# RISKS AND VULNERABILITIES: AN ANALYSIS OF SOCIO-ENVIRONMENTAL RISK MANAGEMENT IN RIO GRANDE DO NORTE, BRAZIL.

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## Resumen.

For some years now, the tripod of risk management in Brazil has been the subject of concern. In general, the country has focused its socio-environmental agenda on crisis management, that is, public policies and actions developed after the occurrence of harmful events or events that cause damage to society and the environment. The lack of inclusion of risk management on government agendas is not limited to the federal level, as state and municipal agendas have also neglected this issue. In this sense, the main objective of this research is to analyze how socio-environmental risk management is configured in the state of Rio Grande do Norte/RN, in the context of building a planned and fair state. Methodologically, a quantitative approach was taken, through the production of graphs, based on the database made available by the Municipal Basic Information Survey (MUNIC), published in 2020. The results of the survey showed that socio-environmental risk management is not very high on the government agenda in the 167 municipalities of Rio Grande do Norte/RN. Therefore, from reading the data, it can be concluded that the majority of municipalities in RN do not have planning, forecasting and prevention instruments to deal with the possibility of events occurring that could be harmful or cause damage to Potiguar society and the environment.


***Keywords:*** Risk management, MUNIC, Municipalities, RN, socio-environmental, Vulnerability.


## Abstract.

Desde hace algunos años, el trípode de la gestión de riesgos en Brasil es objeto de preocupación. En general, el país ha centrado su agenda socio-ambiental en la gestión de crisis, es decir, en las políticas y acciones públicas desarrolladas tras la ocurrencia de eventos perjudiciales o que causan daños a la sociedad y al medio ambiente. La falta de inclusión de la gestión de riesgos en las agendas gubernamentales no se limita al ámbito federal, ya que las agendas estatales y municipales también han descuidado este tema. En este sentido, el objetivo principal de esta investigación es analizar cómo se configura la gestión de riesgos socio-ambientales en el estado de Rio Grande del Norte/RN, en el contexto de la construcción de un estado planificado y justo. Metodológicamente, se adoptó un enfoque cuantitativo,


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mediante la elaboración de gráficos, a partir de la base de datos puestos a disposición de la Encuesta Municipal de Información Básica (MUNIC), publicada en 2020. Los resultados de la encuesta mostraron que la gestión de riesgos socio-ambientales no ocupa un lugar destacado en la agenda gubernamental de los 167 municipios de Rio Grande del Norte/RN. Por lo tanto, de la lectura de los datos, se puede concluir que la mayoría de los municipios de RN no tienen instrumentos de planificación, previsión y prevención para hacer frente a la posibilidad de que ocurran eventos que puedan ser perjudiciales o causar daños a la sociedad de Potiguar y al medio ambiente.


***Palabras clave:*** Gestión de riesgos, MUNIC, Municipios, RN, Socio-ambiental, Vulnerabilidad.

## I. INTRODUCTION.

The scale of this study is the state of Rio Grande do Norte/RN, located in the Northeast region of Brazil, and the aim is to analyze how socio-environmental risk management is configured in this territory. It discusses how RN acts, through municipal management, on socio-environmental issues, and how they are being implemented, in the context of building a planned and fair state. To this end, it is expected to have a socio-environmental risk management system.

Before getting into the discussion about socio-environmental risk management in Rio Grande do Norte/RN, it is necessary to define the concepts related to this issue. It should be noted that:

The concept of risk refers to the perception of an individual or group of individuals of the possibility of a harmful event occurring. Therefore, the concept of risk is a human (or social) notion that only exists if there are people who perceive it and/or are likely to suffer from the occurrence of a harmful event (Almeida & Pascoalino, 2009, p. 2).

