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Research Article

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A literature Review of the Factors Considered Critical in Influencing Disaster Risk Management Due to Seismic Activity (2010-2025)

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ABSTRACT
The materialization of natural disasters stems from the interaction and exchange of temperatures in bodies, dynamic manifestations concentrated in the environment, where natural phenomena manage to manifest and combine, with the help of water, large amounts of oxygen, unstable temperatures, relative humidity, and closed and open spaces, generating abrupt and disruptive changes in the normal habitat process and finding temporary equilibrium, moving on to others, where the repercussions reach to impact, penetrate, and alter the normality of the natural status quo for living organisms. The leadership of the United Nations (UN) has been globally promoting priority objectives to protect the lives and well-being of people affected by natural disasters. The working group documents that have been obtained are supported by meetings and exercises of hundreds of participants, including academics and scientists from various countries, and have provided an opportunity to present an extensive list of priorities, objectives, goals, and actions on five continents. These initiatives seek to address environmental responsibilities and commitments to reduce vulnerability to the risk of natural disasters, with particular emphasis on those with significant impacts, such as earthquakes (seismic activity) and floods (torrential rains). The occurrence of a disaster, whether natural or man-made, generates drastic and permanent changes in society. Disasters are classified according to their origin as natural, man-made, or mixed, creating a global problem that demands an immediate response. Although the scientific community has increased its joint efforts, these efforts remain insufficient and require a better understanding and comprehension, with trained human resources and limited materials, associated with global strategies that still require refinement and improvement. The bibliographic review on seismic activity disaster risk management (FCGRDAS), covering the period 2010-2025, provides updated information to identify and explain the factors considered critical and that influence seismic activity natural disaster risk management. This review is based on multidisciplinary knowledge and understanding. The selected research articles highlight the factors that impact natural disaster risk management due to seismic activity, showing progress and identifying gaps. This underscores the motivation for the study with the detection of twenty-four factors considered critical and related to such disasters. The selected research articles also indicate significant academic and scientific advances linking disaster risk management (DRM) with information and communication technologies (ICTs). Technological media play a crucial role in the real-time exchange and transmission of information. Some of these technologies already enjoy widespread social acceptance and are capable of detecting and communicating global seismic activity in real time, leveraging mobile social networks and technological platforms, among others.

Keywords: Disaster Risk Management, Seismic Activity, Influencing Factors, Theories

Introduction

Context of Relevant Empirical Evidence of Natural Disasters Due to Seismic Activity. Ancestrally, we know that natural disasters, derived from the phenomenology of seismic activity, are defined as violent, sudden, disruptive, and destructive changes in the environment. It is also known that the direct cause is not human activity; these are classified as natural phenomena (EEA, Li). They are part of the evolutionary process of Planet Earth, and their appearance, magnitude, presence, frequency, and drasticity have increased at the end of the 20th century and now more so at the beginning of the 21st century (Statista, 2017). Natural disasters due to seismic activity (earthquakes) are events not caused by man that negatively affect life, causing high mortality (Musacchio, 2015), damage, and loss of homes [1]. We have deterioration of health and complications in public health [2]. The immediate consequences are disruptions to people's livelihoods (food, water, medicine), damage to infrastructure, increasing disruption of economic activity, and disruption to ecosystems, which are already fragile due to the high level of exposure in natural environments, among others. Among the earthquakes of magnitude 7.50 on the Richter scale, which have

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been recorded and considered the most deadly and destructive, are, first of all, the one that occurred in the People's Republic of China on July 28, 1976, with a magnitude of 7.50 on the Richter scale and epicenter in Tangshan, where more than 255,000 people were impacted and died abruptly and leaving more than 11 million people homeless (USGS, 2020). Secondly, seismic activity was recorded in the Republic of Indonesia, with its epicenter near the coast of the island of Sumatra, on December 26, 2004, with a magnitude of 9.00 on the Richter scale, leaving a surprising number of 240,000 people dead and others reaching 1.7 million affected, who were left homeless (Duputel et al., 2012). Third, we have the earthquake that occurred in the Republic of Haiti on January 12, 2010, with a magnitude of 7.00 on the Richter scale and its epicenter in the capital, Port-au-Prince. More than 222,570 people died and just over 1.5 million were left homeless (USGS, 2010), mainly due to the high vulnerability of housing, weak institutional infrastructure, and precarious and substandard transit and access routes in a country considered the poorest in the Americas (Musacchio, 2015). The UN, in coordination with member countries, has been promoting interest in promoting vulnerability reduction through the Sendai Framework (2015-2030) and the Paris Agreement (2015). These actions and coordination are part of the priority and strategic objectives aimed at protecting people's lives and well-being. These global consensus documents contain a comprehensive list of recommendations, responsibilities, and environmental commitments to address natural disasters, particularly those resulting from natural phenomena with the most significant and far-reaching impacts, such as earthquakes (seismic activity) and floods (hydrometeorological activity). The occurrence of a disaster, whether natural or man-made, generates permanent changes in society and is classified according to its origin as natural, man-made, or mixed. This creates a problematic situation on a large, global scale, requiring an organized, immediately planned response. While the scientific community has redoubled its efforts to address these problems, the various coordination mechanisms remain insufficient and limited, with scarce budgetary, economic, and human resources requiring promptness to be associated under global strategies that still require improvement. After an exhaustive review of the literature on the "factors considered critical that influence disaster risk management due to seismic activity (FCGRDAS), during the period of time from 2011 to 2025, the research found in the database, are indexed and used mainly in Scopus and Web or Science journals, and five hundred and sixty-one (571) articles were found. Developing the systemic approach of synthetic, analytical and reflective thinking, in the selection process, they were reduced to seventy-five (75) articles, which were used during the research and open the opportunity to deconstruct and deepen them, with the approach, understanding, comprehension and knowledge of the literature on the factors that are important and influence decision-making on disaster risk management due to seismic activity (FCGRDAS). This budget is the source of motivation, related to the study of the factors, considered critical and with strong influence and presence in this type of disasters. Thus we can propose the following research guidelines, with questions that indicate the following:

- Which Factors are Considered Critical and have an Influence on Disaster Risk Management due to Seismic Activity (FCGRDAS)?
- Determine what Scientific Theories Explain These Factors that are Considered Critical and have an Influence on Seismic Activity Disaster Risk Management (FCGRDAS)?
- What Research Methods have been Applied in the Investigation of these Critical Factors?

