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The new climatic regime and migratory dynamics on the North Coast of Rio Grande do Sul

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Abstract
This article aims to discuss climate change based on the extreme events recorded in Rio Grande do Sul in May 2024: floods, landslides, and the rise in the level of Lake Guaíba, which surpassed the historic flood of 1941. We reflect on the reality of the North Coast, from the standpoint of the impacts generated by extreme events, but mainly, considering the fact that the region has been assuming a role of welcoming what we can call climate refugees. Methodologically, it is an exploratory study, based on a bibliographic and documentary review. We conclude that the North Coast needs to be prepared to care for its population, its ecosystems (rich, fragile and dynamic) and the masses of people who systematically (in the summer) or exceptionally (extreme events) occupy small coastal cities, transforming them into medium-sized cities.

Key words: Climate change. Territorial resilience. Climate refugees. Climate migrants. Imagined futures.

O novo regime climático e as dinâmicas migratórias no Litoral Norte do Rio Grande do Sul

Resumo
Este é um artigo que discorre sobre as mudanças climáticas a partir dos eventos extremos registrados no Rio Grande do Sul em maio de 2024: enxurradas, cheias, deslizamentos e a elevação do nível do lago Guaiba, que superou a histórica enchente de 1941. Refletimos desde a realidade do Litoral Norte, do ponto de vista dos impactos gerados pelos eventos extremos, mas principalmente, ponderando sobre o fato da região vir assumindo um papel de acolhimento do que podemos chamar refugiados climáticos. Metodologicamente, é um

estudo exploratório, com base em revisão bibliográfica e documental. Concluímos defendendo que o Litoral Norte precisa estar preparado tanto para cuidar de sua população, de seus ecossistemas (ricos, frágeis e dinâmicos) quanto das massas populacionais que sistematicamente (no verão) ou excepcionalmente (eventos extremos) ocupam as cidades pequenas litorâneas, transformando-as em cidades médias.

Palavras-chave: Mudanças climáticas. Resiliência territorial. Refugiados climáticos. Migrantes climáticos. Futuros imaginados.

El nuevo régimen climático y la dinámica migratoria en la costa norte de Rio Grande do Sul

Resumen
Este es un artículo que tiene como objetivo discutir el cambio climático a partir de los eventos extremos registrados en Rio Grande do Sul en mayo de 2024: inundaciones, inundaciones, deslizamientos de tierra y el aumento del nivel del lago Guaiba, que superó la histórica inundación de 1941. Reflexionamos desde la realidad de la Costa Norte, desde el punto de vista de los impactos generados por eventos extremos, pero principalmente, considerando que la región ha asumido el rol de acoger a lo que podemos llamar refugiados climáticos. Metodológicamente es un estudio exploratorio, basado en una revisión bibliográfica y documental. Concluimos argumentando que la Costa Norte necesita estar preparada tanto para cuidar de su población, de sus ecosistemas (ricos, frágiles y dinámicos) como de las masas de población que sistemáticamente (en verano) o excepcionalmente (eventos extremos) ocupan las pequeñas ciudades costeras. , transformándolos en las ciudades de tamaño medio.

Palabras clave: Cambio climático. Resiliencia territorial. Refugiados climáticos. Migrantes climáticos. Futuros imaginados.

1 Introduction

As Giddens (2010) did in the introduction to his book The Politics of Climate Change, we can say that this article is about nightmares, catastrophes and dreams. The expression "climate change" has long been part of our daily lives. It is present in academia, the press, politics, social movements, the business world and so many other spaces.

Although climate change is a natural process on the planet, the emissions of gases produced by modern industry, which sustains our consumer society, are causing the Earth's climate to heat up more quickly, foreshadowing potentially devastating consequences in the future (Giddens, 2010). We seem to be living in the future.

The place we are talking about is Rio Grande do Sul. Although there have been records of extreme weather events over the years, in the light of the historic flood of 1941 in the capital, the various floods of the Caí, Uruguay and many other rivers, the droughts and dry spells that have an impact on the state's agriculture, in May 2024 we were faced with a flood that far exceeded that of 1941. If 84 years ago the level of the Guaíba reached 4.76m, in the early hours of May 5 this year it reached 5.35m. The heavy rains began on April 29 and continued throughout May. The large volume of rainfall in the state led 357 municipalities to declare a state of emergency and another 91 to declare a state of public calamity, affecting 862,564 people (MUPRS, 2024).

Some 2,398,255 people were affected and 581,638 displaced. Of these, 81,403 ended up living in shelters, with 3,001 still in this condition in August. 806 people were injured and 183 deaths were confirmed. In all, 478 municipalities reported human and/or material damage, and 149 sections of 63 highways were blocked. There were 84,598 rescues of people and 15,108 rescues of animals. Peak employment of personnel and auxiliary forces reached 32,145 people, 3,857 vehicles, 83 aircraft and 83 vessels. It is estimated that 2,398,255 people were affected by the May disaster (Civil Defense RS, 2024).

In the region of the Regional Development Council (COREDE) Litoral, the focus of this study, 15 of the 21 municipalities were affected. There were 3,210 people affected, representing almost 1% of the region's population. The most affected municipality was Maquiné, with 2,704 people affected, representing 36.5% of the total population (MUPRS, 2024).

Despite these impacts, what is striking is the flow of people to the region in search of refuge, a phenomenon similar to that which occurred during the Covid-19 pandemic. While the waters of the Guaíba didn't recede and it wasn't possible to start the clean-up work, as well as the re-establishment of services such as water and electricity, thousands of people settled - temporarily or not - on the North Coast. During this period, the region reflected the landscape of the high summer season, when the population swells to 140% of the total population of the coastal region during the low season (Zuanazzi, Bartells, 2016).

We intend to focus on this phenomenon. Forced migrants, climate migrants, climate refugees, people displaced by the May disaster. Although forced human displacement for environmental reasons is not new in scientific terms, it is new for the region.

It should be noted right away that, although there is no consensus on what the term disaster means, as explained in the book Sociologia dos desastres [Sociology of Disasters], organized by Valencio, Siena, Marchezini and Gonçalves (2009), and recognizing that this is a polysemic term, we will adopt Valencio's concept of disaster in chapter 3 of this book: disaster is configured as an unacceptable abnormality in the routine of a place for those who live there, but with a low endogenous capacity to recover from the losses incurred. It leaves open the question of the content of the social relations that make the affected groups, materially and socially, vulnerable in the face of a given threat factor. The disaster that can be transformed into a catastrophe, according to Valencio, depends on the strategies adopted by the civil defence agencies when they naturalize social separation and give the appearance of correctness to the technical practices of those who will be dispossessed.

Furthermore, Federal Law 14.750, enacted on December 12, 2023, to improve the instruments for preventing accidents or disasters and recovering areas affected by them, the actions for monitoring the risks of accidents or disasters and the production of early warnings, in section V of Article 2, defines disaster as "the result of an adverse event, of natural origin or induced by human action, on vulnerable ecosystems and populations that causes significant human, material or environmental damage and economic and social losses".