It is worth noting that risk is a polysemic concept, with meanings associated with conditional aspects. From this perspective, risk management corresponds to managing

the possibility of a harmful event occurring. In other words, it is implied that this concept incorporates the management of something that has not happened and demands its prediction and prevention (Almeida & Pascoalino, 2009). However, according to the authors, Brazil's risk management tripod has been the subject of concern for some years now. In general, the country has focused its socio-environmental agenda on crisis management, i.e. actions taken after the occurrence of events that cause damage to society and the environment (Almeida & Pascoalino, 2009).

Another concept related to risk management is vulnerability. The term vulnerability is not new, but it was only at the beginning of the 1980s that it began to be applied in studies evaluating specific groups that are more susceptible to certain harmful or damaging events (Almeida & Pascoalino, 2009).

In the socio-environmental context, vulnerability is conceptualized as the inability of a person, group or territory to anticipate, cope with, resist and recover from the impact of a natural hazard; it involves a combination of factors that determine the degree to which someone's life and livelihood are put at risk by a discrete and identifiable event in nature or society (Blaikie et al., 1994).

In this way, socio-environmental vulnerability makes environments more sensitive and exposed to risks. As such, the concept of socio-environmental vulnerability becomes essential in the approach to risks and dangers, and central to the development of strategies for predicting and preventing harmful events or those that cause damage to society and the environment, helping to cope with and mitigate the consequences of these events.

This article consists of four (4) sections: Introduction, Methodology, Results and Discussions and Conclusions. The first section introduces what this study is about and its objective. The second section describes the methodological procedures used in the research. The third discusses the results extracted through the implementation of the methods. The fourth and final section presents the conclusions about what was studied and analyzed, as well as the acknowledgements.

## II. METHODOLOGY.

In terms of methodology, this article took a quantitative approach, based on the database provided by the Municipal Basic Information Survey (MUNIC). The Brazilian Institute of Geography and Statistics (IBGE) has been carrying out the Municipal Basic Information Survey (MUNIC) since 1999, providing information on Brazil's 5.570 municipalities. The aim of this survey is to establish a municipal information base, with periodically updated statistical and registration data on local public administration. The information provided indicators for evaluating and monitoring the institutional framework of the country's municipalities, contributing to the planning and improvement of municipal management.

The information collected by MUNIC is obtained from questionnaires applied to local managers in the various sectors and/or institutions investigated, who have information on public bodies and other municipal instruments (IBGE, 2023). The questionnaire provides answers of the following types: Yes, No and Cannot provide information. In addition, municipalities in which it was not possible to contact the town halls and those that had not responded by the closing date of the collection are considered to have refused. In view of this, the MUNIC is important in the analysis proposed in this study, as it encourages the managers of all Brazilian municipalities to reflect on the risk and disaster management of the municipality they administer.

This article used data from MUNIC 2020, which collected information for the years 2017, 2018, 2019 and 2020. Only the data relating to the topic "Risk Management", which is within the section "Risk Management and Disaster Response", was analyzed. This topic looked at the existence of risk planning, prevention and management instruments, which are responsible for reducing the degree of vulnerability in municipalities, as they are elements that increase society's resilience and ability to respond to the dangers that exist in the states.

MUNIC 2020 presents seven (7) variables to categorize risk in Brazilian municipalities, however, this article used the results of these variables only in the 167 municipalities of Rio Grande do Norte/RN. The seven (7) variables mentioned were used to produce seven (7) graphs, built using Google Spreadsheets.

The graphs are divided into Fig. 1: Municipalities in Rio Grande do Norte that have Urban Planning Instruments; Fig. 2: Municipalities in Rio Grande do Norte that have specialized risk management corporations; Fig. 3: Municipalities in Rio Grande do Norte that have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization; Fig. 4: Municipalities in Rio Grande do Norte that carry out activities aimed at civil defense protection; Fig. 5: Municipalities in Rio Grande do Norte