To answer these questions, we selected scientific articles with important advances associated with disaster risk management (DRM) and ICTs. These technological means are well regarded and are received and accepted by society, and facilitate the task of detecting and communicating news of seismic activity worldwide in real time, taking advantage of mobile social networks and technological platforms (Fernández et al., 2013). This bibliographic review is structured in six (6) sections. Section 2 addresses the epistemologically the management of disaster risk due to seismic activity (GRDAS), immediate management, coordination and intervention aspects. In section 3, the systematic review methodology followed in this study is presented (prism methodology), complemented by the search for interest in a direct and selective way. Our effort includes the analysis of the factors considered critical, which can generate influence, the theories that support them and the methods used and found in disaster risk management (DRM), which are present in the selected articles. Section 4 is immediately associated with this, detailing the identification of critical factors and their grouping based on the literature. To contribute to generating a debate to expand and improve disaster risk management due to seismic activity, we delve into the discussion of the results presented in Section 5. Finally, we recommend some contributions to guide future scientific research through conclusions and reflections related to disaster risk management.

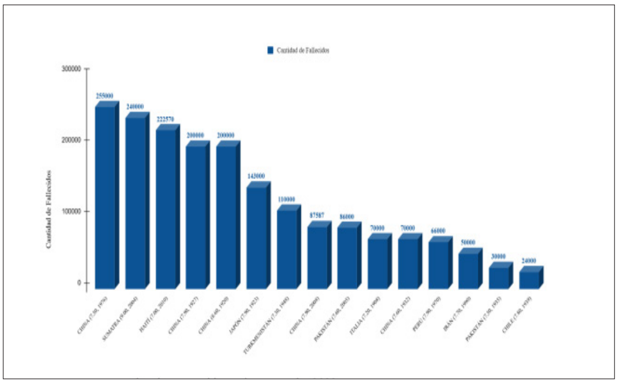

Figure 1: Seismic Activity and Destructive Earthquakes with the Highest Death Toll

Source: National Geographic Institute - Spain, 2023

The life cycle of any product or service manifests itself generally in any living organism and also within the services that may accompany us, offer us and that may be generated. All of them are associated with three key moments. The GRDAS consists of three stages: [3]. The first, which we can call a "before", The second, which we can place as a "during" and the third moment, when we place it as an "after", framed in seismic activity [4,5]. The consequences occur mainly in the second moment stage when we express it as "during" and have a minor impact afterward. This is occurring except in the case of tsunamis generated by earthquakes, where the impacts generate large displacements of volumes and large masses of salt water, where the consequences of impacts can be greater and complicated to predict. However, the impact can be less if the appropriate activities are carried out in each of these stages, with prevention activities (before) being those that have the greatest impact on the consequences of the NDDSA. For example, disaster risk management (DRM) models that include preventive activities, proposed in, show a 50% mortality reduction by simulation. NDDSA prevention activities involve natural risk, defined as the probability that the geographic area and the society that inhabits it will be affected by natural events of extraordinary scope, and is expressed by the equation (Andrade et al., 2022) [6]:

$$\int \boldsymbol{Risk} = \int \boldsymbol{Danger}\ (\boldsymbol{threat}) * \int \boldsymbol{Vulnerability} \ldots\ldots (1)$$

We present a simple algorithm, widely used in academic and scientific research, that defines risk as a direct relationship between hazard (threat) and vulnerability (1). In the context of disaster risk management (DRM), the term hazard is also called threat and refers to a situation or element that could cause damage or negative impacts on people, infrastructure, the ecosystem, or any other asset. Vulnerability is defined as the relationship between a unit and a threat. This unit (individual, structure, community) is vulnerable when it experiences material loss, economic damage, or impact on health, among others (Ruiz, 2011).

The Problem and Importance of Natural Disaster Risk Management Due to Seismic Activity (GRDNAS)

Natural disaster risk management due to seismic activity (NDRM) is a social process whose purpose is the prevention, reduction, and permanent control of NDDSA risks in society (Narváez et al., 2010), and consequently the reduction of the consequences of the disaster. In risk reduction, management models are being developed, such as the Pressure and Release Model (Wisner et al., 2004), global priority standards such as the United Nations Sendai Framework 2015-2030 (UN, 2015), and country-specific regulations such as Law No. 111 on NDDSA and tsunamis in Japan (Special Measures Act for the Prevention of Seismic Disasters), which involves raising awareness and preparing the population on how to act in the event of a disaster [7,8]. Technological platforms such as early warning, among others, are also being developed and implemented. However, the consequences of natural disasters due to seismic activity (earthquakes) in the last 10 years show us catastrophic results in terms of vulnerability reduction, such as what happened in Turkey in February 2023, where nearly 60,000 deaths and more than 120,000 injuries were recorded caused by two earthquakes measuring 7.80 and 7.50 on the Richter scale (USGS, 2023), despite being a country with emergency plans and a culture of prevention, that is, there are elements that affect the success of GRDNAS, which are called critical factors or simply factors influencing GRDNAS (See Figure 1) [9].

Aspects Related to the Study of Influencing Factors and Methods Used

There are several studies that identify factors influencing GRDNAS. In, the degree of perception by the population is identified as a factor that affects GRDNAS and how people act in the face of imminent risk [10]. Other factors of GRDNAS are the effectiveness and acceptance of the media, the socioeconomic and demographic situation, the degree of awareness of the population, among others. There are several studies that identify factors of GRDNAS [11,10]. In, it is identified that the degree of perception by the population is a factor that affects GRDNAS because, by being aware of their environment, better results are achieved in reducing the impacts caused by the disaster in question [12,10]. Other factors of GRDNAS are the effectiveness and acceptance of the media, the socioeconomic and demographic situation, the degree of awareness of the population (among others) [12,11,60].

Some Methods Used

On the other hand, to demonstrate that a construct is a factor of GRDNAS, the authors have relied on various statistical methods in general. In (Dos Santos et al., 2019) they use the statistical method with multivariate analysis, to test how human factors such as age, education, income, among others, can be determining factors when analyzing the risk to which humans are exposed to possible earthquakes and floods, in order to then manage them appropriately. In (Tuladhar et al., 2015) we find a statistical and descriptive analysis based on questionnaires (surveys) of the key problems that exist in DRM, such as education, lack of knowledge, adaptability and weak perception and importance of risk by the population, as is the case of the study of results on perception, evidencing improvement in women because they prefer to obtain information through richer media, such as national and international television, while men have opted to choose more traditional media such as FM radio with the incorporation of audio devices. In a statistical study and descriptive analysis was carried out based on surveys on the perception of seismic risk that existed in schools in Italy, where relevant results are revealed that tell us that young children understand and perceive the risk instinctively according to their age, however, as people grow in age and assume greater responsibilities, a significant result expresses the lack of knowledge in 78% of people about the danger (threat) and the perception of risk that is evident in the responsible personnel (surveyed), where less than 50% of people have an adequate perception regarding the danger generated in the area impacted by landslides [12].

In addition, we must include the study that proposes a risk-based behavioral decision-making model that integrates cognitive biases, risk assessment and probabilistics with adaptive support for AI-based decisionmaking [13]. The proposed methodology comprises four main elements: (1) Risk Perception Modeling, (2) Cognitive Bias Integration, and (3) Decision Framework: Mathematical decision model.