Therefore, disaster and catastrophe are terms that we intend to use to refer in a way that adheres to the perceptions that the data researched about the region of interest in this study gave us.

Methodologically, this article is an exploratory study, based on bibliographical and documentary reviews. These are still initial reflections on the course of a recent event, which impacted the local and regional, but shocked and mobilized people and institutions around the world. Theoretically, we have reflected on climate change, disasters and catastrophes, migrants and climate refugees, and territorial resilience. To describe the May disaster, we consulted the websites of the Civil Defense of Rio Grande do Sul (RS), the Rio Grande Single Plan Map (MUPRS), the Integrated Disaster Information System of the Ministry of Integration and Regional Development (S2iD-MIDR) and the International Organization for Migration (IOM). We also used digital newspaper clippings as a technique, forming news mosaics to illustrate the North Coast's status as a place of refuge.

This article is organized into four sections, in addition to this introduction. We begin by discussing the relationship between society, nature and climate change. We argue that climate change is just one dimension of the environmental crisis, which includes the enormous load of toxic chemicals, mining, the depletion of lakes and rivers, both below and above ground, the simplification of ecosystems and the great genocides of people and other beings. We defend the idea of coexistence with climate change, locally and regionally, pari passu with the perspective of territorial resilience. In the second section, we systematize a set of notions pertinent to people who are forced to move - environmental displaced persons, climate refugees, climate migrants, eco-refugees - due to extreme events, which tend to be more recurrent due to the environmental crisis. Although there is no consensus, it is essential that we have a clearer definition of this phenomenon, in order to support people who have been displaced socially, economically, politically and legally. In the third section, we present data on the impacts of extreme events on the North Coast and on climate migrants who have turned the region into a refuge. Finally, there are concluding remarks and bibliographical references.

2 The local, the regional and climate changes

The extreme weather events that took place in Rio Grande do Sul in 2023 and 2024 not only marked the statistical history of such phenomena in the country, but also externalized the "New Climate Regime" (Latour, 2020). The ways of responding to these anthropogenic actions in a capitalist scenario of technological progress, institutional change, division of labor, population growth and cultural transformation should be at the center of debates on the "temporal order" as the prevailing cognitive orientation of actors in relation to the time horizons of their economic activities (Bourdieu, 1979).

Imagined futures (Beckert, 2016) are truly open and undefined in the context of climate change in a dynamic of transformations in the modern world. The disastrous events of September 2023 and May 2024 bring to people's daily lives the natural reaction of laws that are not written by human beings, but which mark the spontaneous reaction of nature. Anthropogenic interventions over time have become clear to society and have established the need for new milestones that have

been scientifically prescribed since Stockholm in 1972, and which are currently guiding the 2030 Agenda Challenges.

We can't ignore the fact that it was only with the 2030 Agenda that human rights began to dialog with sustainability, with an emphasis on the right to development, conditional on the need to also ensure and guarantee that future generations can have even more rights and opportunities than current ones, the essence of the adjective sustainable when applied to development. The rhetoric of international relations, within the framework of the United Nations, leads us to believe that sustainable development is already the great contemporary utopia. However, if the criterion is global governance, this conclusion becomes inconsistent. As much as environmental governance bodies and institutions have evolved, they remain far removed from those that promote development governance. For this reason, there is no global governance of sustainability, unless we understand this notion as being restricted to the environmental issue (Veiga, 2017).

The power of human beings acting on the earth at all times unmasks the need for attention, respect and care for the natural environment. Human and natural connections are exposed and require changes in behavior from those who have taken the place of water and forests and set new milestones in society's relationship with nature, in a clear context of the Anthropocene. Humanity has affected the biogeophysical limits of the planet to the point of exposing the ills of the hegemonic economic system on society.

People started this discussion very early and dynamically, even before they/we were called Homo sapiens, argues Haraway (2016). The relevance of calling it the Anthropocene, Plantationocene or Capitalocene (Andreas Malm and Jason Moore's terms) has to do with scale, rate/speed ratio, synchronicity and complexity. The constant question when considering systemic phenomena has to be: when do changes of degree become changes of kind? And what are the effects of bioculturally, biotechnologically, biopolitically and historically situated people in relation to, and combined with, the effects of other species arrangements and other biotic and abiotic forces? No species, not even our own, acts alone; arrangements of organic species and abiotic actors make history, both evolutionary and otherwise (Haraway, 2016).

But is there a tipping point of consequences that changes the name of the game of life on Earth for everyone and everything? It's about more than climate change; it's also about the enormous load of toxic chemicals, mining, depletion of lakes and rivers, below and above ground, simplification of ecosystems, major genocides of people and other beings, etc., in systemically linked patterns that can generate repeated and devastating system collapses. The recursion can be terrible (Tsing, 2005). The inflection point between the Holocene and the Anthropocene could eliminate most of the refuges from which diverse groups of species (with or without people) can be reconstituted after extreme events.

We are living through an environmental crisis taken to extreme levels by neoliberal capitalism, which has transformed nature and natural wealth into natural resources and raw materials (Rodrigues, 2005) appropriated by a small portion of society. These unequal opportunities lead to degrading conditions from which subjects - human and non-human - find it increasingly difficult to escape (Oliveira, Lopes Júnior, Batista; 2023).

The Anthropocene is more of a limiting event than an epoch, like the K-Pg boundary between the Cretaceous and the Paleocene. The Anthropocene marks serious discontinuities: what comes after will not be like what came before. Our job is to make the Anthropocene as short and tenuous as possible, and to cultivate with each other, in every way imaginable, eras to come that can reconstitute the refuges. Right now, the Earth is full of refugees, human and non-human, and no refuges. What we need is a name for the ongoing dynamics of forces and powers, of which people are a part, within which this process is at play. Perhaps, but only perhaps, and only with intense commitment and collaborative work with other terrans[1], will it be possible to make rich multi-species arrangements, that include people flourish (Haraway, 2016).

At no time in human history have the vulnerable been so exposed and subjected to risks in terms of their survival. Nor can we fail to observe that climate disasters singularize the human condition and turn it into a generic occupying species. In this new period in the planet's history, environmental degradation is a reflection of a 9.2-fold increase in the world's population, boosted by intensified consumption and waste disposal, exceeding the capacity of the natural environment to withstand the presence of man, imposing a debt on nature in the face of the heavy-handedness that has unbalanced it. The multiple disasters recorded in recent years around the world are a reflection of the destruction of 15 billion trees a year (Crowther, 2015) and the end of the sponge effect. Not to mention the degradation of the water and land needed to feed the ever-growing human population.

