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DISASTER AND VULNERABILITIES: HOW CAN WE DEVELOP COLABORATIVE ACTIONS TO PREVENT VICTIMS FROM DISASTERS

CARLA WINTER AFONSO
UNIVERSIDADE CATÓLICA DE PETRÓPOLIS

ARMINDO DOS SANTOS DE SOUSA TEODÓSIO

UELITON DA COSTA LEONÍDIO

JOSÉ CRISTIANO PEREIRA

Introdução
The increasing number of disasters due to climate change and especially after the pandemic of COVID19 uncovers a series of vulnerabilities in the humanitarian supply chain responses, for instance in the attendance of victims in difficult geographic areas such as the one studied in our paper. Risk Management in the supply chain can identify and manage risks externally and in the supply network.. Risk management can be described as risk identification and mitigation. Meanwhile, the differences between commercial supply chain management (SCM) and humanitarian SCM in terms of objectives.
Problema de Pesquisa e Objetivo
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.
Fundamentação Teórica
When analyzing Humanitarian Logistics, Jilani et al. (2018) mention that conventional responses to natural disasters disturb the environment and all beings that surround it. When examining humanitarian operations in critical areas, it can be said that the environment is further damaged as the carbon emissions linked to logistical activities add to the already fragile environmental health of the place. This happens while abrupt responses to natural disasters are never simple, involving several variables to be considered, such as the emissions of pollutants from transport inputs.
Metodologia
The paper had a qualitative approach using an interview protocol with 20 subjects, responding to an in depth interview, regarding their participation in aiding victims of the Petrópolis Tragedy. The interviews were analysed using MaxQda software by categorizing the answers based on the literature on humanitarian logistics, disaster risk management and reduction of vulnerabilities. The focus were to understand how can colaborative actions can help prevent and reduce victims.
Análise dos Resultados
In the literature presented (Tomasini & Van Wassenhove, 2009; Adiguzel, 2019), there are different moments when dealing with a tragedy like the one that happened in February in Petrópolis. We can talk about actions that were taken during the event, actions to relieve and prevent disaster, and actions regarding the recuperation of the city. Based on these categories, the interviews were analyzed. The software identified the categories and indicated their relation. A strong relationship was built between Recuperating and Relieving/Prevention
Conclusão
The Petrópolis municipality is marked by disasters that happen by environmental causes, especially intensive rain, floods, landslides, and landslides have strong connections with the inequalities in Brazilian society and the way that poor people find to build residences, work and survive in the city. These structural elements make the tragedies from disasters stronger, resulting in many losses and killing many people. The data we collected shows us that the Cross-Sector Interactions in the Petrópolis case is not a political, social, and management reality.
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Palavras Chave
Humanitarian Logistics , Reduction of vulnerabilities, Disaster risk management

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Introduction

Humanitarian Logistics is a vital area of study that can help to create better response to disaster, especially those created by climate change. 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, 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.

The increasing number of disasters due to climate change and especially after the pandemic of COVID19 uncovers a series of vulnerabilities in the humanitarian supply chain responses, for instance in the attendance of victims in difficult geographic areas such as the one studied in our paper. Risk Management in the supply chain can identify and manage risks externally and in the supply network. Risk management can be described as risk identification and mitigation. Meanwhile, the differences between commercial supply chain management (SCM) and humanitarian SCM in terms of objectives (Ertem etl, 2010), demand patterns, and stakeholders affect the approach to handling humanitarian operations, as well as risk management.

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, p. 1, 2021)

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. 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).

Vulnerabilities can be understood as the human dimension of disasters and is resulted from a range of economic, social, cultural, institutional, political and psychological factors that influence people's lives and the environment they live. Before a few decades ago, governments and relief organizations responded to disasters as isolated incidents without considering their social and economic ramifications or underlying causes. A more technocratic worldview that held that the "only way to deal with disasters was by public policy application of geophysical and engineering knowledge" emerged as a result of considerable advancements in our understanding of the natural processes that underpin hazardous events. These methods treated natural disasters as extraordinary occurrences that had little bearing on continuing social and developmental processes. The emphasis on preparatory measures, such as the storage of relief supplies, preparedness plans, and an expanding role for relief organizations like the Red Cross, gradually replaced this approach. In this case, "contingency planning".

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 neighborhoods live in dangerous areas. Two years ago, the most important disaster in Petrópolis history happened, killing around two hundred people 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, NGO, and civil society actors when facing natural or man-made disasters. Second,

evaluating objective indicators can lead to understanding how organizations behave 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:

How can collaborative actions can help prevent victims from other disasters?