In the process of searching for information and data to answer these questions, we have searched for scientific information (Journal) in journals indexed in Scopus and Web of Science (WoS), in a period from 2008 to 2023. We highlight studies that identify some factors that influence GRDNAS, with emphasis on the technology used, the media and ICTs, all of which support research and can give us information about NDDSA (earthquakes), as well as the explanation and treatment used.

A Synthesis of LBD Updating and Generation

Taking as a reference the search of the literature base (LBD), the research covers a period of time from January 2010 to June 2025. The research initially found in the database and used, belongs mainly to the journals Scopus and Web Of Science (WoS) and are approximately five hundred and sixty-one (571) articles and, through a selection process, were reduced to sixty-five articles (75) that will be used during the research.

Our Motivation

During the literature search and selection process, no information was found that directly records the critical factors of GRDNAS management. We also found that there is little research that includes the planning, development, understanding, explanation, orderly, integrated execution, and concatenation processes in natural disaster scenarios caused by seismic activity. This prioritizes history, with empirical evidence, observation-based narratives and descriptions, and details, focusing both structurally and non-structurally on post-disaster consequences, such as material damage and loss of human life. Relevant data such as the magnitude, scope, and impact of phenomenological events resulting from seismic activity complement each other and can effectively support decisions regarding the achievement of the factors influencing the disaster risk management process.

The need to update and identify factors considered critical to disaster risk reduction (DRRM) leads us to evaluate advances in scientific research, using the post-disaster criterion as "afterward," in reference to the reactive disaster risk management (RDRM) approach. In the current context ("during", "now", "present"), we have identified gaps, opportunities, and spaces to address this issue, given the lack of a deconstructive and detailed analysis of the factors influencing NDDSA from a multidisciplinary scientific perspective (Takako Izumi, 2019). Gaps and approaches to be addressed deconstructively in GRDNAS have been identified, considering the interaction between humans, disasters, and technology (Kaylin Rochford, 2019). Another important point detected in the research is the need to update the language and terminology in the description and explanation of GRDNAS, considering the textual presentation of scientific research, methodological aspects, incorporation of technology, innovation, and entrepreneurship (Sendai Framework, 2015). The idea of having an orderly structure of influencing factors in research that addresses GRDNAS is a valid reason to promote research and contribute effectively and systematically with information for disaster risk management. Furthermore, there is a consensus, expectation, and perspective among researchers in citizen science, social engineering, environmental science, and other scientific areas to deepen human knowledge and understanding of DRM and the elements that influence DRMNAS (Jacek Raka, 2021).

Objective and Purpose of the Research

The objective of this research is to systematically and selectively review the important and developed aspects of the critical factors that influence the Management of Natural Disaster Risks from Seismic Activity (GRDNAS), taking into account a period of time from January 2010 to June 2025, with the purpose of generating knowledge and aiming at the reduction of structural and non-structural vulnerability.

Main Contributions

The main contributions of the study are:

- To provide organized and explanatory information on the factors considered influential in the GRDNAS, specifically the theories that support them and the inventory of the methods used for verification, from January 2010 to June 2025.
- Provide the reader with a significant variety of bibliographic references that can be used to research the factors considered critical in the GRDNAS.

Article Organization

This research is composed and organized into six (6) sections. Section 2 addresses natural disasters caused by seismic activity, management, and intervention aspects. Section 3 presents the systematic review methodology (Prisma methodology), complemented by direct and selective search. Section 4 presents the analysis of the critical factors and methods found in the selected articles, and Section 5 analyzes the results. Finally, Section 6 presents the conclusions, recommendations, and future research.

Background and Disaster Due to Seismic Activity

Disaster Risk Management Due to Seismic Activity

It should be noted that critical DRM factors are considered the "set of administrative, organizational, and operational decisions developed by societies and communities to implement policies, strategies, and strengthen their capacities to reduce the impact of natural hazards and the resulting environmental and technological disasters" (ISDR, 2008). The UN has promoted the reduction of the number of deaths caused by seismic activity, and researchers are joining individual and collective efforts to address risk prevention and reduction. It is precisely the issue of DRM that concerns us, with the importance of information on risk factors and DRMNAS to adequately address them. To date, there is tangible evidence in the planning and development arena that points to a lack of compliance in land use planning and environmental impact assessments across the economic, social, and environmental sectors.

Likewise, there are evident deficiencies in road and pedestrian infrastructure, and as large cities grow and evolve, regulatory procedures are only partially met in terms of adequate urban planning and assessments. In this process of development and expansion, the need for more integrated action by public administration and the participation of the private sector becomes evident. It is crucial to consider that DRM, as currently defined, constitutes an integrated social process whose objective is to continuously prevent, reduce, and control the factors that trigger disasters in society. This must be intrinsically linked to human, economic, and environmental development. However, to date, this approach has proven insufficient in terms of territorial coverage, which has limited the effectiveness of vulnerability reduction.

Aspects of the Factors Considered Influential in the GRDNAS

What is a Factor?

In general terms, "a factor is an element that has a decisive influence on an outcome; that is, it influences some aspect of reality and, therefore, must be taken into account when studying it" (Lavell, 2009).

What are Factors?

Below, we'll explain what we mean by factors: "those elements that can condition a situation, becoming the cause of the evolution or transformation of events." That is, they contribute to achieving certain results once they occur and are important elements to be considered in general.

The Interaction Between Humans and Disasters

We firmly know that the demonstration, manifestation, and explanation of interactions between humans and disasters dates back to primitive and ancient times (Villalibre, 2013). Since the beginning, humans have interacted with disasters. The first documented disaster in history occurred more than 47,000 years ago with the eruption of the Sumatra volcano. This event caused significant material and human damage, leading to a drastic reduction in the world's population. It is estimated that the human population decreased from one million to approximately 10,000 individuals. Although the literature lacks empirical evidence and precise details of the event, some researchers suggest that a meteorite impact may have released energy that caused the extinction of many living beings on the planet, including humans and prehistoric animals.

The Disaster

A disaster is an event that generates significant consequences and results following the impact of natural phenomena, commonly known as natural disasters, which originate in nature itself. Furthermore, some disasters have been identified as being caused by human activities [14].

A third category is added to these two, which encompasses events where natural causes combine with human intervention, known as anthropogenic or anthropic events (a mixture of natural causes and human intervention) [15]. These events, driven by human interaction and participation, negatively affect lives, families, livelihoods, industrial and service institutions, and businesses. They often cause permanent changes to human societies, the animals that inhabit those areas, ecosystems, and the environment.

The Methodology of Scientific Research

We are focusing on applied social research, and the Systematic Literature Review (SLR) is a clear and reproducible procedure consisting of a series of phases that help researchers define the research objective and plan the retrieval and presentation of articles (Ardito et al., 2015).