"There are discussions we had more than 10 years ago and almost nothing has changed". Ricardo Ojima (DDCA/UFRN) said this in an interview with the Agecom/UFRN website on May 15, 2024, about the environmental crisis we are currently experiencing in Brazil, especially in Rio Grande do Sul, but which has been discussed around the world for decades. Although isolated initiatives have taken place over the years, especially since the publication of the IPCC's 4th report - Impacts, Adaptation and Vulnerability - in 2007, a more robust policy framework has not been put in place to tackle the climate emergency. "Facing these challenges requires a medium- to long-term commitment and this is not a tradition in the formulation of public environmental policies in Brazil. The Brazilian legal framework is relatively well formulated, but there is still a lack of initiatives that transform what the legislation says and the implementation of policies" (Ojima, 2024).

The 2022 Census revealed that Brazil's population growth trend is already stabilizing and in RS around 40% of municipalities reduced their population between 2010 and 2022. However, in 94% of Rio Grande do Sul municipalities there was an increase in the number of permanent occupied households. This means that although the population is no longer growing in almost half of the municipalities, people are living in more and more households, reducing the average number of residents per household, adding that in RS the highest average is 3.1 residents per household in Arroio do Padre and 2.3 in Pinheiro Machado (Ojima, 2024).

This data points to a more extensive occupation of urban space, even with a shrinking population, which is a reflection of the fall in the birth rate, where families are getting smaller and smaller. This has a lot to do with the topic we are discussing,

[1] Humans and non-humans.

as the city's urban area is growing despite population growth, which increases the waterproofed area of the city, urban occupation is moving towards more remote and less dense areas; the very capacity to rescue people in critical situations becomes more complex with the population occupying a larger area. In short, just one example of data that says a lot about the challenges ahead and which is often overlooked in municipal management, since municipalities are very concerned about their population growing, as this increases their share of the Municipal Participation Fund (Ojima, 2024).

While the greenhouse earth and biodiversity are being destroyed, society needs to find other developments, different from the current one, in which population growth is necessary for economic growth. As Daly (2004) rightly argues, it is impossible to escape poverty and environmental degradation through global economic growth. In other words, "sustainable growth is impossible". In its physical dimensions, the economy is an open subsystem of the earth's ecosystem, which is finite, non-growing and materially closed. As the economic subsystem grows, it incorporates an ever greater proportion of the total ecosystem and must reach a limit of 100%, if not before. Therefore, its growth is not sustainable.

"Today's healthy economy is tomorrow's dystopian misery" (Casey, 2019) and, although the global south is the main part of the planet 'victimized' by the consequences of climate disasters, it shows no signs of this healthy economy, demonstrating that coloniality influences different dimensions of the way of life on the planet.

If the global governance of sustainable development fails to curb climate change, it seems that countries, states and regions are left to live with it. But not simply put up with it and wait for exogenous responses. This is because sustainability requires multi-scale actions. We are referring to something similar to the notion of coexistence with the Brazilian semi-arid region. This notion places the region as a space of potential and represents an important guiding paradigm in the discussion of sustainable development in the semi-arid region. It means embracing a development proposal that affirms that the Semi-Arid is viable, that its people are intelligent and capable, and that the nature of the Semi-Arid is rich and possible, provided that human beings relate to it in a respectful way and that there are appropriate public policies (Marinho; Oliveira, 2013; Conti; Schroeder, 2013).

Therefore, living with climate change does not mean simply waiting for global governance to act, but acting. Acting on the scale that is possible. Living in a respectful and cautious way with nature, with regional ecosystems. Ecosystems as socially constructed places, in the light of what Escobar (2005) says. The core of ecosystem management is to guide decisions affecting a place using an abundant knowledge of it's natural and cultural history. Decisions about resources should be guided by an understanding of all the social processes that define, structure and alter the meaning of landscapes.

Ecosystem management is matched by territorial resilience, which goes beyond the dimensions of resistance and adaptability to evolutionary resilience. It means focusing on re-evaluating the relationship between society and nature in a systemic vision. From a practical point of view, the resilience paradigm reorients diagnosis. It proposes a new matrix of principles that can enable sustainability as a civilizational goal (Gonçalves, 2018).

Territorial resilience rejects a pro-resistance interpretation (maintaining or recovering equilibrium positions) and advocates a systemic and evolutionary vision. It focuses on adaptive capacity, insofar as it makes it possible to embody the differences between regions, cities, localities, communities or companies, to orient themselves towards change, whenever shocks occur (or not) in the development matrix, in the structure of local markets (and external relations), in the technological framework, in governance models and in the nature of political (decisions). Adaptive capacity envisages choices that influence the quality of life of populations, in our view, both human and non-human.

Since the imagined futures are as open as the global governance of climate change, it seems that it is up to us locally to learn to live with the environmental crisis through territorial resilience. It is with this perspective that we continue our discussions, reflecting on the dimension of population displacement caused by climate disasters.

3 Climates migrants

The May disaster prompts us to reflect on a dimension that until then had not been part of the state's reality, internally displaced persons (IDPs)[2] for climate reasons.

There is no consensus in conceptual and legal terms to designate people who move for climate reasons. They can be called environmental displaced persons, climate refugees, climate migrants or eco-refugees.

In Federal Law 14.750, enacted on December 12, 2023, and referred to earlier in this article, Art. 2(III) states that the concept of homeless person is "a person who has been forced to leave their home temporarily or permanently due to preventive evacuations, destruction or serious damage resulting from an accident or disaster and who needs shelter provided by Sinpdec or by the entrepreneur whose activity caused the accident or disaster" and Art. 2(IV) states that the concept of homeless person is "a person who has been forced to leave their home temporarily or permanently due to preventive evacuations, destruction or serious damage resulting from an accident or disaster and who does not necessarily need shelter provided by Sinpdec or by the entrepreneur whose activity caused the accident or disaster". 2, the concept of displaced person as "a person who has been forced to leave their home temporarily or permanently due to preventive evacuations, destruction or serious damage resulting from an accident or disaster and who does not necessarily need shelter provided by Sinpdec or by the entrepreneur whose activity caused the accident or disaster".

The International Organization for Migration (OIM) presents the following categories and concepts of the dimensions of human mobility:

[2] Internally displaced persons (IDPs) are those who have been forced to flee their homes as a result of conflict, violence or disaster and who have not crossed an internationally recognized state border. This number continues to rise as more people flee each year, increasing the number of those who have lived in displacement for years or even decades and have not yet reached a lasting solution.

Table 01: Categories and concepts of the dimensions of human mobility according to OIM

Disaster displacement
Movement of people who are forced or obliged to leave their place of origin or habitual residence as a result of a disaster or to avoid being affected by the effects of an immediate and foreseeable natural threat.
Migration for environmental reason
Movement of people or groups of people who, mainly due to sudden and gradual changes in the environment that negatively affect their lives or living conditions, are forced to leave their place of habitual residence, or decided to do so, temporarily or permanently, moving to other parts of their country of origin or habitual residence, or outside it.
Climated-related climation
Movement of a person or group of persons who, mainly due to a sudden or gradual change in the environment as a consequence of climate change, are forced to leave their place of habitual residence, or decided to do so, temporarily or permanently, within a country or across an international border.
Planned relocation
In the context of natural disasters or environmental degradation, particularly as a result of climate change, a planned process by which a person or group of people move or receive assistance to leave their homes or temporary places of residence, and settle in a new place where they are offered the necessary conditions to rebuild their lives.
Immobility for environmental reasons
This occurs when people or communities exposed to environmental changes are unable or unwilling to leave their usual places of residence. Staying in these places can be a voluntary decision to remain and adapt to these changes, or it can be forced, considering that these people or communities are "trapped" in a context of risk.

