

CROSS-SECTOR INTERACTIONS IN THE PETRÓPOLIS' DISASTER: MULTISPECIES COMMUNITIES AND VULNERABILITIES IN THE FIELD

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Introdução

Disaster is defined by the extent of destruction it can cause in one area, most related to vulnerability. The more vulnerable the area is, the more affected by a disaster, weather is an earthquake or a flood, or even a man-made disaster, vulnerability is a central idea when considering disaster (Storr, Haeffele-Balch & Grube, 2015). Usually, the most affected victims in the disaster scenario are those who cannot defend themselves. This paper aims to understand how a disaster can impact humans and non-humans, the most vulnerable in those types of situations.

Problema de Pesquisa e Objetivo

The contribution is significant since the study will augment the knowledge of the organizations and individuals in Humanitarian Logistics and help in the decision-making process. The debate of these ideas leads up to the following research question: Who were the actors and how did they interact in the case of the disaster in the city of Petrópolis? How humans and non-humans were affected by the disaster?

Fundamentação Teórica

Risk Management and Disaster Risk Reduction is not simply a set of defensive measures: they also facilitate positive change (Twigg, 2015). If you have a region that is safer, it tends to have more opportunities, and should have a more sustainable development. Effective actions in Disaster Risk Reduction provides more development benefits, as well as diminishing vulnerability in the long term. Most approaches in disaster management have used the concept of disaster cycle, a conceptual model (see Khan et al., 2008). This is a linear operational model, dividing the cycle into phases.

Metodologia

An in-depth literature review on Disaster risk and vulnerability, Cross-sector Interrelations was conducted to identify critical factors. The data was analyzed in order to identify categories in the speech, although the categories were previously found in the literature as meaningful and important. Disaster risk literature indicates that there are at least three levels of analysis: Actions during the disaster, Recuperating and Prevention. The data was collected through an indepth interview with participants in the rescues.

Análise dos Resultados

The subjects of the research were interviewed using a presented protocol, but in some cases there were a variety of questions included on the spot, using the discretion of the authors, in order to have a better understanding of the situation. Although we were able to categorize the answers in the same way presented by the literature. The people interviewed were involved in both humans and non-humans rescues, there were a variety of histories where the multispecies helped each other out in the process of rescue.

Conclusão

Our paper brings new insights to future research about Disasters and Risk Management. This topic is new in the Brazilian Management research centers and postgraduate programs. The analysis of the Cross-Sector Interactions brings us a deeper and more complex comprehension of the collective action to deal with the Disasters, not only in the action after the tragedies but as prevention too. In this general issue of research, non-human rights, the protection, and safety of non-human rights represent a more advanced and necessary discussion in the Brazilian context as well as globally.

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Palavras Chave

Disaster Risk Management, Cross-sector Interactions, Multispecies

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1 – Introduction

Disaster is defined by the extent of destruction it can cause in one area, most related to vulnerability. The more vulnerable the area is, the more affected by a disaster, whether is an earthquake or a flood, or even a man-made disaster, vulnerability is a central idea when considering disaster (Storr, Haeffele-Balch & Grube, 2015). Usually, the most affected victims in the disaster scenario are those who cannot defend themselves. This paper aims to understand how a disaster can impact humans and non-humans, the most vulnerable in those type of situations.

Humanitarian Logistics consists of promoting the distribution of supplies and relocation of people in emergency situations to alleviate the victims of the emergency situation. The focus of this logistical process goes beyond the assistance to the population directly affected by such disasters, including the planning before the occurrence of the disaster, support and assistance during the occurred and the subsequent restructuring. At the same time, this type of logistics intends in its foundations to carry out the immediate implementation of measures to reduce the extent of impacts in a geographic context." (Zago & Leandro, 2013). As a challenge, Humanitarian Logistics needs to deal with the fact that there is great diversity and a high number of active organizations (governmental, non-governmental, military, social and environmental movements, grassroots organizations and, civil society and humanitarian organizations) (Tomasini & Van Wassenhove, 2009). In addition to operating with a high flow of supplies circulating through the chain until reaching those affected (Day *et al.*, 2012). According to Bui *et al.* (2000), none of these different organizations can serve the contingent of victims affected, which requires collaborative actions between organizations. These actions allow the facilitation and integration of assistance and rescue operations, which enhances the organization's total service capacity (Storr, Haeffele-Balch & Grube, 2015).

Another way to understand disaster can be extracted from the area of Risk Management in order to apply disaster risk reduction policies and certain strategies to prevent disasters from happening again. Reducing existing disaster risk and managing residual risk, contributing to resilience and reduction of disaster losses (Naheed, 2021; Aitsi-Selmi, *et al.*, 2016). The idea behind disaster risk reduction and resilience is a concept and practice of reducing disaster by making efforts to analyze and manage the factors of disaster, that includes reducing exposure to hazards, "lessened vulnerability of people and property, and a wise management of land and environment, and improved preparedness for adverse events."(Naheed, 2021, p. 1)

Disaster risk reduction and resilience should be seen as a concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events. The major threat emanates from an increasingly interconnected and interdependent social, technical, and biological systems and complex risk landscape. In developing countries, disasters represent a major source of risk for the poor and can potentially destroy development gains and accumulated wealth.