In the research phase, a methodology was followed to conduct a literature review around critical factors related to natural disasters caused by seismic activity, especially earthquakes, and how these directly affect the living conditions of the population. The process was divided into the following stages [16]:

- The planning phase - The detailed search was conducted in various information sources, such as academic, scientific, and specialized databases, in a coherent and cohesive manner using the keywords in the systematic bibliographic search.
- The development process - Clear criteria were applied for the selection of studies and literature reviews, which are directly related to the factors affecting GRDNAS.
- The results found - The studies were selected for a deep and deconstructive review with the extraction of relevant data and associated with the GRDNAS factors, to which twenty-three (23) were added, duly justified by the importance of the content, the theories used and the methods applied during the research.

The Planning Phase

We focus on answering the research questions, the following sub-questions are raised:
RQ1 What are the Factors Found and Considered Influential in the GRDNAS?
RQ2 What are the Theories Used to Explain and Support the Factors Considered Influential in GRDNAS? RQ3 What Methods Have Been Applied to Verify the Study of these Factors that are Considered Influential in the GRDNAS?

To answer these questions, we searched for journals indexed in Scopus and Web of Science (WoS) in the period from January 2010 to June 2025, considering the following search string that was applied in titleabs-key for Scopus and topic for WoS:

(factor OR cause OR influence) AND (“risk management” OR “risk administration”) AND (“natural disaster” OR “natural catastrophe”) AND (earthquake* OR earthquake)

In addition, the inclusion and exclusion criteria shown in Figure N° 2 were considered.

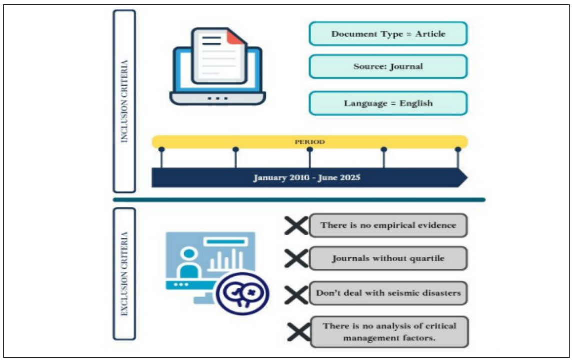

Figure 2: Inclusion and exclusion criteria in the literature selection process
Source: Own elaboration

The Content Development Phase

We present the search string and explain the sequence of operations. Initially, we used the search algorithm and generated 571 articles. Regarding the affiliation with scientific journals, 315 and 233 documents were obtained from Scopus and Web of Science, respectively. Applying the inclusion criteria to strengthen our research, these were reduced to 67 and 65 articles, respectively.

These were then screened, eliminating duplicates and applying exclusion criteria to titles, abstracts, and content. Thus, 24 articles belonged to Scopus and 28 to WoS, totaling 52 documents for the review. In addition, 23 articles considered important from indexed journals, which presented influencing factors in GRDAS, were incorporated. Finally, 75 (seventy-five) articles were selected, which are presented in the bibliography, with their corresponding IDs, which will be used later to identify them. Figure 3 shows the development process of the Systematic Review, based on the Prisma methodology.

The Results of the Selected Literature

Potential and Selected Studies

Figure 3 shows the number of potential articles and the number of selected articles. We then applied the inclusion and exclusion criteria described in Figure 2.

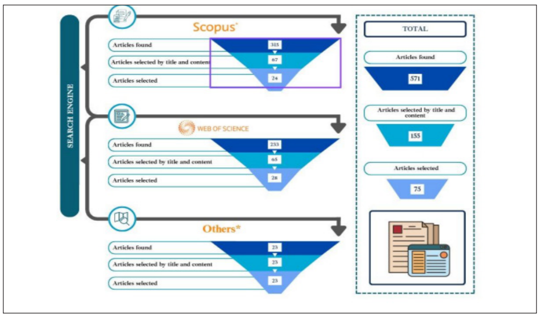

Figure 3: Potentially Important and Selected Articles Found

Source: Own elaboration (*Important articles added)

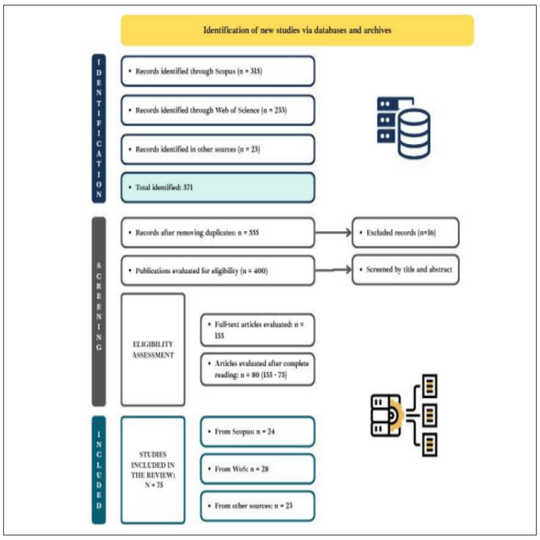

Figure 4: The systematic literature review process with Prisma Methodology
Source: Own elaboration

Scientific production and publications

The selected items increase from 2015 onwards, this could be explained by the validity of the Paris Agreement (2015) and the Sendai Framework Agreement (2015-2030), as shown in Figure No. 3.

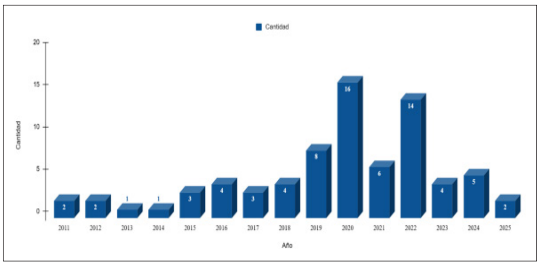

Figure 5: Annual Scientific production (Period 2010-2025)
Source: Own elaboration

Journals and Articles by Quartile

Table 1 shows 44 journals corresponding to the selected articles, of which 71 belong to the Q1 quartile, 2 to Q2 and 2 to Q3. Furthermore, the total number of articles from journals in the Q1 quartile represents 94.12% of the participating articles, with the International Journal of Disaster Risk Reduction being the journal with the highest number of publications in GRDNAS.