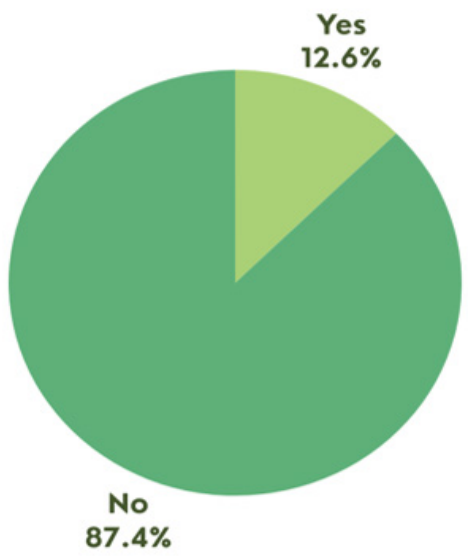
that periodically clean the city's storm drains, especially before the rainy season; Fig. 6: Municipalities in Rio Grande do Norte that have risk management in relation to disasters resulting from floods or gradual inundations, or torrents of water or steep inundations; and Fig. 7: Municipalities in Rio Grande do Norte that have risk management for disasters resulting from landslides or slope slides.

# III. RESULTS AND DISCUSSIONS.

The lack of inclusion of risk management on government agendas is not limited to the federal level, as state and municipal agendas have also neglected this issue. In this sense, reading the data from MUNIC 2020 showed that socio-environmental risk management is not very high on the government agenda in the 167 municipalities of Rio Grande do Norte/RN. The data analyzed showed that the majority of municipalities in RN do not have planning, forecasting and prevention instruments to deal with the possibility of events occurring that could be harmful or cause damage to Potiguar society and the environment.

According to Villaça (1999, p. 173), urban planning is defined as "the action of the State on the organization of intra-urban space". When applied concretely, urban planning is an important instrument when it comes to preventing environmental disasters. Risk management is therefore directly linked to urban planning, and these processes complement each other.

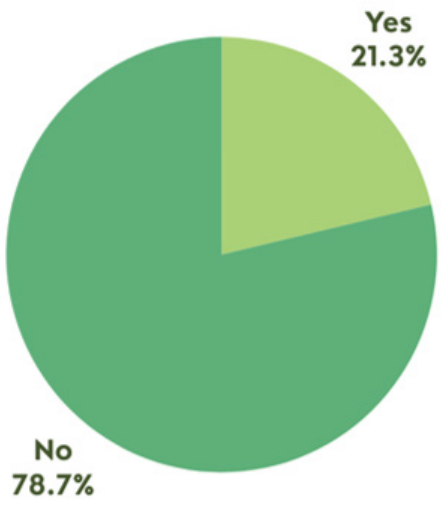
***Figure 1.***
Municipalities in Rio Grande do Norte that have Urban Planning Instruments.




***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Despite the fact that approximately 80% of the Brazilian population already lives in urban areas (National Household Sample Survey, 2022), Fig. 1 shows that when asked if the municipalities in Rio Grande do Norte/RN have urban planning instruments, only 12.6% of the municipalities answered Yes, and the rest, 87.4%, answered No.

***Figure 2.***
Municipalities in Rio Grande do Norte that have specialized risk management corporations.




***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

In addition, Fig. 2 shows that when asked if the municipalities in Rio Grande do Norte have specialized risk management corporations, the majority of municipalities, 78.7%, again answered No, and only 21.3% of municipalities answered yes.

As a result, even though the municipalities of Rio Grande do Norte/RN are responsible for concentrating most of the population and economic activities in the state, they do not have urban planning instruments incorporated into their municipal agendas, such as specialized risk management bodies.

Risk areas are characterized as less valued territories, such as floodplains and steep slopes; historically, these areas have been occupied by socioeconomically vulnerable populations (Ribeiro, 2010). The concept of social vulnerability is multidimensional, as it can occur due to issues related to social inequality, low schooling, unemployment or underemployment, poor health and difficulty in accessing public policies (Vignoli, 2001). In view of this, it can be concluded that this issue is related to individuals who are in a process of social exclusion, lack of representation and opportunities, and without

access to basic social rights, in other words, who are on the margins of society.