After recognizing a risk, the next step is to assess it by judging its significance and acceptability. This evaluation may include comparing the risk to other risks or to established criteria related to loss of life or other values. To conduct a thorough risk assessment, one must also consider various factors such as environmental impact, public reaction, politics, business or public confidence, and fear of litigation (Storr, Haeffele-Balch & Grube, 2015). In a straightforward situation where only the customer or owner is affected, the assessment may be

a simple value judgment. However, in more complex situations, appropriate value judgments must still be made as part of a comprehensive Risk Management process to determine acceptable risk levels specific to the situation.

Collaborative action is considered one of the significant challenges of Humanitarian Logistics, given the constant risk situations and the diversity of forms of action by organizations. According to Charles *et al.* (2010), the increasing occurrence of disasters tests the reactivity of humanitarian systems, especially the ability of different agents to work together. Humanitarian action, therefore, depends on how the humanitarian agent decides to carry out his operations, which can be individually (decentralized), in which this agent makes decisions in his supply chain, or collaboratively (centralized), in which he makes decisions that jointly influence the operations of the partners involved (Akhtar *et al.*, 2012; Balcik *et al.*, 2010; Kovács *et al.*, 2010).

However, none of them discuss indicators and relations between actors, so this paper aims to understand how the interaction between Civil Society Organizations (SCO), Government and Market Organizations (corporations, small business, etc.) occurs when facing a disaster. To do so, we use Humanitarian Logistics literature regarding indicators to understand how these actors should relate. We are using the disaster that occurred in Petrópolis municipality, Rio de Janeiro state, Brazil, as a case study to understand how these relations unfold, how humans and non-humans were affected.

The Petrópolis municipality has been marked by a history of disasters related to intensive rain during the summer. Located in the mountain area of the Rio de Janeiro state, Brazil, Petrópolis' territory is a microcosmos of the Brazilian social, political, economic, cultural, and environmental reality. Brazil is a country with high levels of inequality that results in different ways of occupying, and building residences, and commercial buildings. Most of the time, poor people living in low-class neighbor live in dangerous areas. Two years ago, the most important disaster in Petrópolis history happened, killing around two hundred people, no number is accounted for the non-humans lives lost, and bringing to evidence the challenges of creating collaborative interactions and actions between the public sector, civil society organizations, and corporations to provide more secure living and better logistics management when disasters happened. Our paper focuses on the analysis of the disaster by understanding the relation among the various actors involved, such as volunteers, NGOs and government, assuming that coordinated and joint actions are necessary and vital, either to trans pond the immediate needs of the affected population, but also to recover and create prevention against future disaster. Learning from past experience in this case is essential to understand what should or should not be done in a coordinated fashion to restore balance, recover and prevent future issues.

We can mention two contributions that this study can provide to the area of Disaster or Humanitarian Logistics. Firstly, there is a lack of studies that relate the dynamics of Government, Civil Society, and Market actors when facing natural or man-made disasters. Second, evaluating objective indicators can lead to understanding how organizations behaved in past tragedies contributing to future problems. The contribution is significant since the study will augment the knowledge of the organizations and individuals in Humanitarian Logistics and help in the decision-making process. The debate of this ideas leads up to the following research question: *Who were the actors and how did they interact in the case of the disaster in the city of Petrópolis? How humans and non-humans were affected by the disaster?*

Our paper is divided in five sections containing the introduction presenting the main aspects of our problem; a section about Humanitarian Logistics presenting the state of the art of the field, and how this approach can help us to create a better understanding of our problem; a section about recovery of disaster indicating theories and examples of actions that can be perceived as ideal for recovery; a section dedicated to understand how Risk Management can

shed a light to disaster recovery; a section present cross-sector theories to understand how the actor can coordinate certain actions; a methodology section exploring the method applied to our research; the results section presenting the results of our interviews in the field; and conclusion section presenting our main finds on the subject.

2. Theoretical Background

2.1 Disaster Risk and Vulnerability

The term Disaster Risk Management (DRM) is often used referring to a systematic approach to identifying, assessing and reducing risks.” (Twigg, 2015, p. 6). The focus is on practical implementation of initiatives to achieve risk reduction and resilience. The major objective of Risk Management is to reduce risk. Reducing risk requires the implementation of prevention measures (Carreño *et al.*, 2007). The idea behind this is to anticipate potential sources of risk, executing procedures and other measures to either avoid hazard or reduce the economic, social and environmental impacts through corrective and prospective interventions on future vulnerability conditions.