Table 1: Journals selected and indexed by quartile

Quartile	Diary	Articles	Total articles by quartile
Q1	International Journal of Disaster Risk Reduction	[A01], [A02], [A05], [A09], [A10], [A25], [A27], [A38], [A64]	71
	Renewable and Sustainable Energy Reviews	[A03]	
	Natural hazards	[A06], [A07], [A12], [A20], [A26], [A34]	
	Archives of Academic Emergency Medicine	[A08]	
	Springer Nature Switzerland	[A11], [A28], [A44]	
	Elsevier	[A13]	
	British Medical Bulletin	[A14]	
	Journal of Disaster Research	[A15], [A24]	
	Habitat International International	[A16]	
	Communication in Humanities and Social Sciences	[A17], (71]	
	Scopus - Engineering	Scopus - Engineering	
	Journal of Civil Engineering	[A21], [70], [72]	
	Water	[A22], [A52]	
	New Prisutnost	[A29]	
	Journal of Loss Prevention in the Process Industries	[A30]	
	Risk analysis	[A18], [A31]	
	International Journal of Information Management	[A32]	
	Land	[A23], [A33]	
	Sustainability	[A35], [A36], [A53], [A66]	
	Environmental disasters	[A37], [A63]	
	International Journal of Disasters International Journal of Environmental Research and Public Health	[A40], [73]	
	Nature	[A40], [73]	
	ICE Journal of Management, Acquisitions and Law	[A42]	
	Review of public finances	[A43]	
	Land use policy	[A46]	

	Journal of Loss Prevention in the Process Industries	[A47]	
	Procedia Engineering	[A48], [A56]	
	Total Environmental Science	[A49]	
	Disaster Medicine and Public Health Preparedness	[A50]	
	Journal of Risk Research	[A51]	
	Disaster Science	[A54]	
	IOP Publications Earth and Environmental Sciences	[A55]	
	Remote sensing	[A59]	
	Scientific reports	[A60], [75]	
	Shock and vibration	[A61]	
	International Journal of Population Studies	[A62]	
	Technological forecasting and social change	[A67], [74]	
	Geomatics, natural hazards and risks	[A68]	
Q2	Tohoku Journal of Experimental Medicine	[A45]	2
	Symmetry	[A65]	
Q3	Geographical Research	[A57]	3
	International Journal of Safety and Security Engineering	[A58]	

Analysis

RQ1 What are the factors found and considered influential in the GRDNAS?

Twenty-four critical factors of GRDNAS have been identified, the most studied being [1] knowledge, [2] planning and [3] understanding with 65, 53 and 49 studies, respectively (see Table No. 2).

Table 2: Factors considered influential in the GRDNAS

ID	Factor	Description	Fountain
F1	Knowledge	The knowledge of Quetta city residents about the city's propensity to earthquakes within the high perception of compound seismic risk in both areas [4].	[A01], [A02], [A03], [A04], [A05], [A06], [A07], [A08], [A09], [A10], [A11], [A12], [A13], [A14], [A15], [A16], [A17], [A19], [A20], [A21], [A22], [A23], [A24], [A25], [A27], [A28], [A29], [A30], [A31], [A32], [A33], [A34], [A36], [A37], [A38], [A40], [A41], [A42], [A43], [A44], [A45], [A46], [A47], [A48], [A49], [A51], [A52], [A53], [A54], [A56], [A59], [A60], [A61], [A62], [A63], [A65], [A67] , [A68], [A69], [A70], [A71], [A72], [A73], [A74], [A75]
F2	Planning	Recent devastating earthquakes have shown that destruction and loss of life can only be effectively reduced through nationally planned awareness, preparedness and response action programs (Baytiyeh, H., Öcar , A., 2016).	[A01], [A02], [A03], [A04], [A06], [A07], [A09], [A11], [A13], [A14], [A15], [A16], [A17], [A19], [A20], [A21], [A22], [A23], [A25], [A26], [A28], [A29], [A30], [A31], [A34], [A35], [A36], [A37], [A38], [A39], [A41], [A42], [A45], [A46], [A47], [A48], [A49], [A50], [A52], [A53], [A54], [A56], [A58], [A59], [A60], [A61], [A62], [A63], [A65], [A66], [A67], [A68], [72]
F3	Comprehension	Understanding how people perceive disasters is necessary to formulate better disaster management strategies and increase social resilience [17].	[A01], [A02], [A04], [A05], [A06], [A07], [A09], [A10], [A11], [A13], [A15], [A16], [A17], [A19], [A20], [A22], [A23], [A24], [A25], [A27], [A30], [A31], [A32], [A35], [A36], [A37], [A38], [A40], [A41], [A42], [A43], [A44], [A46], [A47], [A49], [A51], [A52], [A53], [A54], [A56], [A59], [A60], [A61], [A62], [A63], [A67], [A68], [69], [70], [74]
F4	Perception	Studies reveal that the level of individual preparedness is influenced by personal risk perception and individual circumstances [18]	[A01], [A02], [A04], [A07], [A09], [A10], [A11], [A14], [A15], [A16], [A17], [A20], [A21], [A22], [A23], [A25], [A27], [A29], [A30], [A31], [A33], [A34], [A37], [A38], [A41], [A42], [A44], [A48], [A51], [A52], [A53], [A54], [A58], [A59], [A63], [A66], [69], [74]
F4	Organization	It is necessary for the community to establish a community organization to enhance disaster response capacity and lay a solid foundation for community disaster management (Lee, C.-H., 2022) [19].	[A01], [A03], [A06], [A11], [A12], [A14], [A15], [A20], [A21], [A24], [A26], [A29], [A32], [A34], [A37], [A41], [A44], [A47], [A51], [A53], [A54], [A56], [A59], [A60], [A61], [A62], [A63], [A67], [A68], [69], [71],[73], [74]

F6	Hear	Natural hazards also play a role in the assessment and prevention of disasters due to earthquakes or volcanic eruptions, which requires careful monitoring (Michellier et al., 2020).	[A07], [A08], [A11], [A12], [A13], [A14], [A19], [A22], [A23], [A24], [A26], [A29], [A32], [A34], [A38], [A41], [A44], [A48], [A51], [A53], [A54], [A56], [A59], [A60], [A62], [69], [71], [74]
F7	Management	There is an urgent need to build and implement disasterresilient systems, including the digitization of medical information and the establishment of a networked system for its management [20]	[A12], [A13], [A14], [A18], [A21], [A22], [A26], [A34], [A39], [A41], [A45], [A46], [A47], [A53], [A59], [A60], [A61], [A62], [A67], [A68], [A70], [A72], [A73], [A75]
F8	Address	A key aspect of the response to both events was the swift and strong leadership of the government [21]	[A02], [A04], [A11], [A21], [A25], [A34], [A41], [A43], [A44], [A45], [A46], [A50], [A53], [A60], [A61], [A62] [A63], [A67] [A72], [A73]
F9	Control	Five main components of perceived risk in hazardous situations are identified: frequency of death, subjective estimate of mortality, catastrophe potential, judged severity of death, and some qualitative characteristics, including control [22]	[A08], [A10], [A17], [A21], [A23], [A33], [A38], [A43], [A50], [A51], [A60], [A65], [A67], [A68]
F10	Assessment	Seismic risk assessment of support structures and elevated process piping on support structures plays an important role in accident prevention within process plants [23].	[A03], [A05], [A06], [A07], [A09], [A21], [A23], [A28], [A30], [A48], [A59], [A67], [A70], [A67], [A74], [A75]
F11	Comment	The decision to adopt the Hong Kong criterion was supported by recommendations from consultants and informal public comments [24]	[A06], [A11], [A13], [A29], [A37], [A44], [A49], [A56], [A65], [A67]
F12	Execution	Pre-disaster management includes the preparedness and mitigation phases, while response and recovery correspond to the post-disaster phase . During these phases, different disaster management plans and activities are implemented [25]	[A11], [A23], [A26], [A31], [A60], [A62], [A71], [A73]
F13	Keep track	Pre- and post-disaster digital elevation models were generated from satellite stereoscopic image tracking [26].	[A11], [A14], [A19], [A50], [A58], [A59], [A71], [A67], [A73]
F14	Reduction	disaster risk reduction should be applied by merging knowledge, lessons learned and bringing together academics, practitioners and government officials to discuss common issues from different perspectives [10]	[A33], [A44], [A54], [A56], [A63] , [A73], [A75]
F15	Vulnerability	What is understood by vulnerability has been defined in many ways, including risk, stress, susceptibility, adaptation, resilience, sensitivity or strategies to cope with stress [27].	[A35], [A36], [A45], [A57], [A65], [A72], [A74], [A75]
F16	Preparation	To mitigate the effects of natural hazards, it is essential to understand how people living in at-risk locations perceive hazards and risks, and their knowledge and preparedness in relation to them [39].	[A02], [A09], [A20], [A27], [A59], [A71], [A73], [A75]
F17	Listen	Aerial monitoring is key to preventing natural disasters using real-time object detection from drones with methods such as R-CNN and KCF (Sayuri et al., 2020).	[A06], [A32], [A55], [A58]