Source: IOM, 2023. Adapted by the authors.

Myers (1993) emphasizes the importance of definitions being easily understood and demonstrable (documentation and quantification) for decision-makers, managers and scientists. He therefore proposed a definition that separates economic migrants from "environmental refugees":

> Environmental refugees are people who can no longer lead a secure life in their homeland because of environmental factors of unusual scope. These factors include drought, desertification, deforestation, soil erosion and other forms of land degradation; resource deficits such as water scarcity, the decline of urban habitats through massive overloading of city systems, emerging problems such as climate change, especially global warming, and natural disasters such as cyclones, storms and floods, earthquakes, with impacts exacerbated by human mismanagement. There may be additional factors that exacerbate environmental problems and that often result, in part, from environmental problems: population growth, widespread poverty, hunger and pandemic disease. Other factors include poor development policies and systems of government that marginalize people in an economic, political, social and legal sense. In certain circumstances, a number of factors can serve as immediate "triggers" for migration, for example major industrial accidents and the construction of large dams. Of these multiple factors, several can operate together, often with aggravated impacts. Faced with environmental problems, the people involved feel they have no alternative but to seek a livelihood elsewhere, within their own countries or in other countries, on a semi-permanent or permanent basis (Myers, 1993).

The May disaster in Rio Grande do Sul, which forced people to move, temporarily or permanently, adds to the millions of people who move every year for similar reasons.

According to the *Global Report on Internal Displacement* (IDMC, 2024), on a global scale, internal displacement due to disasters in 2023 amounted to 26.4 million people, while displacement due to conflict and violence reached 20.5 million people. Brazil registered 745,000 internally displaced persons (IDPs) due to disasters, while violence and armed conflicts forced 16,000 people to leave their territories in the country.

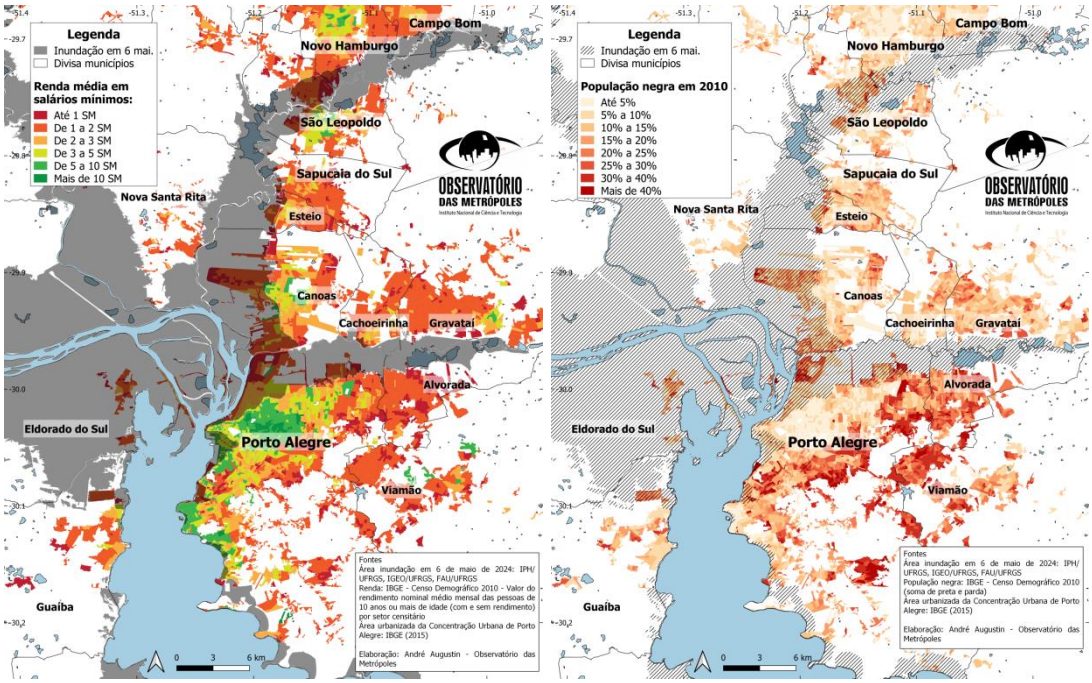
According to the IOM, environmental disasters are important factors in mobility in South America, which is suffering from the increased frequency and intensity of these phenomena:

> South America is a region with high exposure to the effects of climate change due to its geographical location and topography. The significant increase in average temperature in the region and other impacts of climate change (e.g. floods, droughts and storms) are amplified by socio-economic factors such as inequality, poverty, population growth and density, as well as changes in land use linked to deforestation and the consequent loss of biodiversity (environmental degradation) (IOM, 2023).

Human beings' intense and progressive use of natural resources is not only predatory, but also creates vulnerability for a significant portion of the population. Social strata experience the effects of the degradation of the planet in different ways, in search of goods. These experiences shape environmental inequality, in that the socially and economically disadvantaged are the ones most deeply affected by the effects of the crisis (Oliveira, Lopes Júnior, Batista; 2023).

The May catastrophe is an example of this environmental inequality, or environmental injustice (Acselrad, 2010), as it shows the unequal exposure to risk resulting from the logic of wealth accumulation, which leads to the environmental penalization of the most dispossessed. The following figure, which relates income and color/race of the population affected by flooding in the metropolitan region of Porto Alegre, shows this condition.

Figure 01: Relationship between income and color/race of the population affected by floods in the Porto Alegre metropolitan region in May 2024



Source: Observatório das Metrópoles, 2024.

With a few exceptions, the images show a predominance of people with incomes of up to three minimum wages and black and brown people in the flooded areas. In other words, even though the floods have also affected middle- and high-income earners, the vulnerable population has been hit hardest and will find it more difficult to get back on their feet. People often look to migration to other regions as a way of rebuilding their lives.

However, there are difficulties in terms of access to disaggregated, regionalized data on the internal displacement of people due to climate change, disasters and environmental degradation in Brazil. The IOM's report *Mechanisms and sources of data on human mobility in the context of climate change, disasters and environmental degradation in South America* recommends that Brazil include categories relating to environmental and climatic factors in migration data collection instruments (entry and exit cards, censuses, household surveys) that can highlight these types of movements, whether they are sudden (floods, storms, etc.) or slow-moving (droughts, desertification, etc.). It also suggests developing specific statistics on human mobility associated with these factors, both internal and cross-border, which should be integrated with population, socio-economic and environmental statistics (IOM, 2023).