Risk Management and Disaster Risk Reduction is not simply a set of defensive measures: they also facilitate positive change (Twigg, 2015). If you have a region that is safer, it tends to have more opportunities, and should have a more sustainable development. Effective actions in Disaster Risk Reduction provides more development benefits, as well as diminishing vulnerability in the long term. Most approaches in disaster management have used the concept of disaster cycle, a conceptual model (see Khan *et al.*, 2008). This is a linear operational model, dividing the cycle into phases (before, during and after disaster), each of which requires different forms of intervention (mitigation, preparedness, response, and recovery). The formulation is easy to understand and makes it easy for disaster management organizations to allocate tasks, coordinate efforts and implement actions that can be useful. The cycle indicates the range of initiatives that occur both the disaster and in the recovery stages. Disaster management intends to reduce, or avoid the potential losses from hazards, besides promoting the appropriate assistance to victims of disaster, and achieving effective recovery (Warfield, 2008). In a way, the Disaster Risk Management has an objective similar to Humanitarian Logistics, although it specifics deals with risk and ways to reduce it. The disaster management cycle incorporates the idea of the process by which government, businesses and civil society plan and reduce impact disaster (Kahn *et al.*, 2008; Storr, Haeffele-Balch & Grube, 2015). Having appropriate actions at all the points of the cycle reduces vulnerability and prevent new disasters. This actions also includes preparing public policies and plans to modify the causes of disaster or reduce the effects on people, property and infrastructure.

Often phases of the cycle overlap and the length of each phase greatly depends on the severity of the disaster. • Mitigation - Minimizing the effects of disaster. Examples: building codes and zoning; vulnerability analyses; public education. • Preparedness - Planning how to respond. Examples: preparedness plans; emergency exercises/training; warning systems. • Response - Efforts to minimize the hazards created by a disaster. Examples: search and rescue; emergency relief. • Recovery - Returning the community to normal. Examples: temporary housing; grants; medical care (KAHN ET.AL., 2008, p.48)

A risk assessment intends to analyze and mitigate future disaster (see Kim *et al.*, 2022). There is an increase in magnitude and frequency of natural disasters such as those of heavy rains described by Kim *et al.* (2022). And therefore, managers in a lot of countries uses the four phases of disaster management to reduce the damage caused by the disaster: Phase 1 – Mitigation; Phase 2 – Preparedness, Phase 3: Response, and Phase 4: Recovery. The first phase

is related to prevent future emergencies and also minimize the effects. The second phase is to take actions ahead of time, to be ready for the next emergency. The third phase is to protect people and places in the moment of the emergency. The last phase is to rebuild, and all sorts of efforts to bring the normality back to the community. This is also very similar to the ideas behind Humanitarian Logistics. How to create operational efforts to prevent and recovery affected territories.

The mitigation phase is very connected with studies on risk assessment, either qualitative or quantitative risk assessment (Kim *et al.*, 2022). In a variety of studies (Tîncu *et al.*, 2012 ; Di *et.al.*, 2020) understands flood risks using quantitative models, indicating risk assessment methods for the loss of fatality caused by floods, for example. Quantitative risk assessment method is used to understand the cost benefit ratio through reduced loss, when, for example, disaster prevention facilities are introduced in one area (Kim *et.al.*, 2022). When considering qualitative risk assessment, there is an integrated index using statistical indicators using regional characteristics and risk level of each region (see Zhang *et.al.*, 2002).

Disasters, whenever they occur, have withstood response action by public authority, to minimize the loss of life, property and also environmental damage. However, didactically, it is worth dividing these situations of disaster into two types: emergencies and critical situations.:

1. Emergencies are situations that require immediate intervention by qualified professionals with qualified equipment, but who can be met by normal emergency response facilities, without the need for management actions or special procedures. Emergencies represent ordinary occurrences attended to on a daily basis by firefighters (career or patients), patients (civilians, military or road), electrical network maintenance teams.
2. Critical situations, on the other hand, are situations whose risk characteristics trained professionals, in addition to an immediate intervention by qualified professionals with adequate equipment, an organizational posture not regularly for the integrated management of response actions. Some examples of these situations are car accidents that involvement of multiple victims, forest fires, accidents with dangerous goods, such as long-awaited hostage crises, the natural disasters that had the evacuation of communities, etc. (Kim *et.al.*, 2022; Daud, 2016; Zhang *et.al.*, 2002)

Understanding vulnerability in social terms is essential, emphasizing impacts, several other intersecting social factors, and the unequal distribution of wealth and resources. The good (community resilience) and negative (social risks) social change processes and dynamics that can, respectively, lessen or increase vulnerability and disaster risk in localities are also included in the social dimensions of disaster risk (Imperiale & Vanclay, 2021). The effects of a disaster are heavily influenced by socioeconomic factors, including the stability of the built environment and the income levels of the affected communities (Adger *et al.*, 2011; Cannon, 2022; Chmutina & von Meding, 2019; Dickinson & Burton, 2022; Hilhorst & Bankoff, 2022; Kelman, 2020; Wisner *et al.*, 2012). Since most vulnerabilities are socially produced, they are a part of the interactions between people and their surroundings (Oliver-Smith, 2009). This implies that human and non-humans' activities and catastrophe risk and vulnerabilities are strongly related.

According to Imperiale & Vanclay (2002), vulnerabilities can exacerbate and be exacerbated by social risks. Wisner *et al.* (2004) define vulnerability as: the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard (an extreme natural event or phenomenon).