F18	Responsiveness	Given the importance of disaster management globally, investments in global collaborative networks can make significant contributions and develop real-time response capabilities for research [28].	[A13], [A48], [A71], [A74]
F19	Information technologies	Information technologies are used to store, process and distribute information and are useful in all phases of DRM (Mechan et al., 2020).	[A18], [A41], [74]
F20	Resilience	Individual resilience at the household level and community resilience contribute significantly to mitigation in the early stages of disasters [45]	[A20], [A29], [A70], [A72], [A75]
F21	Mitigation	It is urgent to understand the public perception of seismic risk, as well as to identify the factors that favor mitigation behaviors [22]	[A27], [A51], [A69], [A71], [A75]
F22	Prevention	A culture of prevention manifests itself as a common behavior to respond assertively to risk situations that may arise [8]	[A50], [A53], [A69], [A73]
F23	Awareness	The experience of major disasters contributes to society's awareness of the importance of preventive measures [8]	[A04], [A53], [72]
F24	Recovery	In the context of natural disasters, when communities engage in data collection and information sharing, new opportunities arise to better understand urban vulnerabilities, capacities, and risks. Data-driven methods for damage assessment and recovery planning can also be developed [29].	[A58], [A69], [A71], [A74]

Some factors found in the literature reviews
In addition, in the review of the selected articles, 15 factors were identified (see Table No. 3).

Table 3: Factors of the literature review and the state of the art of the selected articles

No.	Factor	Primary source	Reference
1	Structural damage	Asad, R., et al. [30]	[A06]
2	Temporary housing	Asad, R., et al. [30]	[A06]
3	Victims of the rubble	Asad, R., et al. [30]	[A06]
4	Economic impact	Asad, R., et al. [30]	[A06]
5	Social impact	Asad, R., et al. [30]	[A06]
6	Health risk	Chan, EYY [31]	[A14]
7	Health response	Chan, EYY [31]	[A14]
8	Security	Hosseini et al. [32]	[A21]
9	Hygiene	Hosseini et al. [32]	[A21]
10	Logistics	Hosseini et al. [32]	[A21]
11	Government Conditions	Imamura, F., et al. [33]	[A25]
12	Socioeconomic conditions	Imamura, F., et al. [33]	[A25]
13	Demographic conditions	Imamura, F., et al. [33]	[A25]
14	Sustainability	Sobhi et al., [34]	[A61]
15	Degree of self-organization	Sobhi et al., [34]	[A61]

RQ2 What are the Theories Used to Explain and Support the Factors Considered Influential in GRDNAS?
have been identified in 18 studies ([A01], [A06], [A09], [A10], [A11], [A15], [A15], [A19], [A20], [A25], [A26], [A32], [A41], [A44], [A47] [A51], [A53], [A63]), to support the 24 factors proposed in the research (see Table No. 4).

Table 4: Theories involved in the factors influencing the GRDNAS

ID	Theory	Description	Factor	Reference
T1	Theory of diffusion of innovations	It studies the spread of new ideas in a social system, highlighting research on the duration of distribution and adoption of new ideas through people's communication [9].	F18 F19 F21 F22 F23	[A41] [A41] [A41] [A41] [A41]
T2	Media Richness Theory	The importance of information in influencing and improving understanding is emphasized. Personal media are the most effective for raising awareness about issues, facilitating interactions, and making decisions in situations of risk, uncertainty, and disaster [10]	F12 F19 F23	[A41] [A41] [A20], [A41] [A63]
T3	Organizational information processing theory	Organizations need quality information in the face of environmental uncertainty and to improve decision-making in the face of the complexity of the environment and the dynamism, or frequency of changes in various environmental variables of the seismic disaster [35,36]	F7 F8 F9 F10 F11 F13 F14 F19	[A13], [A19] [A19], [A69] [A13] [A13], [A19] [A13] [A13], [A73] [A13], [A19] [A13]
T4	Theory of phenomenology	It is related to other disciplines, such as science, philosophy, ontology, epistemology, logic, and ethics. People have a particular way of seeing the world and processing what they experience through experience and according to their own perceptions, beliefs, and values [37].	F2 F3 F16 F20 F24	[A06], [A09], [A11] [A06], [A09], [A11] [A06], [A09], [A47]
T5	Perspective theory	Faced with low earthquake probabilities, people may not perceive the risk accurately and may adopt behaviors that ignore or exaggerate the probabilities of occurrence [17]	F4 F14 F15 F16 F23 F24	[A15] [A15] [A15], [A70] [A15] [A15] [A15] [A75]
T6	Social learning theory	It includes social learning (SLD), where people learn new behaviors through reinforcement or punishment, or through observational learning from the social factors in their environment. Sustaining life and the survival instinct allow us to focus on risk management [12].	F1 F7 F14 F15 F17 F20	[A09], [A32] [A09], [A32] [A09] [A09], [A73] [A32] [A09], [A32]
T7	Vector theory	It presents the physical and social dimensions as separate vectors with different magnitudes and allows calculating a combination with independent perspectives and having a common starting point in vulnerability [38]	F1 F14 F15 F20	[A25], [A69] [A25] [A25] [A25], [A72]
T8	Cultural theory	It is based on social and cultural factors that influence how people perceive and accept risks. Research in these fields has revealed that risk perception and acceptance are rooted in cultural and social factors [4].	F1 F6 F15 F16 F23	[A01], [A53] [A53] [A01], [A53] [A01], [A53] [A01], [A53]
T9	Protection Motivation Theory	Assessment is divided into threat and coping. The former focuses on the perception of vulnerability and severity, while the latter focuses on the effectiveness of the response and confidence in one's ability to reduce the threat. Disaster preparedness varies according to the perception of vulnerability [16]	F14 F16 F20	[A10], [A41], [A51] [A10], [A41] [A10], [A41]