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 theory 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; Conclusion section presenting our main finds on the subject.

THEORETICAL BACKGROUND

Humanitarian Logistics

When analyzing Humanitarian Logistics, Jilani *et al.* (2018) mention that conventional responses to natural disasters disturb the environment and all beings that surround it. When examining humanitarian operations in critical areas, it can be said that the environment is further damaged as the carbon emissions linked to logistical activities add to the already fragile environmental health of the place. This happens while abrupt responses to natural disasters are never simple, involving several variables to be considered, such as the emissions of pollutants from transport inputs (medicines, food, and drink to the different affected locations), and the control of their total cost. According to Gonçalves &Lima (2018), there is a gap in the literature regarding the capabilities and resources that organizations should develop in order to deal with different types and intensities of disasters, indicators data obtained from past tragedies, in order to take the best measures in case of a future disaster. According to Rao (2009), indicators, or metrics, help in the determination of priorities and objectives of organizations in the environment in which they are inserted. In our case, an organization should be replaced by the designated actors, such as government or NGO's. They have the role of indicating how the organization is in its current state, providing an overview of operations, in addition to providing means to achieve the strategic objective outlined for where the organization wants to be in the future. Another important gap is regarding the relationship between Society, government and non-governmental organizations (NGO's) specializing in disaster, and how these three actors interact when facing a natural or man-made disaster (Gonçalvez & Lima, 2018).

The indicators make it possible to understand that value can be created to execute the management and, in addition to establishing a structure for the implementation of organizational strategies (Santana-Medina *et al.*, 2012). As highlighted, studying environmentally humane aspects of performance is fundamental, a success measured by the organization's critical factors. As a challenge, Abidi and Klump (2013), Larrea (2013), Lu, Goh & de Souza (2016), Bardhan & Dangi (2016), Toklu (2017) related performance indicators to help the humanitarian supply chain.

To assess the performance of humanitarian supply chain management, dimensions related to resources can be used to manage the total logistical cost (Beamon & Balcik, 2008; Beamon & Kotleba, 2006; Schulz & Heigh, 2009); to exits, to manage the coverage of care provided to beneficiaries (Beamon & Balcik, 2008; Davidson, 2006); and flexibility, to manage the capacity to serve beneficiaries (Beamon & Balcik, 2008). Of these, the service coverage indicator is the one with the greatest humanitarian character. The use of performance indicators makes it possible to evaluate the decision-making of humanitarian organizations, which can

occur autonomously, in which each humanitarian organization makes decisions on how to allocate its resources between acquisition, transport, storage and administrative operations in its supply chains (Balcik *et al.*, 2010); or it can occur centrally, when a company or one of the actors assumes the main control of the decisions of the organizations with which it is associated. Balcik *et al.* (2010) understand that partnerships can occur vertically (between partners from different layers of the chain), horizontally (between links in the same layer) and laterally (combining and sharing resources with competitors and partners).

Major research challenges are pointed out towards the implementation of processes systematized logistics with a focus on humanitarian logistics, with emphasis on: related to infrastructure, location of assistance centers, distribution of resources, process coordination (people, supplies, information, materials). Pettit and Beresford (2005) and Tatham and Pettit (2010) point out similarities between humanitarian logistics and military logistics: both have uncertain demands, face difficulties given by the degradation of the physical infrastructure of the place and the absence of certain State functions, tend to injured and traumatized individuals, and are under observation media constant. On the other hand, for Ertem *et al.* (2010) business logistics are 15 years ahead of humanitarian logistics. According to Nogueira *et al.* (2008), the conditions faced by companies are different faced in a disaster, so there are specific characteristics of logistics humanitarian issues that differ from the traditional business approach, such as life-related issues human resources, unreliable, incomplete or non-existent information systems and random effects generate the demand. Humanitarian operations take place in environments where the infrastructure is precarious, and there is a high turnover of human resources.

A disaster is a test of the reactivity of a system, especially the capacity of different actors to work together as a team (Raillani *et al.*, 2020). The situation demands solutions that include governments, military, civil Society and humanitarian organizations. When a disaster (natural or man-made) occurs, an efficient disaster relief supply chain plays a critical role in quickly distributing relief supplies to the population affected areas for rapid recovery. An insurance risk management framework for decision makers to quantify the risks and benefits associated with stocking decisions for disaster relief efforts or supply chain disruption were proposed by Londree and Taskin (2008). We can say that a disaster is an unexpected event that disrupts the system's normal functioning due to natural or technological causes and leads to human, economic, material, and environmental losses. This requires the intervention of various actors of the community in order to regain initial balance, and humanitarian logistics bases can help to regain the balance, primarily due to frameworks that help us see the risk management process. "Disaster logistics, also known as humanitarian aid logistics, is designed to cover the needs of damaged and vulnerable individuals and to alleviate their suffering" (Adiguzel, 2019, p.213). Humanitarian Logistics consists of processes and systems involved in mobilizing people, resources, and knowledge to help vulnerable communities affected by natural disasters or complex emergencies (IFRC, 2020). It seeks a rapid response, aiming to serve the most significant number of people, avoid shortages and waste, organize various donations and operate on a limited budget.