According to Birkmann *et al.* (2006), vulnerability includes two main components: susceptibility and (lack of) coping skills. The "ability to" and the "difficulty of" recuperating are informed and controlled by coping mechanisms and capacities (Birkmann & Wisner, 2006).

Therefore, it is important to understand both vulnerability and community resilience as notions that include significant interplay and complexity rather than in opposition to one another.

2.2 Comprehensive Theoretical Framework about Cross-Sector Interactions

The theme of Cross-Sector Interactions takes on, in modern days, the status of mobilizing force-idea for different discourses (Knight *et al.*, 2020). At the same time, their echoes are reflected on different spheres of society, intensifying, thus, criticism, doubts and debates (Maiolini *et al.*, 2023). Sometimes denounces are raised about taking advantages of actions, pointing at the limits, ambush and inconsistencies connected to the notion and practice of interactions based on only partnerships (Barroso-Méndez *et al.* (2016). Such partnerships ambiguities and paradox are present in everyday actions of practitioners from state, corporations and civil society groups, focused on their implementation. (Vernis *et al.*, 2007; Selsky & Parker, 2005)

The partnership perspective of policies provision and social services are marked by their attempt for institutionalization in different national realities and cooperation processes (international, national, regional and local) in the last decades (Knight *et al.*, 2020; Prefontaine *et al.*, 2000; Selsky & Parker, 2005, Gordenker & Weiss, 1996) and also for a multiplicity of understanding and assumptions connected to its comprehension (Knight *et al.*, 2020; Meirelles, 2005, Selsky & Parker, 2005). Some of these views are located on the opposite sides of the debate about society and with the provision and management of policies and social projects that are defined by them. The allusion and, sometimes, the defense of partnership construction in social projects are found both in discourses for participative democracy as well as in communitarian views and conceptions of the economic and political liberalism that were reflected on the downsizing of the state and on the enlargement of the market sphere in certain societies (Knight *et al.*, 2020; Spink, 1999). The result seems to be a real polysemy, the idea of the Cross-Sector Interactions as partnership or the elasticity of this concept. (Knight *et al.*, 2020; Fischer *et al.*, 2003; Meirelles, 2005; Selsky & Parker, 2005)

Different debates about Cross-Sector Interactions imply not only discussions related to strategies, instruments and mechanisms of management, but also involve the relationship of societies, institutions, organizations and individuals with the provision of social policies. As a background, notions arise about essence, coverage and the configuration idealized from the relationship among the state, public sphere, market and private life of contemporary society, which is another theme inserted in different interpretative currents and relevant debates. Therefore, the studies about Cross-Sector Interactions require theoretical and methodological approaches capable to deal with the complexity that mark this phenomenon and issues related to social network, cooperation, social capital, social skills, social change, and structural, field and micro level of analysis of the social reality. (Knight *et al.*, 2020; Granovetter, 2007; Fligstein, 2001; Vieira, 2001; Burawoy, 1998)

The discussions about partnerships in the management present a large variety of focus, indicating the complexity of the phenomenon and the comprehensive limitations from certain analytical perspective (Knight *et al.*, 2020. Selsky & Parker, 2005).

According to Selsky and Parker (2005), three main currents can be numbered in studies on Cross-Sector Interactions as Partnerships. The first of them is called Resource Dependence Platform which refers to the literature that assumes collaboration constituted fundamentally by the attempt to solve problems faced by organizations. Under this perspective, partnerships are conceived as developed strategies by organizations so they can solve their problem of accessing resources and development of competencies and capacities. As Selsky & Parker argue (2005), the partnerships on this platform “*are conceived in a narrow, instrumental, and short term way; they are viewed as a way to address organizational needs with the added benefit of addressing a social need*”. (p.852)

This first current approach about Cross-Sector Interactions as Partnerships is similar to the theory called Mobilization of Resources (MR), which deals with both the emergency and the dynamics of social movements. For Gohn (2000), the Mobilization of Resources Theory refers basically to economical science paradigms, assuming that organizations compete for resources in a negotiable market and they are guided by utilitarian logic, molded on assumptions from rational choice. Even a political dispute takes on the character of the political asset market which considers organizations of the civil society as groups of interest competing for all sorts of resources like human, financial, infrastructure, communication, and many others. In this slope, the conflict is discussed from the assumptions of the collective action of Olson (1999), leading to the construction of typologies, like Zald's and McCarthy classifying the movements and organizations in two major categories: consensus and conflict. Cohen and Arato (1994) affirm that the concepts of organization and rationality are central on this approach. This seems to be one of the reasons to justify the meaningful presence of groundwork in the MR analysis from many studies on partnerships in social projects, even when they don't consciously and deliberately assume the adhesion of the perspective centered in resources. Besides, many of these studies seem to offer little contribution to the critical advance of comprehension of the Cross-Sector Interactions (Teodosio & Alves, 2006).