As a result of the May disaster, there were migratory flows to two regions in particular, the Serra Gaúcha metropolitan area and the North Coast. Despite the difficulty of finding official and systematized data on IDPs resulting from the May disaster, we will present some reflections on the North Coast.

4 The North Coast: from floods to refuge

The North Coast stands out, on the one hand, for being the region of the state with the highest population growth and, on the other, for sun and beach tourism, which increases the population of the coastal municipalities by two to three times

during the high season. It is a very rich region from an environmental point of view. Due to its recent geological age, its ecosystems are fragile and rare. There are few regions on the planet with such long, straight, continuous beaches. The geological process, still in transformation, shows a sequence of environments of special landscape value and biological productivity. The string of lagoons, the dune barriers, the marshes and the foothills of the Serra Geral give the region a unique setting on the Latin American continent. Over time, inappropriate urbanization has caused damage to the population and the environment (FEPAM, 2000).

The 21 municipalities of COREDE Litoral are centers of attraction for internal migration, representing demographic growth of 1.98% per year, higher than the average for the state of Rio Grande do Sul of 0.49% per year, with the municipality of Xangri-lá standing out with a rate of 4.25% per year (SEPLAN-RS/DEPLAN, 2015).

According to the 2022 Census, of the 10 municipalities that grew the most in the state in terms of population compared to the 2010 Census, seven are located on the North Coast: Imbé (52%), Capão da Canoa (51%), Arroio do Sal (43%), Balneário Pinhal (38%), Cidreira (35%), Xangri-lá (32%) and Tramandaí (31%).

In addition, during the summer, the region's coastal municipalities double or even triple their population, as we mentioned at the beginning of this article. During the pandemic, this movement towards the North Coast was also recorded. It was the first time that the region served as a refuge, especially for the population of the metropolitan regions of Porto Alegre and Serra Gaúcha. This population shift has economic, social and environmental impacts: it increases water and energy consumption, and waste generation.

As far as a natural disasters in the region are concerned, the Strategic Regional Development Plan 2015 - 2030, drawn up in May 2017, makes the following note: windstorms or cyclones and flash floods occurred in practically all the municipalities between 1991 and 2010, with Maquiné and Três Forquilhas standing out, with seven recorded flash flood events. In the period as a whole, there were 46 windstorm and cyclone events, 47 of flash flood events and, to a lesser extent, drought (7 events), gradual flooding (7 events) and hail (5 events) (Participatory Strategic Plan - COREDE Litoral, 2017).

In the years 2023 and 2024, only five municipalities in COREDE Litoral did not record extreme events (Arroio do Sal, Cidreira, Imbé, Tramandaí, Xangri-lá). Below is a systematization of these events by municipality.

Table 02: Extreme events recorded in Corede Litoral (2023-2024)

Municipality	Extreme event	Date of occurrence	Municipality	Extreme event	Date of occurrence
Balneário Pinhal	Heavy rains	03/05/2024	Maquiné	Heavy rains	06/05/2024
	Heavy rains	28/09/2023		Flash flood	05/12/2023
Capão da Canoa	Flash flood	20/06/2023		Flash flood	17/06/2023
Capivari do Sul	Heavy rains	07/05/2024	Morrinhos do Sul	Flash flood	08/03/2023
Caraá	Heavy rains	08/05/2024		Heavy rains	06/05/2024
	Flooding	27/09/2023		Flash floods	06/12/2023
	Flash flood	18/06/2023		Flash floods	16/06/2023
Dom Pedro de Alcântara	Flooding	09/05/2024		Flash floods	15/03/2023
	Heavy rains	22/06/2023	Mostardas	Heavy rains	03/05/2024
	Flash flood	16/03/2023	Osório	Heavy rains	20/06/2023
Dom Pedro de Alcântara	Flooding	09/05/2024	Palmares do Sul	Heavy rains	06/05/2024
	Heavy rains	22/06/2023	Terra de Areia	Heavy rains	21/05/2024
	Flash food	16/03/2023		Heavy rains	21/06/2023
	Flash flood	16/03/2023	Torres	Heavy rains	02/05/2024
Itati	Heavy rains	02/05/2024		Heavy rains	20/11/2023
	Heavy rains	03/10/2023	Três Cachoeiras	Windstorm	07/05/2024
	Flash flood	19/06/2023		Heavy rains	22/06/2023
	Flash flood	07/03/2023		Windstorm	23/05/2022
Mampituba	Heavy rains	16/05/2024	Três Forquilhas	Heavy rains	05/05/2024
	Heavy rains	19/06/2023		Heavy rains	03/10/2023
				Heavy rains	20/06/2023
				Flash floods	13/03/2023

Source: S2iD, 2024. Adapted by the authors.

Of particular note are the disasters that occurred on June 15, 2023 in two municipalities in the region: Caraá and Maquiné. The following description is sourced from the Disaster Information Form (FIDE) of the Ministry of Integration and Regional Development's Integrated Disaster Information System (S2iD-MIDR).

In Caraá, a municipality of 7,313 inhabitants, there was a downpour on the night of the 15th which directly or indirectly affected the entire municipality. There was 240mm of rain in less than 24 hours. Its topography, formed by valleys with many streams, favored drainage by these streams. Eight localities were severely affected.[3].

The downpour caused immediate saturation of the soil and high-energy movement across the surface, increasing the flow very quickly, raising the level of the Caraá stream by approximately 5 meters, and the Sinos River, in the town of Rio dos Sinos, by 7 meters. This increase in flow caused the water bodies to overflow along their courses, causing the water to flow out of its bed and violently occupy the flood plain, uprooting trees, moving soil and stones, destroying or damaging buildings and urban infrastructure installations. It was estimated that more than 50 buildings were destroyed and another 200 damaged.

Three deaths were recorded as a result of the action of the torrent and the consequent destruction of the buildings where the people were. One person was injured after being swept away by the waters and managing to hold on to vegetation in the riverbed, becoming hypothermic and, after being rescued, being taken to hospital. The homeless were taken to a shelter set up at the Sentinela dos Sinos Gaucho Traditions Center. The municipality reported 2,960 people displaced and

[3] Vila Nova, Fundo Quente, Pedra Branca, Rio dos Sinos, Caraá Central, Passo da Pedra Branca, Arroio Guimarães, Passo do Marco.

another 4,306 directly affected. If we add up the people displaced and those directly affected, there are fewer than 50 people in the municipality left unaffected. In terms of economic damage, R$763,000.00 was recorded in the public sector and another R$20,150,000.00 in the private sector.

The municipality of Maquiné was affected by intense and voluminous rainfall: 175.6 mm on the 15th alone, and 119.8 mm on the 16th, totaling 320.2 mm in 48 hours. The downpour in the Maquiné river basin caused mass movements and landslides, transportation and concentration of sediment in the floodplain area, causing serious human, social and economic damage.