Tomasini & Van Wassenhove (2009) define five flows that must be managed in the humanitarian supply chain, which they called 5 B's: boxes, bytes, bucks, bodies and business. They also point to difficulties inherent in the management of the supply chain:

1. Difficulty in carrying out its operations with limited resources;
2. Difficulty in reconciling ambiguous objectives;
3. Difficulty in making decisions due to the high degree of uncertainty;
4. Difficulty in carrying out actions in a politicized environment;
5. Difficulty in dealing with urgent problems.

Disaster Risk Management

"The term disaster risk management (DRM) is often used referring to a systematic approach to identifying, assessing and reducing risks." (Twigg, p. 6, 2015). 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 in 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, disaster risk management has a objective similar to humanitarian logistics, although it specifically 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). Having appropriate actions at all the points of the cycle reduces vulnerability and prevents new disasters. This action 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 preventing future emergencies and also minimizing 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 normality back to the community. This is also very similar to the ideas behind humanitarian logistics. How to create operational efforts to prevent and recover 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 are 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 involving multiple victims, forest fires, accidents with dangerous goods, such as long-awaited hostage crises, the natural disasters that had the evacuation of communities, etc.

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. At the same time, their echoes are reflected on different spheres of society, intensifying, thus, criticism, doubts and debates. Sometimes denunciations are raised about taking advantage of actions, pointing at the limits, ambush and inconsistencies connected to the notion and practice of interactions based on only partnerships. Such partnerships, ambiguities and paradoxes are present in everyday actions of practitioners from state, companies 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 (PREFONTAINE *et al*, 2000; SELSKY; PARKER, 2005, GORDENKER, WEISS, 1996) and also for a multiplicity of understanding and assumptions connected to its comprehension (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 (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. (FISHER 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. (GRANOVETTER, 2007; FLIGSTEIN, 2001; VIEIRA, 2001; SELSKY, 2005; BURAWOY, 1998)

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 and 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 apud Gohn's (2000) 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 Social Management field of knowledge. (Teodosio and Alves, 2006)

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 meta problems 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 and 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 an 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.

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 grass-roots organizations, and private corporations (not only big companies as well small and medium private enterprises operating in the local level).

Methodology

As a methodological approach, the authors relied on humanitarian logistics literature to draw a different perspective where the citizen allied directly with political powers could provide immediate help for those who need it. From this perspective we describe the methodology applied to understand the disaster scenario and its implications in the recuperation of the city. The research will augment the knowledge of humanitarian logistics, disaster risk management 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.

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 20 interviews made during the 1st and 10th of September, 2022 and form 2nd and 8th of August, 2023. 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.

Using Instruments and Tools

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.

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?	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?	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 author.

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.

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 in a NGO 1	Separating supplies for the victims	Participation in other floods in Petrópolis.
Volunteer in a NGO 2	Delivering supplies for the victims	None experience.

Volunteer in a NGO 3	Psychological support for the victims	No experience in attending to victims of a disaster.
Volunteer in a Church 2	Separating and Delivering supplies for the victims, especially food delivery.	No experience in attending to victims of a disaster.
Volunteer in a Church 2	Attending victims who were staying in the church until finding other houses.	Previous experience in other floods in the city.
Member of NGO 1	Delivering supplies for the victims	Attending victims of other floods in the city.
Member of NGO 2	Organization of delivery of food and supplies to the community affected by the flood or mudslides.	None experience
Member of NGO 3	Delivering supplies for the affected communities	Attending victims in other floods in the city.
Member of the city hall 1	Planning and Coordination of Action of Assistance.	No experience in attending disasters.
Member of the city hall 2	Coordination of volunteers attending the victims, among doctors, psychologists, nurses.	Experience in attending victims during other floods in Petrópolis.
Volunteer help in animal shelter	Separating supplies for non humans victims	Participation in other floods in Petrópolis.
Victim from a risky area 1	Delivering supplies for the victims	Participation in other floods in Petrópolis.
Victim from a risky area 2	Separating donations and helping neighbor's and the fire fighters looking for other victims	No experience in attending to victims of a disaster.
Victim from a risky area 3	Separating and Delivering supplies for the victims, especially food delivery.	Suffered in another flood, but no actual experience.
Victim from a risky area 4	Helping neighbors finding other relatives trapped in risky areas.	Previous experience in other floods in the city.
Victim from a risky area 5	Delivering supplies for the victims	Attending victims of other floods in the city.
Victim from a risky area 6	Delivering supplies for other victims	No experience
Victim from a risky area 7	Helping neighbors.	No experience
Victim from a risky area 8	Delivering supplies for other victims	No experience