Those assumptions that raise the perspective for mobilization of resources arouse much criticism in the studies about the nature of social action and the rationality of actors, above all when applied to the discussion about Cross-Sector Interactions. They operate on other explanatory foundations, more consistent to analyze the praxis of actors in the phenomena of collaboration and do not disregard the relevance of resources like the current factors on this dynamics. On the contrary, resources are relevant, but as relevant as resources are meanings, reframing, institutions and non-linear games of power built in realities that involve resources.

The second current, usually found in studies about Cross-Sector Interactions as Partnerships is called Social Issues Platform. Under this perspective, collaboration among state, public sphere organizations and market would come from the convergence around metaproblems socially built and accepted as relevant by actors. Within that approach, one may find blanks between expectations and performance of organizations facing unexpected turbulences in the environment. According to Selsky & Parker (2005), they can focus afterwards on social issues. As to Social Issues Platform, the organizations aim to face social meta-problems, and partnerships would appear to be drawn out from this motivation and central perspective.

Along with such approach on the Social Issues Platform, is noticed a larger reference to a voluntary character of Cross-Sector Interactions. As previously discussed, the social action developed by actors in collaborative practice is transmitted by valuable notions and interests given by ideas of social transformation, unlike those which are strictly marked by self-interest. However, when themes related to the enlargement of citizenship, participative democracy, ethics in management and social responsibilities are discussed, it is very common to find idealized speeches that reproduce social constructions guided by the consensus around the importance of the enlargement of ethics and democracy. These discursive idealizations can, deliberately or not, disturb the critical perception of collaborative processes in course, as well as disregarding the mosaic of interests; values and rationalities built in a non-linear way in the social action which marks the Cross-Sector Partnerships. Therefore, the relevance in the alignment of actors around metaproblems should not be disregarded, but also go beyond the limits of this analysis from this dimension, otherwise a considerable advancement might not take place in the analysis of the collaborative processes involving state, civil society and market organizations.

At last, Selsky & Parker (2005) present the so called Societal Sector Platform. The relationships among state, companies and civil society organizations operate under new

foundations. Besides, the limits among these three sectors are obscure and not well defined. This overlap and understatement of borders occur especially when an organization from a certain sphere uses or captures roles traditionally associated to action and rationality of actors from another sphere. For the authors, such phenomena can lead to the appearance of real processes of hybrid governance and the emergency of hybrid organizations or interorganizations. Among these elements, there are relevant propellants of the Cross-Sector Interactions through literature produced by this current of discussion, which refers to the reduction of governmental financing of social projects developed by the civil society organizations, leading them to the collection of resources through commercialization of products and services, also to the weakening capacity to govern the state organization. Such facts force civil society organizations to offer public services at same time that develop typical business activities to access financial resources for its projects. Another kind of civil society organization makes pressure over business activities in global scale, leading the corporation to insert social issues in the management policies.

The discussion about the borders among public, state and market spheres as well as those about roles and rationalities of their organizations allows a series of debates either related to structural phenomena that mark contemporaneity or about micro-foundations of social action from actors, as previously discussed. The approaches of the Societal Sector platform fall into this dimension and allow a series of relevant phenomena that mark Cross-Sector Interactions to be troubled, including those connected to the construction of references and meanings shared as for the appearance or not of a new field located on gray areas of intercession and overlap of practice from actors involved in collaboration. Besides, this discussion provide important vectors for analysis about traditional roles of each actor in their own sphere and the tensions and games of power involving a shift and/or permanence of their praxis toward the partnerships with organizations from other spheres, marked by different rationalities and practices.

Therefore, it seems more productive and consistent theoretically not to proceed with the analysis of Cross-Sector Interactions from exclusive or dichotomous perspective of analysis, but from three central elements of three lines of approaches such as: *Resource dependence*, *Social Issues and Societal Sector*.

To support our study, we connected the Humanitarian Logistics and Disaster Risk Management literature to the Cross-Sector Interactions as a way to understand different actions, strategies, and capacities developed by government organizations and agencies, civil society organizations and grassroots organizations, and private corporations (not only big companies as well small and medium private enterprises operating in the local level).

3 –Methodology

This study aims to understand how humans and non-humans were affected by the disaster and specially how the interaction between actors happened. The research aims to elaborate and increase the area, by adding a in depth analysis of the relationship among actors involved in the aiding and recovering the population (human and non-humans) affected by tragedies. The research will augment the knowledge of Humanitarian Logistics and cross-sector interrelations. In the history of Petrópolis, there was no such analysis that intended to understand the relations and indicate scenarios in which they can work more coordinated together. From this perspective, we describe the methodology applied to understand the disaster scenario and its implications in the recuperation of the city.

3.1 Selecting the Population and Sample

The selection of the sample was made by accessibility. The population selected were those directly or indirectly involved in the disaster scenario. The research sample was composed of 6 interviews made during the 1st and 10th of July, 2023. Among the interviewed: were members of NGO's and city hall, a representative from impacted communities, specialists in city recuperation, members of the community directly affected, and participants in the reconstruction. The composition of the sample, although made by accessibility, there was an intent to choose people from different institutions and organizations, that could provide insights on the tragedy, and also indicates how the relations among institutions and organizations unravels. Each subject had a different filiation and were involved with different levels of aiding the population. Some have more executive functions such as volunteers and others are responsible for coordinating and organization of supplies or donations, working sometimes directly with public actors, such as the town hall or central government.