Maquiné has a population of 8,222 and its economy is based on agriculture and, more recently, tourism. The flood left around 50 families homeless and 1,950 families displaced. Directly affected were 6,219 people, 1,000 of whom were left isolated. There were three deaths. This climatic event caused a concentration of water inside homes, causing irreparable damage to furniture, household appliances, clothing in general, food and emotional memories. Some needed help to be rescued by volunteers and the Fire Brigade.

In addition to the roads, 500 houses were damaged and 15 destroyed, three bridges were damaged and another three destroyed, as well as culverts and wet crossings whose concrete structures were compromised. Surveys pointed to public economic losses of R$5,654,220.00 and private economic losses of R$52,200,000.00, especially in agriculture.

The extreme event in May 2024 affected 14 municipalities in the region, as shown in the table above. In subsequent months, other events impacted the region. According to the table below, in 10 municipalities the population accessed state government programs. A total of 538 grants benefited 1,367 people, amounting to R$1,312,500.00 from the Volta por Cima[4] program and SOS Rio Grande[5].

Table 01: State government program resources for the Corede Litoral population (2024)

[4] Volta por Cima is a state government program that provides one-off aid to affected families in the amount of R$2,500.00. More information at: https://sosenchentes.rs.gov.br/voltaporcima

[5] SOS Rio Grande is a program run by the state government that donates R$2,000 to families affected by the extreme events in May. More information at: https://casacivil.rs.gov.br/comite-gestor-do-pix-sos-rio-grande-do-sul-define-criterios-para-a-distribuicao-dos-recursos-doados.

Municipality	Volta por Cima Program			SOS Rio Grande Program		
	Total Aid	Peaple Served	Total Value (R$)	Total Aid	Peaple Served	Total Value (R$)
Balneário Pinhal	12	43	30.000	-	-	-
Capão da Canoa	1	2	2.500	-	-	-
Capivari do Sul	10	23	25.000	-	-	-
Caraá	5	10	12.500	-	-	-
Itati	51	153	127.500	-	-	-
Mostardas	8	17	20.000	-	-	-
Palmares do Sul	249	567	622.500	-	-	-
Terra de Areia	10	31	25.000	-	-	-
Três Forquilhas	10	33	25.000	-	-	-
Maquiné	121	328	302.500	61	160	122.000
Total	**477**	**1.207**	**1.192.500**	**61**	**160**	**122.000**

Source: MUPRS, 2024. Adapted by the authors.

Still on the subject of the May catastrophe, another issue had an impact on the North Coast. On the 5th of that month, the mayor of Porto Alegre advised residents of the capital to leave the city and take shelter on the North Coast, a region less affected by the rains. The justification was aimed at both water rationing and facilitating the access of humanitarian aid to the capital. From then on, the movement of people to the region intensified. The North Coast therefore served as a refuge for this population, as illustrated below.

Figure 02: North Coast as a refuge in the media

Isso sem contar os demais prejuízos. Em Maquiné, por exemplo, é prevista a quantia de cerca de R$ 9,6 milhões para o conserto de pontes, escolas, casas e ruas danificadas pelas chuvas. Além disso, o aumento populacional tem agravado a situação de todas as cidades do Litoral. Conforme a Amlinorte, a região recebeu 41.188 pessoas, as quais estão em abrigos, casas de amigos e/ou parentes, imóveis alugados. A superlotação fora de época tem ocasionado aumento nas demandas em todos os setores, principalmente nas áreas da saúde, o que tem gerado alerta aos cofres dos Municípios, ocasionando corte de gastos, como é o caso de Imbé.

Source: organized by the authors [6]

According to official data from the RS Department of Social Development, there is only one shelter on the North Coast, in the town of Capão da Canoa. But it is known that there were others, helped by people from the UFRGS Litoral academic community. Furthermore, the *website* Metrópoles, on May 13, 2024, reports: *As of this weekend, around 1,200 flood victims have already been assisted in Capão da Canoa. In Atlântida Sul, there were more than a thousand people. In Imbé, the number jumps to 5,000.*

As with the notion of climate migrants, there is no academic, political or legal consensus on the prospect of climate refugees. A term used for the first time in 1985 at the United Nations Conference held in Nairobi, Africa, it has not yet received adequate treatment to enable the protection of individuals who move in a state of vulnerability and need refuge due to the most varied environmental disasters and degradations (Costa; Piñeiro, 2022).

It is extremely difficult to measure the number of people who move to the North Coast, both in summer and at exceptional times such as the pandemic period and during the May catastrophe. Nevertheless, in the latter, it is possible to see that the people who moved to the North Coast during the floods can be grouped into three categories. The first refers to those who have a second home in the region (Barros, Souza; 2023) and usually travel to the coast (vacations, vacations, remote work). The second category refers to those who rent houses, apartments (common practice in the summer) or stay in hotels. According to the Sindicato de Hotéis, Bares e Restaurantes do Litoral Norte RS, hotels in the region were fully booked at the beginning of May, which represented around 20,000 people. Restaurants, on the other hand, saw a 20% increase in traffic over the same period.

The third category includes people who stayed with relatives and/or friends, or in the accommodation open during the period. We assume that most of the people who settled on the coast after the floods came from this category.

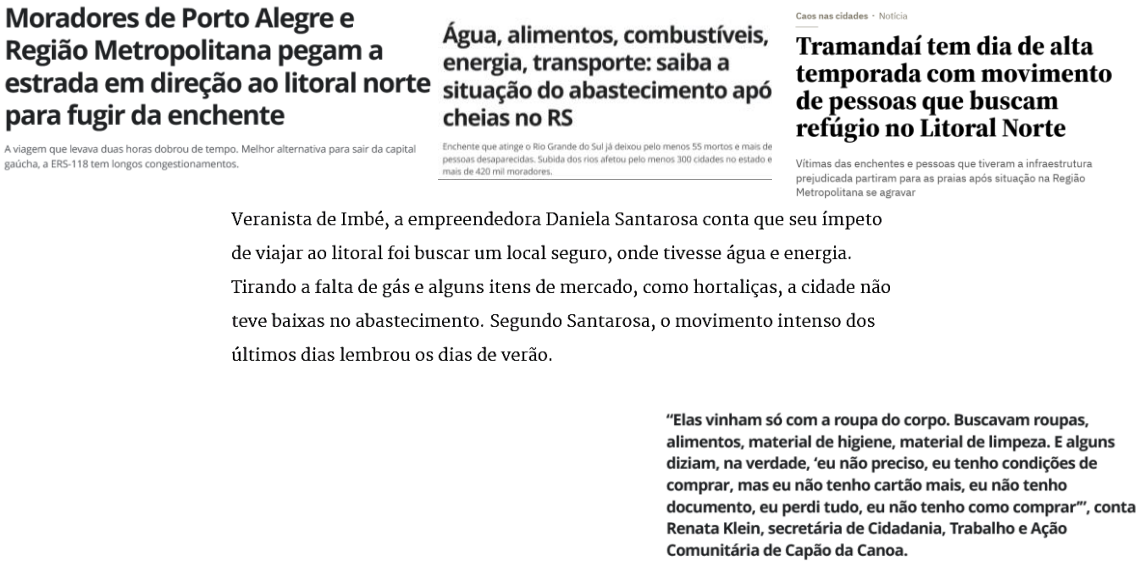
It is important to mention that not only the population directly affected by the floods moved to the North Coast, but also people who "fled the capital" due to the lack of basic services such as water, electricity and household waste collection.