T10	Disaster systems theory	The application of diverse disaster models is essential for managing disaster risk as a structural system encompassing hazard, geographic environment, and exposed units. This approach describes disaster chains as mathematical representations and asserts that the overall process of the disaster model management system is based on the interconnectedness of individual models [39].	F15 F16	[A44], [A75] [A26]
T11	Social exchange theory	Decisions in society are based on the outcomes of social behaviors. This theory suggests that there are intrinsic and extrinsic motivations for social sharing behaviors through information dissemination and interactions on social media platforms [6]	F1 F23	[A32] [A32], [A71],

RQ 3 What Methods Have Been Applied to Verify the Study of these Factors that are Considered Influential in the GRDNAS?
By analyzing the selected literature, we identified interdisciplinary methods and approaches to verify the influencing factors in RMNDDSA (see Table 7), among the most used we can mention the following:

- [M01] Hypothesis testing (Arimura et al., 2020).
- [M02] Evaluation and sizing of the degree of vulnerability of infrastructure and communities, using innovative technological tools.
- [M03] The analysis of the degree of exposure used in (Dos Santos, 2019), which maps the location of the population, the infrastructure of their homes, access to services, among other factors in relation to risk zones, to evaluate how exposed a community is to a disaster (floods and earthquakes).
- [M04] Data collection methods such as the use of surveys and structured interviews (Tuladhar et al., 2015).
- [M05] Also worth mentioning are qualitative methods that not only provide valuable data on specific perceptions and needs, but also encourage active civil participation in earthquake disaster risk management planning.
- [M06] Using Adriseismic methodology to incorporate irregularity-related extensions, the social risk component under rapid approach to assess the vulnerability and seismic risk of buildings and is based on the collection of essential data of the structure.
- [M07] This proposed methodology and the presented results integrate various probabilistic and MCDM analyses, to simulate the level of educational continuity and the recovery time of educational systems, after a disaster.
- [M08] The proposed methodology comprises four main elements: (1) Risk Perception Modeling, (2) Integration of Cognitive Biases and (3) Decision Framework. Formal mathematical decision model for risk-based behavioral decision making under uncertainty in disaster management[40-45].

Table 7: Methods Used in the Verification of RMNDDSA Factors

ID	Method	Factor	Reference
M01	Hypothesis testing	F1 F4 F14	[A02], [A04], [A11], [A16], [A31], [A33], [A36], [A43], [A52], [A56], [A61] [A04], [A11], [A16], [A31], [A33], [A52] [A33], [A56]
M02	Assessment of the degree of vulnerability	F15 F21 F23	[A35], [A36], [A65] [A27] [A04]
M03	Exposure analysis	F2 F6 F14	[A03], [A16], [A22], [A23], [A68] [A22], [A23] [A33]
M04	Structured surveys, stakeholder interviews and questionnaires	F1 F3 F4 F5 F17 F23	[A01], [A04], [A12], [A16], [A32], [A33], [A63] [A01], [A04], [A16], [A32], [A63] [A01], [A04], [A16], [A33], [A63] [A01], [A12], [A32], [A63] [A32], [A55] [A04]
M05	Qualitative methods	F1 F3 F4 F11 F24	[A04], [A06], [A16], [A32], [A63] [A04], [A06], [A16], [A32], [A63] [A04], [A16], [A63] [A06] [A04]

M06	Adriseismic and related extensions to the social risk component	F1, F4 F8, F10 F15, F21	[A16], [A32], [A70], A74]
M07	Markov Decision Process (MDP) and Computational.	F7, F9, F10, F14	[A3], [A28], [A58], [A33], [A70], [A74]
M08	Integration of risk perception and cognitive bias adjustments	F1, F4 F7, F10	[A13], [A21], [aA70], [A74]

Discussion of Results

The systematic review of the literature has allowed us to identify twenty-four (24) factors considered influential due to their importance in the GRDNAS. This academic work generates a special motivation, added to the experience and empirical evidence, which constitute the available and updated inputs for the scientific discussion and the enrichment of disaster risk management, that is, …" now, the present, the present moment".

Question RQ1 What are the Factors Found and Considered Influential in the GRDNAS?

The critical influencing factors detected and with the greatest incidence are related to:

No.	Proposed factor
F1	Knowledge
F2	Planning
F3	Comprehension
F4	Perception
F5	Organization
F6	Listen
F7	Management
F8	Address
F9	Control
F10	Assessment
F11	Comment
F12	Execution
F13	Keep track
F14	Reduction
F15	Vulnerability
F16	Preparation
F17	Listen
F18	Responsiveness
F19	Information technologies
F20	Resilience
F21	Mitigation
F22	Prevention
F23	Awareness
F24	Recovery

The publications are aligned with the Paris Agreement (2015), the Hyogo Framework for Action (20052015) and the Sendai Framework (2015-2030), until September 2023 [46-55]. This path opens the opportunity for individual and group research with multidisciplinary participation, allowing for network internationalization and collaboration [56-63].

In addition, 15 influencing factors in GRDNAS were identified, located in the state of the art of the selected articles:

No.	State of the art factor
1	Structural damage
2	Temporary housing
3	Victims of the rubble
4	Economic impact
5	Social impact
6	Health risk
7	Health response
8	Security
9	Hygiene
10	Logistics
11	Government Conditions
12	Socioeconomic conditions
13	Demographic conditions
14	Sustainability
15	Degree of selforganization

Question RQ2 What are the Theories Used to Explain and Support the Factors that are Considered Influential in GRDNAS?

In the process of reviewing the literature, we found eleven theories that are directly related to the critical factors of RMNDDSA (see table 6) these are: (T1) Diffusion of Innovations Theory, (T2) Media Richness Theory, (T3) Organizational Information Processing Theory, (T4) Phenomenology Theory, (T5) Prospect Theory, (T6) Social Learning Theory, (T7) Vector Theory, (T8) Cultural Theory, (T9) Protection Motivation Theory, (T10) Disaster System Theory and (T11) Social Exchange Theory [64-70].

Question RQ3 What Research Methods Have Been Applied in the Investigations of these Critical Factors?

The process of collecting information in situ at affected locations, demonstrated through empirical evidence and based on structured surveys, stakeholder interviews, and structured questionnaires, has allowed for the analysis of the degree of exposure, the assessment of the degree of vulnerability, and the use of qualitative methods and hypothesis testing to confirm acceptance or rejection. Strengthening the knowledge and importance of the critical factors of GRDNAS and assisting in the development of procedures based on eight (eight) methods related to the participation of the community and organized civil society, in this case the people affected and possibly exposed to future disaster risks [71].