Victim from a risky area 9	Delivering supplies for other victims	No experience

Source: elaborated by the authors.

Data Analysis & Actions

An in-depth literature review on Humanitarian Logistics, Cross Sector Interrelations and disaster was conducted to identify critical factors in how humanitarian logistics can help a city recuperate from a significant natural disaster. 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. Humanitarian logistics 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.

After the interviews' transcription, all our data was inserted in the MaxQDA software to analyze and code our data. The results can be seen in the next section. A different number of analyses were run to understand the tragedy's steps and how each interviewer contributed by helping the victims.

Results and Discussion

In the literature presented (Tomasini & Van Wassenhove, 2009; Adiguzel, 2019), there are different moments when dealing with a tragedy like the one that happened in February in Petrópolis. We can talk about actions that were taken during the event, actions to relieve and prevent disaster, and actions regarding the recuperation of the city. Based on these categories, the interviews were analyzed. The software identified the categories and indicated their relation. A strong relationship was built between Recuperating and Relieving/Prevention. This happened during the interview when the subject talked about relieving actions that were strongly connected with recuperating, such as urban planning. The subject of vulnerabilities was brought into discussion when talking about the necessity of planning specific with poor communities that still lives in endanger areas. Only a percentage of the answers are shown to illustrate what was developed in the Literature Review section, and categories or codes are present in the table.

Table 3 – Actions During the disaster

Name of the document	Codes	Parts of the speech
Interviews 2 Interview 3 Interview 4 Interview 5 Interview 12	Actions During the disaster	1. Separating and delivering supplies for the victims. 2. Fireworks and a city hall department called Civil defense* were activated to attend the victims. These was recognized by most of the interviewers.
Interview 1 Interview 6 Interview 15	Actions during the disaster	3. Official members of the city hall helped evacuate the victims, besides separating and delivering supplies.
Interview 7 Interview 8 Interview 9 Interview 17	Actions during the disaster	4. Volunteer coordination in NGO. NGO was responsible for collecting and distributing supplies, including helping official members of the city hall and all the workers necessary to remove trash accumulated by the flood and mudslides.

Interview 10 Interview 20	Actions during the disaster	5. Coordination of volunteer kitchen responsible for providing meals for workers of all sorts, including individuals Volunteer, NGO volunteers, and workers responsible for removing trash from mudslides and floods. Also helped in collecting and distributing different sorts of supplies.

*Civil defense is city hall department responsible for attending areas classified as in danger Source: Elaborated by the authors.

In this category, most of the interviews had similar responses, although the respondents were from different backgrounds, NGO, Church, and City hall members, they all contributed by collecting and distributing supplies. Also, a lot of people that lived in the areas affected started helping out, reaching for those that suffered more. The areas affected were challenging to access, so there was a considerable contribution from individuals with motorcycles, who volunteered to deliver what was needed. Tons of supplies came from all over the city and from other cities, and these usually comes through churches and NGO's. The city hall participated in collecting supplies, but there was a delay in action. Out of 20 interviews in 17, these problems were mentioned. Also, in 2 interviews, it was mentioned because there was disorganization at the beginning that, a lot of supplies were robbed by people who pretended to be affected.

In all interviews, they mentioned the difficulty of evacuating the areas, partly because people were still looking for survivors. One month after the first flood, there was a big storm that caused several mudslides with fewer victims, but there were 7 casualties in the second storm. In the first storm the numbers were 233 casualties, and after one month of the tragedy, there was still 600 people without houses. The city hall, as mentioned in interviews 1 and 6, created a social lease to help people rent new places to live, these actions were classified in the category of relieving and prevention, but it was also mentioned as a recuperating action. In table 4, we can see the results from the category Recuperating.