Unlike the summer high season, this time the region was not prepared to receive the contingent of people who traveled. In addition to the traffic jams on the highways linking the Metropolitan region of Porto Alegre to the North Coast - which doubled travel times - there was a shortage of some products in local shops, such as

[6] ARAÚJO, Luiz Antônia. Refugiados da chuva' enfrentam inundações também no litoral gaúcho. BBC News Brasil. 13 May, 2024. Avaliable at:<https://www.bbc.com/portuguese/articles/ce5le8p7yvjo>. Accessed at: 28 May, 2024.
SANDER, Isabella. RS tem meio milhão de migrantes climáticos em razão da enchente; entenda o que é isso. GZH. 17 May, 2024. Avaliable at: <https://tinyurl.com/yvc5wky3>. Accessed on 28 May, 2024.
VASCONCELLOS, Hygino. Famílias buscam refúgio no litoral do RS: 'Saí só com a roupa do corpo'. UOL. 07 May, 2024. Avaliable at:<https://tinyurl.com/4427wtty>. Accessed on 28 May, 2024.
ELY, Lara. Enchente faz porto-alegrenses "fugirem" para o litoral apesar do frio. Metrópoles. 13 May, 2024. Avaliable at: <https://tinyurl.com/54afa4ym>. Accessed on: 28 May, 2024.
Presidente da Amlinorte apresenta dados da enchente na região em Brasília. Jornal Momento. Avaliable at: <https://tinyurl.com/3dkmsb82>. Accessed on 28 May, 2024.

fuel and water, for example. The latter item was massively sold both to people who had taken refuge in the region and for donations destined for the metropolitan region, as illustrated below:

Figure 03: Impacts of climate migrants on the North Coast - May 2024

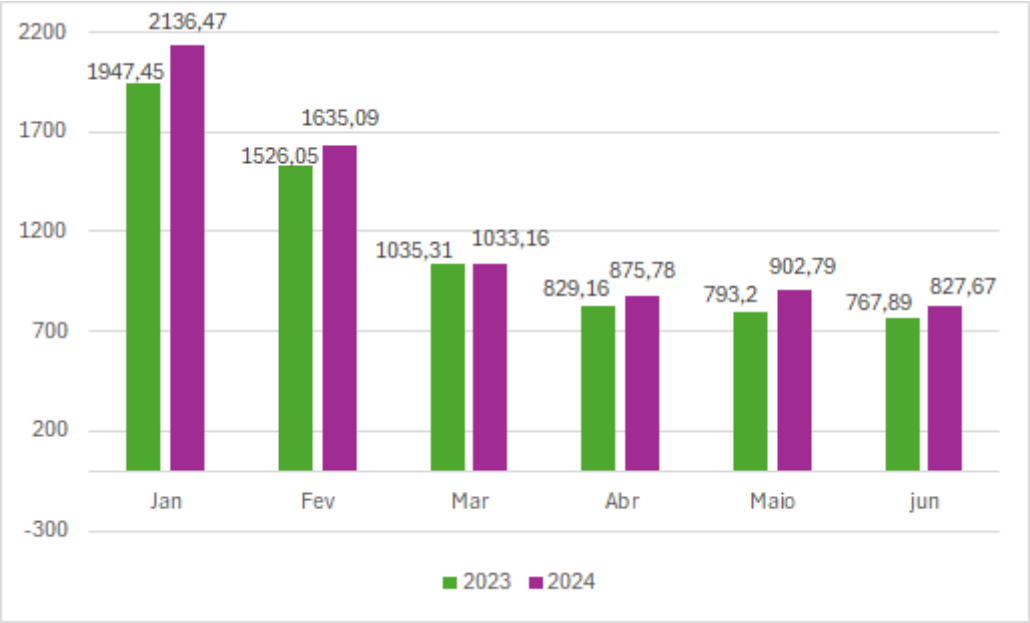


Source: organized by the authors [7]

One way of measuring the size of the displacement and its impacts is from the collection of solid household waste. Information provided by the Municipal Department of Urban Cleaning of the municipality of Imbé shows an increase of 9.7% in waste collected in January 2024 compared to the same period in 2023, which is equivalent to more than 189 tons. When comparing the month of May 2024 with May 2023, there is an increase of 14%, representing 110 of tons more waste collected by the municipality, a result of the use of the region as a refuge. The following graph illustrates the increase in waste generation in the municipality:

[7] PERACHI, Giulia. Water, food, fuel, energy, transportation: find out the supply situation after the floods in Rio Grande do Sul. **G1 RS**. 04 May 2024. Available at:<https://g1.globo.com/rs/rio-grande-do-sul/noticia/2024/05/04/saiba-o-que-e-verdade-ou-mentira-sobre-a-enchente-no-rs.ghtml>. Accessed on: 30 May, 2024.
POLO, Fernanda. Tramandaí tem dia de alta temporada com movimento de pessoas que buscam refúgio no Litoral Norte. **GZH**, 08 May, 2024. Avaliable at: <https://gauchazh.clicrbs.com.br/geral/noticia/2024/05/tramandai-tem-dia-de-alta-temporada-com-movimento-de-pessoas-que-buscam-refugio-no-litoral-norte-clvy999vp00hu0152r90dm0we.html>. Accessed on: 30 May, 2024.
Moradores de Porto Alegre e Região Metropolitana pegam a estrada em direção ao litoral norte para fugir da enchente. **G1.** 14 May, 2024. Avaliable at:<https://g1.globo.com/jornal-nacional/noticia/2024/05/14/moradores-de-porto-alegre-e-regiao-metropolitana-pegam-a-estrada-em-direcao-ao-litoral-norte-para-fugir-da-enchente.ghtml> Accessed on 30 May, 2024.

Graph 01: Tons of household waste collected in the municipality of Imbé (RS) 2023/2024



Source: Data provided by the Municipal Department of Urban Cleaning. Organized by the authors

At the same time, there is no official, systematized data on the people who ended up settling in the region. But there are some figures that give us indications of this process. One example is the transfer of enrollment in the region's schools.