The lived experience of residents reflects the level of concern expressed in voluntary participation in surveys, interviews, and questionnaires [72]. The content structure of these information collection tools is developed by experts from different disciplines, including environmental engineering, geological engineering, civil engineering, industrial engineering, agricultural engineering, mining engineering, architecture, physicians, university professors, sociologists, psychologists, educators, among others[73-75].

Conclusions and Recommendations

- The research was based on the selection and bibliographic review of five hundred and seventyone (571) scientific articles based on empirical and substantiated evidence of seismic disasters (earthquakes) and correspond to post-disaster, "after" study cases, and identify them as the model of studies that have occupied greater attention to the GRDNAS in a reactive manner and still continue to be prioritized, from there the information and data platforms for future research are established.
- Scientific studies of seismic events (earthquakes) and heavy rainfall (floods) are a universal priority, and identifying and deconstructing the factors influencing disasters due to seismic activity constitutes a scientific challenge of global importance. In our case we have managed to identify twenty-four critical factors of importance in disasters due to seismic activity, they are: (F1) Knowledge, (F2) Perception, (F3) Understanding, (F4) Planning, (F5) Organization, (F6) Direction (Leadership), (F7) Execution, (F8) Supervision, (F9) Follow-up, (F10) Monitoring, (F11) Control, (F12) Feedback, (F13) Management, (F14) Evaluation, (F15) Reduction, (F16) Vulnerability, (F17) Preparation, (F18) Response Capacity, (F19) Information Technologies, (F20) Resilience, (F21) Mitigation, (F22) Prevention, (F23) Awareness, and (F24) Recovery.
- In the review of the literature and the state of the art of the selected articles we identified fifteen (15) factors related to GRDNAS and they are: (1) Structural damage, (2) Temporary shelter, (3) Victims of debris, (4) Economic impact, (5) Social impact, (6) Health risk, (7) Health response, (8) Security, (9) Hygiene, (10) Logistics, (11) Governance conditions, (12) Socioeconomic conditions, (13) Demographic conditions, (14) Sustainability and (15) Degree of self-organization.
- In the selected literature, we find the use of interdisciplinary methods and approaches to verify the factors that influence GRDNAS, such as structured surveys, stakeholder interviews and questionnaires, exposure analysis, vulnerability assessment, qualitative methods, and hypothesis testing.
- Regarding the post-disaster scenario of the Coronavirus (CoVid 19) pandemic, it is necessary to deepen and update knowledge in the present "during", that is, the current moment (now) related to corrective disaster risk management.
- Scientific research involving experts through the collaborative, multidisciplinary working group has been prioritized over the present decade, with emphasis on technological communication and innovation tools that facilitate the further development of scientific research at GRDNAS.

Future Work

- The most urgent thing is to focus efforts on Corrective Management, referring to the present, to the present, in a concatenated manner with the Hyogo Action Agreement (2005-2015) and the Sendai Framework (2015-2030), individual research migrated to a collaborative and associated network, in which universities, climate change research institutes, NGOs and environmental and natural disaster research centers intervened, with the support of the UN. This imminent response from international organizations and researchers has left us with lessons learned, based on impacted scenarios, with empirical and substantiated evidence after the disaster, among which priority is given to attention to natural disasters caused by seismic activity.
- The impacts of natural phenomena derived from seismic activity (earthquakes) constitute the elementary and direct inputs received and developed by reactive disaster risk management. Due to the repercussions and significance of high human mortality and considerable economic losses, they are the focus of global attention. This prioritization has set the pace for research associated with the "aftermath," in response to an immediate reaction to address natural disasters that have already occurred (post-disaster intervention).
- These previously conducted investigations into disaster risk management constitute valuable academic and scientific contributions. The shared information allows us to work based on past events and fundamental empirical evidence and to address them in the current context. This dimension of disaster risk management is known today as corrective disaster risk management.
- In the context of experience, it drives us, empowers us, and guides us in properly managing natural disasters, including those resulting from seismic activity (earthquakes), prioritizing the present moment—that is, acting now. This current approach is directly related to Disaster Risk Assessment and Reduction; therefore, it is essential to include and detail how to deepen and deconstruct disaster risk assessment, prevention, and reduction studies, with the realization of vulnerability reduction to disasters caused by seismic activity.
- It is important to operationalize the variables involved in natural disaster risk assessment, associated with secondary, higher, and university education, in a transparent, cross-cutting, collaborative, and resilient manner in the public and private sectors through dissemination and awareness-raising. The participation of the State, governments, competent authorities, relevant officials, and organized civil society plays a decisive role in achieving efficient and effective results in natural disaster risk management and prevention.
- Third, there is the need to build cities that are resilient and sustainable over time. Prospective disaster risk management stands out here, which is managed with a vision for the future. This workspace encompasses reconstruction, known as the seventh key process of natural disaster risk management. This creates simulation scenarios that can cope with natural phenomena, withstand impacts, and recover immediately. Science, research, engineering, innovation, technology, and other scientific elements provide support and help build these cities and the characteristics they represent.

Below we present the temporality and chronology of disaster risk management studies (see Figure No. 6), such as:

First moment	Second moment	Third moment
The post-disaster scenario "after", linked to the past, to what happened	The current scenario, known as "during and now"	The pre-disaster scenario: acting "before" and "looking ahead"
Reactive Disaster Risk Management (RDRM)	Corrective Disaster Risk Management (CDRM)	Prospective Disaster Risk Management (PDRM)

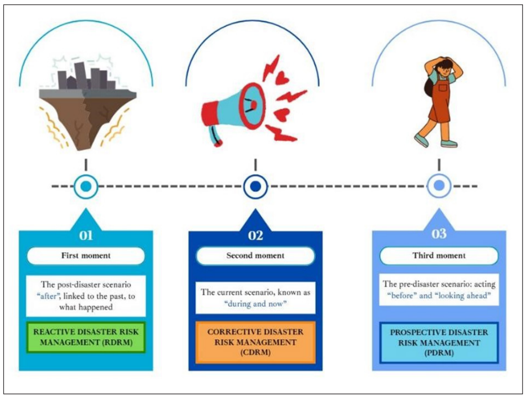

Figure 6: Moments and temporality of disaster risk management
Source: Own elaboration

- By identifying the factors that influence natural disasters caused by seismic activity (earthquakes), we were able to emphasize and highlight once again the importance of moving from individual scientific research to participatory and collaborative work at the local, regional, and global levels, which requires the determined participation of multidisciplinary professional teams and researchers.
- The limited availability of models for modeling and integrating natural disaster risk management with scientific and academic institutions and government authorities, with coordinated participation of the local population, fully justifies the need to address this gap and the still unaddressed gaps in detail, rigor, and in an academic and scientific manner in the areas of education, socialization, and awareness-raising related to vulnerability reduction.

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Ethical Declaration
This article is a literature review analyzing factors affecting disaster risk management. The data presented in this study were extracted from previous studies cited in the references. This study did not involve the collection of new data from humans or animals. All data used are in the public domain or have been previously published by other researchers with the appropriate ethical clearances. No ethical approval was required for this review.

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