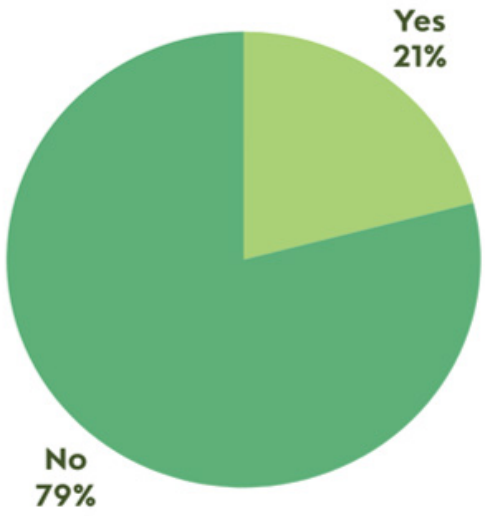
In most cases, Brazil's risk areas are located far from the urban centers of cities, due to the country's rapid urbanization process, coupled with the expropriation of land in the countryside, especially between the 1970s and 1980s (Ribeiro, 2010). According to the author, this process resulted in masses of migrant workers who, without job opportunities or with jobs that provided low pay, were unable to afford to house in urban centers. In addition, Ribeiro (2010) points out that, as an alternative, this population was left to occupy the peripheral areas of the cities, which were of no interest to people with great purchasing power, precisely because they were located far from the urban centers, and because they were areas susceptible to risk situations, such as disasters resulting from floods, inundations, torrents of water, landslides or slope slides.

In these areas, which are considered to be at risk, factors such as low levels of education, combined with the absence of concrete risk management, with measures to predict and prevent socio-environmental disasters, only tend to increase the risk of the individuals who occupy these zones, or intensify the consequences if these events actually happen.

At the federal level in Brazil, civil defense was institutionalized in the late 1940s, in the context of the ideological polarization after the Second World War (Valencio, 2010). In his bibliography, Valencio explains that civil defense consists of a set of prevention, mitigation and emergency preparedness measures designed to prevent disasters or minimize their impact on the population. These actions take place before, during and after disasters, with the aim of reducing the risks and damage suffered by the population in the event of these events, which mainly affect the most vulnerable individuals or social groups. In recent decades, with the increase in socio-environmental disasters, civil defense has come to play a strategic role in emergency situations.

***Figure 3.***

Municipalities in Rio Grande do Norte that have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization.

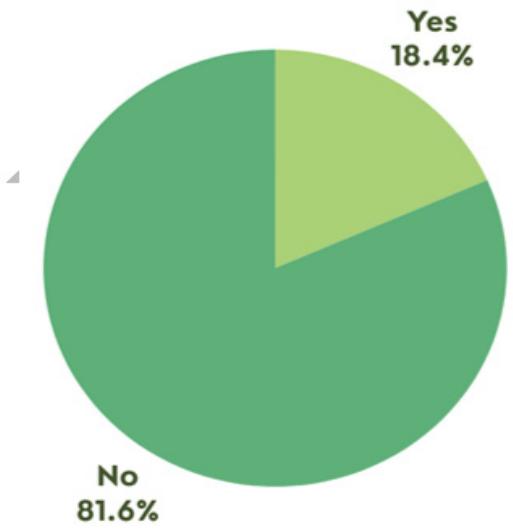



***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 3 and Fig. 4 analyze the civil defense situation in Rio Grande do Norte/RN. Fig. 3 shows that when asked if the municipalities in RN have a Municipal Coordination of Protection and Civil Defense (COMPDEC) or similar organization, only 21% of the municipalities answered Yes, and the remainder, which is the majority of municipalities, 79%, answered No.

***Figure 4.***

Municipalities in Rio Grande do Norte that carry out activities aimed at civil defense protection.




***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 4 shows whether the municipalities in RN carry out civil defense activities. Fig. 4, on the other hand, shows that when asked whether the municipalities of RN carry out activities aimed at civil defense protection, only 18.4% of the municipalities answered yes, and the rest, 81.6%, again the majority, answered No.

