Conference on Environment and Development held in 1992. Much was discussed, much was publicized, but little was done. This bioethics framework

can serve to analyze the recent climatic events in Rio Grande do Sul. More than one and a half million people affected, dozens of entire cities devastated, and a large number of people, animals, and plants destroyed (SAVARESE & PESSOA, 2024).

4 Disaster in Rio Grande do Sul in 2024: A Case Study Based on Data from the United Nations Office for the Coordination of Humanitarian Affairs

In context of the staggering scenario of climate change and its impacts, we would like to draw attention to the urgent need to address and reflect on the bioethical issues related to the recent extreme climatic events in the state of Rio Grande do Sul, Brazil (BUSCHSCHLÜTER, 2024; CNN WORLD, 2024). The floods and extratropical cyclones that devastated the region in 2023 and struck the state again in May 2024 (IONOVA, 2024; SAVARESE & PESSOA, 2024) caused dozens of deaths and displaced thousands of people. This event had a direct relationship with global climate change (CHAGAS *,et. al.* 2022; MARENGO *,et. al.* 2023), which has been neglected by society, especially by businessmen and politicians who should have the responsibility to formulate actions for prevention and damage mitigation.

The floods in Rio Grande do Sul in May 2024 affected 23 million people, with the disaster spreading across 469 of the 497 municipalities in the state, equivalent to almost 90% of the state's territory. The intense rains resulted in a devastation scenario comparable to a category 5 hurricane, with precipitation levels corresponding to the monthly average in just one week (UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, 2024). This sudden increase in river levels caused the collapse of temporary structures and failures in drainage systems.

About 200,000 houses were affected, with half of them completely destroyed, leaving more than 600,000 people homeless, of whom more than 56,000 are in temporary shelters. Additionally, 90% of commercial and industrial businesses suffered partial or total losses, severely affecting the local economy (UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, 2024).

Moreover, the cities' infrastructure suffered significant damage, with roads damaged or blocked, interrupting the transport of supplies and causing substantial delays in resource distribution to the population. Temporary bridges and walkways were destroyed again, isolating entire communities. The educational system was also heavily impacted, with 381,000 students and 1,066 schools affected. It is estimated that approximately 87,000 students were impacted, and 54 schools are being used as shelters (UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, 2024), numbers that may still increase.

The public health situation is concerning, with the population facing deteriorated living conditions and a rapid increase in confirmed cases of leptospirosis. The arrival of winter and low temperatures further aggravate the situation, increasing the incidence of respiratory diseases (UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, 2024). The health response to this scenario includes the mobilization of health centers and actions to meet urgent needs, integrating Ministry of Health employees and supporting local NGOs. The reconstruction of Rio Grande do Sul will require a coordinated and multifaceted approach to mitigate the economic, social, and health impacts of the floods, ensuring

that the most vulnerable communities receive the necessary support to recover and thrive.

Some bioethical principles can guide the analysis of recent extreme climatic events as well as their prevention and associated damage reduction strategies:

- Precautionary Principle: Political decisions must be made based on the worst possible scenarios, even in the face of scientific uncertainties, to establish measures that can minimize potential damage to affected populations (DINNEEN, 2013).
- Intergenerational Responsibility: Political and societal decisions must ensure that future generations are not harmed by the unsustainable use of natural resources and current economic and industrial policies (ANDINA, 2018).
- Environmental Justice: The most vulnerable populations, especially economically, have the right to effective participation in decisions that affect their lives, particularly those related to a safe environment (HARRIS, 2024).

The recent climatic events in Rio Grande do Sul highlight the urgent need for an integrated and ethical approach to climate change management. This article proposes that bioethics, by incorporating these dimensions, can play a crucial role in promoting public policies that not only respond to immediate emergencies but also mitigate future risks.

5 Political Decisions and Bioethical Repercussions

Public policies and political decisions regarding the effects of climate change have profound bioethical repercussions at local, community, and global levels (DWYER, 2019; HARRIS, 2024). Environmental justice, which seeks to reduce socioeconomic inequalities and vulnerabilities associated with climate change impacts, is an important prism for analyzing these events (DWYER, 2019).

The lack of effective alert systems and resilient and welcoming infrastructure exposed and exposes vulnerable communities to the risk of death and loss of property (OTTO ,*et. al.* 2017). Children, the elderly, and low-income populations are disproportionately affected, increasing social inequalities (BIRKMANN ,*et. al.* 2022). Another point to highlight is the insufficient response to the mental health of victims, including anxiety and post-disaster trauma (WHITE ,*et. al.* 2023). These issues reinforce the need for a bioethical approach to address the needs of affected populations, especially the most vulnerable ones. Negligence in implementing prevention and damage mitigation policies, such as strengthening alert systems and relocating populations in risk areas, has resulted in disproportionate damage to indigenous and rural communities (CAIRNEY ,*et. al.* 2023). The disregard for involving affected communities in formulating response and recovery strategies demonstrates a lack of consideration for the dignity and autonomy of the people living there (SALVADOR COSTA ,*et. al.* 2022). Scientific denialism and political omission regarding the need to reduce greenhouse gas emissions highlight the lack of global ethical-moral commitment to mitigating the effects of climate change (LEWANDOWSKY, 2021). The occurrence of extratropical cyclones and major floods in Rio Grande do Sul is just a planetary alert as they are not isolated or temporary events but part of a global climatic trend that requires coordinated and urgent actions to prevent and mitigate similar natural disasters in the near and distant future.

6 Conclusion

The recent episode of flooding in the state of Rio Grande do Sul shows how government neglect and scientific denialism can be analyzed through bioethics. The failure to implement effective public policies in preventing and addressing climatic events evidences the negligence of political actors who prioritize economic interests to the detriment of human and environmental well-being.

Thus, given the devastating impacts of climate change observed in the May 2024 disaster in Rio Grande do Sul, bioethics faces the challenge of expanding and adapting its scope of action. This article reaffirms that ethical issues related to the environment and public health are not merely complementary to the traditional interests of bioethics but are central to the future of this field and the next generations.

Climate crises exacerbate the need for a "global bioethics" as proposed by Potter and Jahr, which integrates considerations of human, animal, and planetary health. By adopting an ethic of precaution, intergenerational responsibility, and environmental justice, bioethics can and should play a crucial role in formulating public policies. These policies must not only respond to current emergencies but also foresee and prevent future crises.

Thus, it is essential that bioethics promote an ethic of global solidarity and justice, ensuring that no population, particularly the most vulnerable, is disproportionately affected by the adverse effects of climate change. Bioethicists have a duty to act as intellectual and moral leaders, instigating significant changes in global policies and practices to combat and mitigate the impacts of climate change.

We also conclude that bioethics, as a bridge between various disciplines and communities, is essential to facing the ethical challenges of the 21st century. The engagement of the bioethical community is imperative to ensure a future where planetary health and global justice are a tangible reality for all generations. As active researchers in the field of bioethics, we have the duty to draw attention to the negligence of these actors and political agents and promote the discussion and implementation of strategies that are fair, inclusive, and centered on vulnerable communities.

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