Table 02: Number of transfers in the State Education Network in Corede Litoral schools

Município	Escolas	N. Matrículas 04/2024	Transferidos 04/2024	N. Matrículas 05/2024	Transferidos 05/2024	N. Matrículas 06/2024	Transferidos 06/2024	N. Matrículas 07/2024	Transferidos 07/2024
Arroio do Sal	1	538	4	538	2	529	3	520	4
Balneário Pinhal	1	589	9	585	3	553	7	546	4
Capão da Canoa	4	3669	45	3663	24	3789	52	3831	37
Capivari do Sul	2	293	14	285	1	291	1	287	3
Caraá	2	413	5	412	3	412	5	408	4
Cidreira	2	1134	21	1131	10	1114	39	1095	16
Dom Pedro de Alcântara	2	167	5	168	1	173	1	170	3
Imbé	2	1238	23	1236	7	1230	15	1177	9
Itati	2	258	5	259	3	260	2	262	0
Mampituba	2	152	2	154	0	152	0	152	0
Maquiné	4	816	15	822	4	821	12	815	6
Morrinhos do Sul	2	178	3	181	0	182	0	183	0
Mostardas	3	723	20	715	6	719	8	711	2
Osório	9	4390	63	4371	34	4331	86	4256	46
Palmares do Sul	4	742	10	735	1	726	12	721	3
Terra de Areia	2	724	10	728	12	731	6	729	6
Torres	10	3823	68	3808	35	3799	62	3748	43
Tramandaí	6	3220	73	3205	25	3149	93	3149	26
Três Cachoeiras	5	901	19	904	8	905	8	903	13
Três Forquilhas	1	309	3	308	2	303	5	302	1
Xangri-lá	1	458	5	454	2	453	2	447	4
Total	**67**	**24735**	**422**	**24662**	**183**	**24622**	**419**	**24412**	**230**

Source: Data provided by the Rio Grande do Sul State Department of Education. Organized by the authors.

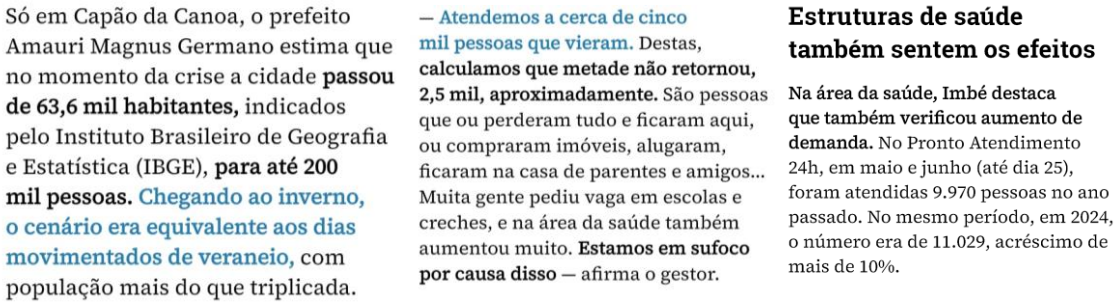
In Corede Litoral's state education network, we can see a significant number of student transfers. In a total of 67 schools, there were 183 transfers in May, 419 in June and another 230 in July. The municipality that recorded the most transfers in the period was Osório (166), followed by Tramandaí (144), Torres (140) and Capão da Canoa (113).

It's not possible to say that all of these transfers were due to the floods and were requested by families from the metropolitan region of Porto Alegre, not least because there are recurring reports of intra-regional migrations, displacements from municipalities such as Maquiné and Caraá, which were heavily impacted by the extreme events in 2023. In any case, these are atypical figures for the months mentioned.

A similar situation was observed in the Imbé municipal school system. According to the Mayor's Office, out of a total of seven primary schools and eight nursery schools, 50 new enrolments were made after the floods. There were a larger number of requests that were unable to be fulfilled due to the lack of vacancies in the desired schools, as well as students in remote education at their school of origin waiting for vacancies in local schools.

Other situations that demonstrate the settlement of people displaced by the floods on the North Coast are illustrated below:

Figure 04: The settlement of the displaced population



Só em Capão da Canoa, o prefeito Amauri Magnus Germano estima que no momento da crise a cidade **passou de 63,6 mil habitantes,** indicados pelo Instituto Brasileiro de Geografia e Estatística (IBGE), **para até 200 mil pessoas.** Chegando ao inverno, o cenário era equivalente aos dias movimentados de veraneio, com população mais do que triplicada.

— Atendemos a cerca de cinco mil pessoas que vieram. Destas, **calculamos que metade não retornou, 2,5 mil, aproximadamente.** São pessoas que ou perderam tudo e ficaram aqui, ou compraram imóveis, alugaram, ficaram na casa de parentes e amigos... Muita gente pediu vaga em escolas e creches, e na área da saúde também aumentou muito. **Estamos em sufoco por causa disso** — afirma o gestor.

Estruturas de saúde também sentem os efeitos

Na área da saúde, Imbé destaca que também verificou aumento de demanda. No Pronto Atendimento 24h, em maio e junho (até dia 25), foram atendidas 9.970 pessoas no ano passado. No mesmo período, em 2024, o número era de 11.029, acréscimo de mais de 10%.

Source: organized by the authors.[8]

The region's status as a refuge deserves attention. A more dialogical interaction between actors from science, academia and society seems essential in order to build a healthy coexistence with the local ecosystem, socio-economic dynamics and resilience to climate change.

The municipalities and, in particular, the cities of the North Coast, need to be prepared both to look after their population, their ecosystems (rich, fragile and dynamic) and also the masses of people who systematically (in summer) or exceptionally (extreme events) occupy the small coastal towns, turning them into medium-sized cities. Taking care of the social, economic, environmental and even climatic repercussions is the challenge ahead.

[8] DILLY, Bianca. Litoral Norte se consolida como refúgio emergencial e permanente de gaúchos. GZH. 01 June, 2024. Avaliable at:< https://tinyurl.com/4e6r6uvv>. Accessed on 02 June, 2024.

5 Final considerations

If we've already talked about nightmares and catastrophes, it seems appropriate, in these final remarks, to talk about dreams. Dreams here permeate imagined futures in the face of a new climate regime.

Despite the 2030 Agenda and the Paris Agreement, we have seen little progress in the places and regions mentioned. Whether we will succeed in this endeavor is difficult to determine. We know and live with the environmental crisis generated by the pattern of consumption that sustains capitalism, a pattern that degrades nature, communities and excludes a significant portion of society. And it is this section of society that has been most seriously affected by climate change, extreme events and catastrophes.

While we wait for (and put pressure on) global governance to implement its agreements, we also need to act and learn to live with climate change. This means that, locally, it is also possible (and necessary) to contribute to sustainability, fight poverty, protect the environment, invest in basic infrastructure capable of reducing vulnerabilities and improving the well-being of individuals and ecosystems, to paraphrase Di Giulio (2024). We need to seek territorial resilience.

In view of this, what we are trying to highlight, in addition to the repercussions of extreme weather events in the region, is the "place of refuge" characteristic that the North Coast has taken on in the face of extreme events. This occurred during the Covid-19 pandemic in 2020 and was repeated in the catastrophe in May this year. At the same time, the North Coast is also a refuge during the summer, as many of its tourists are repeat visitors, while many others have second homes to enjoy the region's mild, beachy climate.

And why is this important? Because this population shift has an impact on the area. A very rich place from a natural and cultural point of view, but equally fragile. It therefore requires the attention of public authorities and communities in terms of the management and planning of environmental issues imposed by this new reality.

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