In this way, because it plays a strategic role in emergency situations, civil defense contributes to territories with less vulnerability. However, with regard to this issue, the data shown in Fig. 3 and Fig. 4 show that the state of RN does not have an effective civil defense incorporated into the government agendas of its municipalities.

Modern society's way of life, which has led to the unbridled use of fossil fuels worldwide, is a major contributor to greenhouse gas (GHG) emissions, accelerating global warming and thus changing the global climate (Garcias & Silva, 2011). The authors point out that these climate changes are strongly influenced by anthropogenic action.

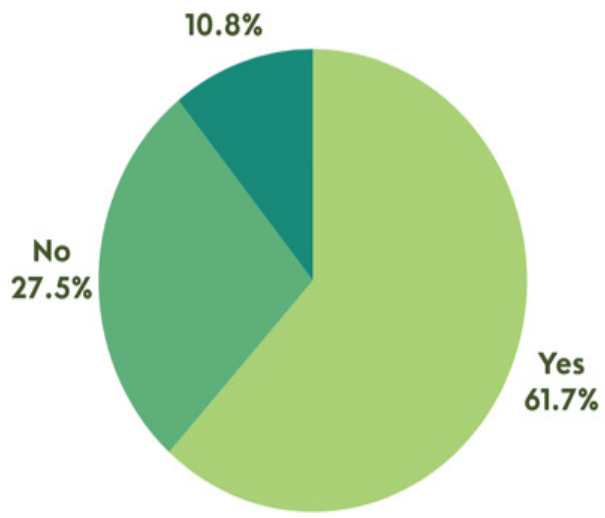
Because they concentrate most of the population and economic activities, cities have been experiencing changes in their climate, which imply a rise in temperature, generating an increase in rainfall, which can potentiate the occurrence of socio-environmental disasters, especially in areas most vulnerable to risks (Teixeira & Pessoa, 2017).

From this perspective, Chaves (2009) points out that individuals or groups in situations of socio-economic vulnerability tend to also be in situations of socio-environmental vulnerability. In general, the author considers that economic aspects are one of the determining reasons for vulnerability to socio-environmental risks.

An important measure for preventing disasters resulting from floods, inundations, torrents of water, landslides or slope slides is the periodic cleaning of storm drains, especially before the rainy season. This measure consists of cleaning the inlet, cleaning the inside of the drainage device, as well as checking and repairing, if necessary, any infiltrations and erosions that may occur (Salomão et al., 2019). Periodic cleaning of storm drains allows rainwater to drain properly, contributing to the prevention of disasters, among other inconveniences that can be caused by clogged storm drains.

***Figure 5.***

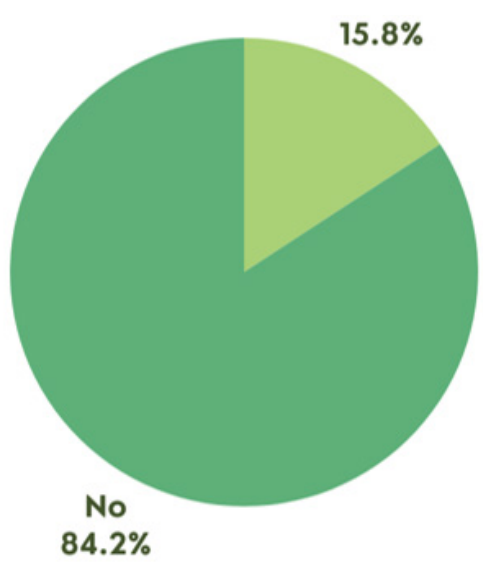
Municipalities in Rio Grande do Norte that periodically clean the city's storm drains, especially before the rainy season




***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 5 shows that when asked whether the municipalities of Rio Grande do Norte/RN periodically clean their storm drains, especially before the rainy season, the majority of municipalities, 61.7%, answered Yes; 27.5% answered No; and 10.8% answered Cannot provide information.