3.2 Using Instruments and Tools

For the development of the interview protocol, we analyzed the literature to add question that can help us understand how a city can recuperate from a disaster, how was the interactions among the multispecies involved in the tragedy. The interview protocol had many open questions regarding the disaster and let the interviewer speak freely on what kind of actions helped recuperate the area affected. There were 11 questions regarding actions made on the spot and post-disaster. The questions could be categorized as such: Actions during the disaster (5 questions); Recuperating (2 questions); Relieving actions and prevention against disaster (5 questions). The instrument was made in that way, in order to follow the path of the humanitarian logistic literature that indicates that a disaster have at least three stages: actions during the disaster, recuperating and prevention. To draw upon these questions, we conduct the interview with simple questions, more like bullet points so that the interviewed should feel free to talk about them. This protocol was used in a previous work regarding only the recuperation and rescue of humans' victims. As we enlarged the research, we have decided to use the same basic questionnaire.

Table 1 – Interview Protocol

Questions	Category
Name Organization Experience with disaster	Profile of the sample
What was your role in the disaster that occurred in February 2022 in the city of Petrópolis?	Actions during the disaster
What were the main actions taken by your organization or by you as an individual in helping the victims of the tragedy, humans or non-humans?	Actions during the disaster, recuperating
What was the process like for the victims to access essential items for survival (water, food) at the time of the tragedy	Actions during the disaster
How can similar tragedies be prevented? Give examples of preventive actions that can be taken?	Prevention
How were victims evacuated from risk locations? The non-humans were taking into consideration over the variety of scenarios?	Actions during the disaster
What was the participation of official entities in this process, for example, city hall, firefighters?	Actions and Recuperating
How could the actions of these entities be if you have identified failures in this process?	Recuperating and Prevention

List the main preventive actions that can be taken by your organization or by you as an individual.	Prevention
List the actions that should be taken by official bodies, eg city hall.	Prevention
How can public awareness actions contribute to the prevention of these types of disasters?	Prevention

Source: elaborated by the authors.

The question was answered not necessary in order, the interviewer conducted the interview as for letting the subject to comment on the subject they felt more inclined to. At times, there were themes developed by the subject that were not intended at first, such as the participation of central government in aiding the recuperation of the city, with special financial loans to help business to recuperate.

3.3 Data Collection

Scientific data was obtained from in-depth literature research. Information obtained from the literature research was combined in other to understand the problem. The respondent could be identified as shown in the table 2.

Table 2 – Sample of the Research

Identification	Function during the disaster	Previous Experience
Volunteer - NGO 1 (Member of the city hall)	Separating supplies for the victims	Previous experience in other floods in the city.
Volunteer in a NGO 2 (Veterinarian)	Delivering supplies for the victims	None experience.
Volunteer in a NGO 3 (Animal Shelter)	Psychological support for the victims	No experience in attending to victims of a disaster.
Volunteer - Church 2	Separating and Delivering supplies for the victims, especially food delivery.	No experience in attending to victims of a disaster.
Volunteer - Church 2	Attending victims who were staying in the church until finding other houses. This specific church give room for pets.	Previous experience in other floods in the city.
NGO (Animal Shelter) 1	Delivering supplies for the victims, humans and non-humans	Attending victims of other floods in the city.

Source: elaborated by the authors.

3.4 Data Analysis & Actions

An in-depth literature review on Disaster risk and vulnerability, Cross-sector Interrelations was conducted to identify critical factors. The data was analyzed in order to identify categories in the speech, although the categories were previously found in the literature as meaningful and important. Disaster risk literature indicates that there are at least three levels of analysis: Actions during the disaster, Recuperating and Prevention. Cross-sector interrelations literature indicates the importance of understanding the objectives and perspective of each actor, in order to understand how they interact or how they behave.

4. Results

The subjects of the research were interviewed using a presented protocol, but in some cases there were a variety of questions included on the spot, using the discretion of the authors, in order to have a better understanding of the situation. Although we were able to categorize the answers in the same way presented by the literature.

4.1 Actions during the disaster

The people interviewed were involved in both humans and non-humans rescues, there were a variety of histories where the multispecies helped each other out in the process of rescue. The table below showed parts of the speech of the participant, separated by rescue, coordination of efforts, delivery of supplies and interactions of actors in the process of immediate response.