Table 4 – Recuperating

Name of the document	Codes	Parts of the speech
Interview 1 Interview 7 Interview 8 Interview11 Interview 12 Interview 13 Interview 18 Interview 9	Recuperating	1. Joint actions with city hall and federal sphere to recuperate the rivers. A lot of trash and sand accumulated could cause other floods.
Interview 2 Interview 3 Interview 6 Interview 14 Interview 15 Interview 16 Interview 19	Recuperating	2. There were workers from different institutions to recuperate the city, the bridges over the rivers were severally damaged, and the city hall helped repair. 3. It mentioned many risk slopes that were repaired by the city hall. 4.The city hall had a special lease to help victims to rent places to live.
Interview 1 Interview 4 Interview 5 Interview 10 Interview 20	Recuperating	5.A repair of a river gallery constructed years ago, the flood impacted that. 6. The flood invaded many shops downtown. The owners and volunteers of NGOs helped clean and reconstruct.

Source: elaborated by the authors.

In order to recuperate, a conjoint action of city hall and other institutions is needed. In interviews 1 and 10, the need to remove all the population of risky areas was mentioned, and the fiscalization should occur for this to happen. The underline notion is urban planning, the importance of planning the construction of new houses on these risky slopes. Also, as interview 10, the city hall must still attend to several risky slopes before the storm season strikes again. These actions were aiming recuperation but also preventing for future disasters. The last category analyzed, Relieving and Prevention, have strong interconnections with recuperation. The notion of vulnerabilities is strongly connected with planning and creating opportunities for people living endangered areas, so that other tragedies are prevented.

Table 5– Relieving and Prevention

Name of the document	Codes	Segment
Interview 1 Interview 7 Interview 8 Interview 9 Interview 10 Intereview 11 Interview 12 Interview 13 Interview14 Interview20	Relieving and Prevention	1. Removing the trash from the rivers; 2. Make the population aware of the importance of recycling the trash for a better destination. 3. Make the population aware of the importance of not constructing on risky slopes.
Interview 2 Interview 3 Interview 4 Interview 15 Interview 17 Interview19	Relieving and Prevention	4. Training of public transportation drivers in order to know how to act in case of floods.
Interview 5 Interview 6 Interview 16 Interview 18		5. Avoid deforestation when constructing houses. 6. A stricter fiscalization concerning houses in risky areas.

Source: Elaborated by the authors.

The category Recuperating and Relieving/Prevention had a lot of similar answers indicating that the respondent understood these 2 actions as combined actions. The recuperating actions would also help to prevent future disasters. Once again in almost every interview a delay of action from city hall was also observed specially when different cities and states have sent workers to clean the city, the first action of the city hall was denied their passage, and after a few days the help arrived.

The literature review, according to (Raillani *et al.*, 2020), requires the intervention of actors of the community in order to restore the balance. The respondents all had in common the notion that there is a conjoint work the recuperation and prevention of other disasters.

Final Remarks

This study aims to understand how can conjoint actions can helpful in dealing with the vulnerabilities of a community and preventing larger tragedies**.** The literature review indicates that humanitarian logistics actions can be divided basically into three steps: actions during the disaster, recuperating, relieving and prevention actions. Actions should be taken first to restore things in order than recuperating, and prevention must be an essential issue to discuss. The literature also indicates that a group of actors needs to make things go right. Disaster risk

management can also help predict certain types of issues that are preventable when aiding victims during disasters.

A study was conducted with several participants in aiding victims, among them members of the city hall, NGOs' and Volunteers, they also pointed into the direction of a co-joint action among the institutions to restore and recuperate the city. There were at least two implications of the study: first it was a contribution of a practical case that proved the theory to be correct. The second contribution was understanding the dynamics of the actions made after and during the disaster by social actors, such as individuals, NGO's and city hall. Moreover, these interconnected actions ended up helping more than the isolated ones.

The Petrópolis municipality is marked by disasters that happen by environmental causes, especially intensive rain, floods, landslides, and landslides have strong connections with the inequalities in Brazilian society and the way that poor people find to build residences, work and survive in the city. These structural elements make the tragedies from disasters stronger, resulting in many losses and killing many people. The data we collected shows us that the Cross-Sector Interactions in the Petrópolis case is not a political, social, and management reality. That is not strong partnerships, dialogues and collaboration in different moments of the local management to prevent disasters and improve fast strategies and actions to face tragedies. Even knowing that the collaboration between local communities, civil society organizations, humanitarian organizations, local government, and businesses can improve the capacities to answer the challenges of management in disaster contexts, the effective capacity of these social actors to work together is very low yet.We believe that our research can provide new insights not only to new research about humanitarian logistics, disaster management, and cross-sector interactions but can provide new insights to the practitioners of this central activity in contemporary society, unfortunately, marked by the increase of climate change and tragedies connected to the environmental disasters.

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