***Figure 6.***
Municipalities in Rio Grande do Norte that have risk management in relation to disasters resulting from floods or gradual inundations, or torrents of water or steep inundations.

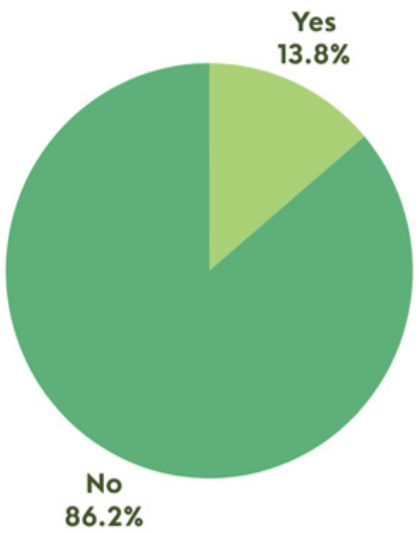



***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

However, even though the periodic cleaning of storm drains is an important measure for the prevention of disasters resulting from floods, inundations, torrents of water, landslides or slope slides, and Fig. 5 is the only category of the seven (7) analyzed that showed a higher percentage of Yes answers than No, Fig. 6 shows that

the percentage of municipalities in RN that have risk management, with specific instruments to deal with these disasters, is low. When asked if the municipalities have risk management for disasters resulting from floods or gradual inundations, or torrents of water or steep inundations, only 15.8% of the municipalities answered Yes, and the remaining municipalities, 84.2%, answered No.

**Figure 7.**
Municipalities in Rio Grande do Norte that have risk management for disasters resulting from landslides or slope slides.




***Fuente:*** Elaboración propia (2023) a partir de datos de MUNIC/IBGE (2020).

Fig. 7 shows that when asked if the municipalities have risk management for disasters resulting from landslides or slope slides, only 13.8% of the municipalities answered yes. Again, the majority of the municipalities, 86.2%, answered No.

The data shown in Fig. 6 and Fig. 7 leads us to reflect on the importance of public interventions, especially in recognizing areas considered to be at risk in Rio Grande do Norte/RN, as these are territories that need greater attention from government officials. Furthermore, recognizing areas considered to be at risk is necessary for effective risk management to take place. Thus, this research reaffirms the importance of strategies for predicting and preventing socio-environmental disasters, which can be harmful or cause damage to society and the environment, helping to cope with and mitigate the consequences of these events.

In short, this study does not intend to state that only areas occupied by individuals or social groups in conditions of vulnerability are susceptible to risk, however, based on various readings on this subject, it is believed that the occurrences of socio-environmental disasters are largely related to the occupation of irregular areas, generally occupied by more vulnerable populations.

# IV. CONCLUSIONS.

During its three phases, this scientific research sought to promote discussion and reflection on the socio-environmental impacts that the absence of risk management causes in territories that do not have this instrument incorporated into their governmental agenda. The problem of environmental issues is a global one, but territories, both urban and rural, bear a great deal of responsibility, especially cities, since they concentrate most of the population and productive activities.

This article analyzed how Rio Grande do Norte/RN acts, through municipal management, on socio-environmental issues, and how they are being implemented in the local government agenda, in the context of building a planned and fair state that has socio-environmental risk management. The results obtained through the database of the Municipal Basic Information Survey (MUNIC) showed that socio-environmental risk management has a low level of incorporation in the governmental agenda of the municipalities of RN.

Based on these considerations, it can be concluded that this study is of the utmost importance for understanding the concepts of risk management and its dimensions, as well as the concepts of types of vulnerability. In this context, the relevance of this research is notable, as it exposes how the absence of risk management affects the most vulnerable individuals or social groups, and from this, alternatives can be found to intervene against vulnerabilities (social, environmental or socio-environmental).

This study also contributes to reflecting on how socio-environmental risk management is essential and central to dealing with and mitigating the consequences of harmful events or those that cause damage to society and the environment, at the various scales of analysis (municipal, state, national and global).

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