Table 3 – Interviewees` Speech about Actions During the Disaster

Interviews	Rescue	Coordination	Delivery	Interaction
1	“I found very interesting that the civil police sent trained dogs in order to help with the rescue. There were 3 phases in the rescue: checking for survivors, indicating location and checking for bodies. The animals were able to easily identify whether the victim was dead or alive.”	“I was responsible for separating donations and helping with the logistics of the delivery. I have done this multiple times before, but now we had a bigger area to cover, multiple places at once, even the ‘animals were hard to ‘rescue	“It was very interesting how there were a variety of NGOs also helping pets from the victims, and there were a lot of independent people coordinating efforts to help the community as a hole”	The cityhall was offered help from a variety of NGOs, specially with food and also medication for humans and non-humans, there were a lot of injured animals.
2	“There were a lot of animals left behind when the houses were destroyed, either the tutor had been killed or injured, so I was responsible for helping rescuing and saving these animals; dogs,. Cats, some birds were brought to the clinic I work.”	“After a couple of days, there was a mobilization from several organization regarding animal protection that helped coordinating the efforts either to help, or send supplies for animals in need. There was including a very memorable rescue of a horse that got stuck in a mud slide. There was a national NGO (GRAD) that provided help in this rescue. But even the NGO (Gare) had support from local animal protectors, individuals or other NGOs.”	The locals NGOs of animal protection received a lot of donations. At the NGO that I have helped, there were in total 350 rescues, more than 2 tons of food donation. The food was delivered either to shelters in churches and schools. And one specific Animal Protection NGO had a private shelter for injured animals.	I notice the civil society very present, in the form of NGOs and individual, although they lack a coordinated effort. The cityhall was lost most of the time, not knowing what was needed where. The efforts lack a central organization.
3	I was a volunteer at a NGO with an animal shelter, and we made more than 350 rescues, including mostly cats and dogs. The animals was than returned to the tutor, but some of them still remain with us, til this day.	We have received donations national wide, and we have tried to coordinate the location and supplies we stand to each region affected by the tragedy. And as we rescued a lot of animals we also used medication and food for the animals	The delivery was made by a private effort from our volunteers. I used my own car to deliver supplies sometimes.	I did not see a coordinated effort, what I saw was a very disorganized attempt of the public organizations to help people, but the animals was never really considered.
4	I was able to help a lot of people reconnecting with their pets, as a I worked with a Church that allowed animals.	We received mostly donation for humans, the animals were secondary, although I notice that they kind of help their tutor in dealing with the trauma. The coordination of efforts was mostly to help in the rescue of people.	The delivery of what we have received were made by people with motorcycle. They were very helpful, because most of the affected area were very hard to reach by car, in the first days.	Our church coordinate efforts with other churches and with a big NGOs that worked with rescuing people. We had no connection with public organizations.

5	I worked directly in helping with rescues, I could not help, but notice that most animals were left unattended. Sometimes we were able to rescue than, but no more than 5 or 6 times. We did not had sufficient time.	Sometimes we had donations for animal foods. Because we only had a few pets, we made contact with another animal protection NGO, that used to come and collect the food to deliver for those in need. We coordinated some actions with that.	The delivery was made by private cars from volunteers or members of the church. The donation was distributed by segmented locations.	I notice a lack of coordinated actions considering all the actors, such as state government, city hall and the NGOs. Because of that some donations were lost.
6	The rescues were hard because most of the animals were trapped inside the houses, and usually the fire workers and specialized rescuers had left the place. So, the volunteers at the NGOs and individuals were responsible for animals' rescues.	We coordinate rescuing efforts, even finding a place for the GRAD team to stay. We have helped in more than 400 rescues, by providing rope, transportation for the animals, shelter and food.	The delivery of donations was also made for humans and non-humans. As we were more involved in animals' rescues, we also coordinated efforts to replace the animals with their original tutors.	There is no public animal shelter in the city. There is a department attached in the health department that is responsible for animal protection but there was no coordinated action of our knowledge with other public organizations.

Source: elaborated by the authors.

Obs: *GRAD – Grupo de Resgate Animal em Desastres – Animal rescue group in disaster, national NGO specialized in animal rescue.

The answers, in general, pointed to the direction of the lack of coordinated efforts, although a lot of public organizations were involved, namely local government, militaries and local police, fire departments. The civil society were essential for made it possible for the humans and non-humans to be better taken care. The city stopped for more than a month to recuperate. There was also a delay in coordinated actions when they happened, such as the cleaning of the roads. Different cities sent help with public workers to clean the city. As we will explore in the next category.

4.2 Relieving and Recuperating

Recuperating a city that suffered so many materials and non-material losses is hard and it takes more than one year. But some efforts were made couple days after, and still lingered after a whole year have passed. These efforts were pointed by the people that have been interviewed and were dived in Immediate Actions and Enduring Actions.

Table 4 – Interviewees` Speech about Relieving and Recuperating

Interviews	Immediate Actions	Enduring Actions
1	What I saw first hand were NGOs working together to clean the city, trying at their best to help people return home or got to safe locations. Although the efforts for cleaning the city were made by public workers, the whole society helped.	The city hall proceeds during the remaining of 2022 and 2023 a series of structural work in rivers, bridges, and endangered slops. Although there was little work toward fiscalization of endangered areas, with half destroyed houses, where some people have returned to live.
2	Rescues teams from police, fire department and groups sent from other cities were the true heroes in the rescues. At that night, there were more calls to the fire department than professionals to help, so I saw neighbors helping neighbors., regular people doing heroic deeds.	Regarding the animals, I believe we need a public health action. Although the NGOs gave shelter for many animals, many were left in the street, contributing for the increase of diseases, a zoonosis issue.

3	There were a lot of help for recuperating the city. An immediate action was made by the central state government creating an emergency budget that allowed for business taking laws at very low rates, although they were very hard to get, there were a lot of specific documentation necessary.	The tourism is essential to the city, and many were the actions made by public organization to creating infra structure for the tourist to get back in the city.
4	The most significant action for me were the cleaning of the debris. There were huge rocks that were dislocated in the mudslides, they were destroyed in the course of the following weeks by contracted engineers.	The correct fiscalization of construction I believe is the more needed action. If we consider that almost every area of the city has a mountain or a river, we need to have a more ordained space.
5	Considering the animals, there were no clear immediate action made by the government, but the NGOs with the help of GRAD were capable of helping more than 1.000 animals.	Considering the long run, I believe an action regarding public health must be addressed as the population of stray animals increased severally.
6	The animal protections NGOs in general kind of created a protocol of animal rescue in disaster situation with the help of GRAD.	There is a clear necessity of a public animal shelter, not only because it would help in another similar problem, but also because there is an increased number of stray animals in the street.

Source: elaborated by the authors.

The answers pointed to the same direction of creating public police that includes the treatment of non-humans, especially as the tragedy created probably a zoonosis issue. In the next section we discuss prevention.

4.3 Prevention

Regarding prevention, we had open questions and waited for suggestions of the respondents. As to think about actions that included humans and non-humans. They all pointed to some actions that can be made in individual and public spheres, as shown in the table.

Table 5 – Interviewees` Speech about Prevention

Interview	Individuals	Public
1	Responsibility with the animals we are tutors, taking care and in the face of tragedy trying at best to also considered them.	Creating an animal shelter that would help in those situations but also educate the population regarding animals in general.
2	Helping out the NGOs by volunteering or donating to help.	Creating a public health police more directly explaining what should be done in case of tragedies.
3	Thinking society by including a multispecies concept, we live in a world that should not exclude anyone.	Creating a local group specialized in animal rescue, with the help of GRAD.
4	We must consider the future generation, by that, I mean is important to take care of what is our, taking good care of a animal, of the environment is necessary if we want to considering living in this city.	Creating an animal public shelter would help to centralize certain types of actions.
5	One thing that would impact a lot is treating better our trash. What we and our pets produce of garbage should be better treated by us. This can contribute to reduce some floods caused by clogged pipes.	Creating fees for polluting rivers, but also a better fiscalization of the disposal of the garbage in general.
6	We have a responsibility specially with the conscience about the garbage that we produce.	Creating a stronger fiscalization of the garbage that is disposed in the rivers.

Source: elaborated by the authors.

As the answers were not exactly guided by, we had open discussions about every question posted in the interview protocol, we can see that actions regarding thinking as a society and also thinking about animals were pointed out.

5- Final Remarks

Our research discussed Cross-Sector Interactions involved in a disaster situation and proposes insights to understand coordination in response efforts while considering vulnerabilities of both human and non-human populations. The results from the field research in Petrópolis, Rio de Janeiro state, Brazil, show us that humans and non-humans are in continuous interaction even in tragedies and risky events in contemporary societies.

From the perspective of the action during the emergency support, a few minutes after the tragedy, different people from multiple organizations (OSC, government, and small enterprises, and commercial entrepreneurs) are connected to support human and non-human. Empathy and compassion happened as a strong political emotion mobilizing people, donations, transportation tools, and money to save and protect people and non-humans, especially pets of survivors and victims.

In the next steps of the Humanitarian Logistics workflow, the necessity of stronger and more efficient Cross-Sector Interactions was becoming clearer to the people working in the post-tragedy events. The absence of a systematic public policy to protect non-humans reveals a more complex reality of safety and not-violation of the rights of non-humans in the day-by-day of Brazilian society.

However, the experience of working together opens the minds and imaginations of the people working hard to revive the community. New interactions, ideas, and the mixing of technical knowledge and political emotions, related to protecting, taking care, and making more safety and harmonic living together between humans and non-humans represent truly seeds of social innovation that can result, in the future, in new Cross-Sector Interactions capable to make more efficient protection of humans and non-humans facing new disasters and tragedies.

Our paper brings new insights to future research about Disasters and Risk Management. This topic is new in the Brazilian Management research centers and postgraduate programs. The analysis of the Cross-Sector Interactions brings us a deeper and more complex comprehension of the collective action to deal with the Disasters, not only in the action after the tragedies but as prevention too. In this general issue of research, non-human rights, the protection, and safety of non-human rights represent a more advanced and necessary discussion in the Brazilian context as well as globally. We hope to see in the near future more research integrating not only academics of multiple fields of knowledge but also the practitioners and local people that bring traditional and ancient knowledge to mix the scientific knowledge, creating a more effective approach to deal with Disasters and Risk in contemporary society.

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