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Factors that Influence Natural Disasters due to Seismic Activity: A Literature Review

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Abstract:- Through the Paris Agreement (2015), the Hyogo Framework for Action (2005-2015) and the Sendai Framework (2015-2030), the UN has been promoting the priority objectives of protecting life and well-being at a global level. of people, these global consensus documents, schedule in countries a wide list of actions of responsibility and commitment to the environment and to deal with natural disasters (seismic activity). The materialization of the disaster is a natural fact or caused by humans, manifested in permanent changes in society. Disasters by origin are classified as natural, anthropogenic or man-made, and mixed, creating a global problematic situation of immediate reaction. The attention and alertness in the scientific community stands out with efforts, still disorderly and with globalized strategies to improve.

Keywords:- *Natural disaster, theories, factors, seismic activity.*

I. INTRODUCTION

The United Nations Organization (UN) and the member countries of the Paris Agreement (2015), the Hyogo Framework for Action (2005-20015) and the Sendai Framework Agreement (2015-2030), have been prioritizing actions to promote, promote and replicate scientific and academic research, aimed at caring for the environment, managing the reduction of risk and vulnerability due to disasters from seismic activity, with the intensive use of science, technology, innovation and entrepreneurship. In this context, a space has been found that can be addressed, due to the lack of deconstruction and the gaps detected, in terms of a deeper and more detailed description of the factors and components that influence natural disasters due to seismic activity.(Lizardo Narváez, 2009).The research study contains the description of the problem, with statistics substantially of the world mortality due to seismic activity disasters(Statista, 2020), the motivation of the researchers, the objective, temporality, contribution, the state of the art on Background and theoretical aspects of the human and disaster, the research methodology, the discussion, Findings and opportunities, conclusions and recommendations of future scientific works.

A. The problem

The natural phenomenology derived from seismic activity translates into disaster, with magnitude, intensity and disastrous and chilling characteristics, with earthquakes of unsuspected scales and magnitude.[1]. Natural disasters materialize year after year, and have directly and considerably affected humans and their whole, the purpose of the UN is focused and proposed to substantially reduce global mortality from disasters by the year 2030, with 100,000 fewer deaths per year, in the period 2020-2030, than in the period 2005-2015. (SENDAI Framework, 2014).

Empirical evidence of level 1 earthquakes has registered the deadliest and most destructive earthquake, this phenomenological event occurred in the Republic of Haiti, on January 12, 2010, where more than 316,000 people perished, due to high vulnerability, in a country considered the poorest in America, reaching a magnitude of 10.70 on the Richter scale, and with its epicenter in the capital Port-au-Prince. (G. Musacchio, 2015).The disaster left between 300,000 and 400,00 fatalities, in addition to 350,000 injured in critical and severe condition, and more than 1.5 million homeless people.

[1](Race, 2018)

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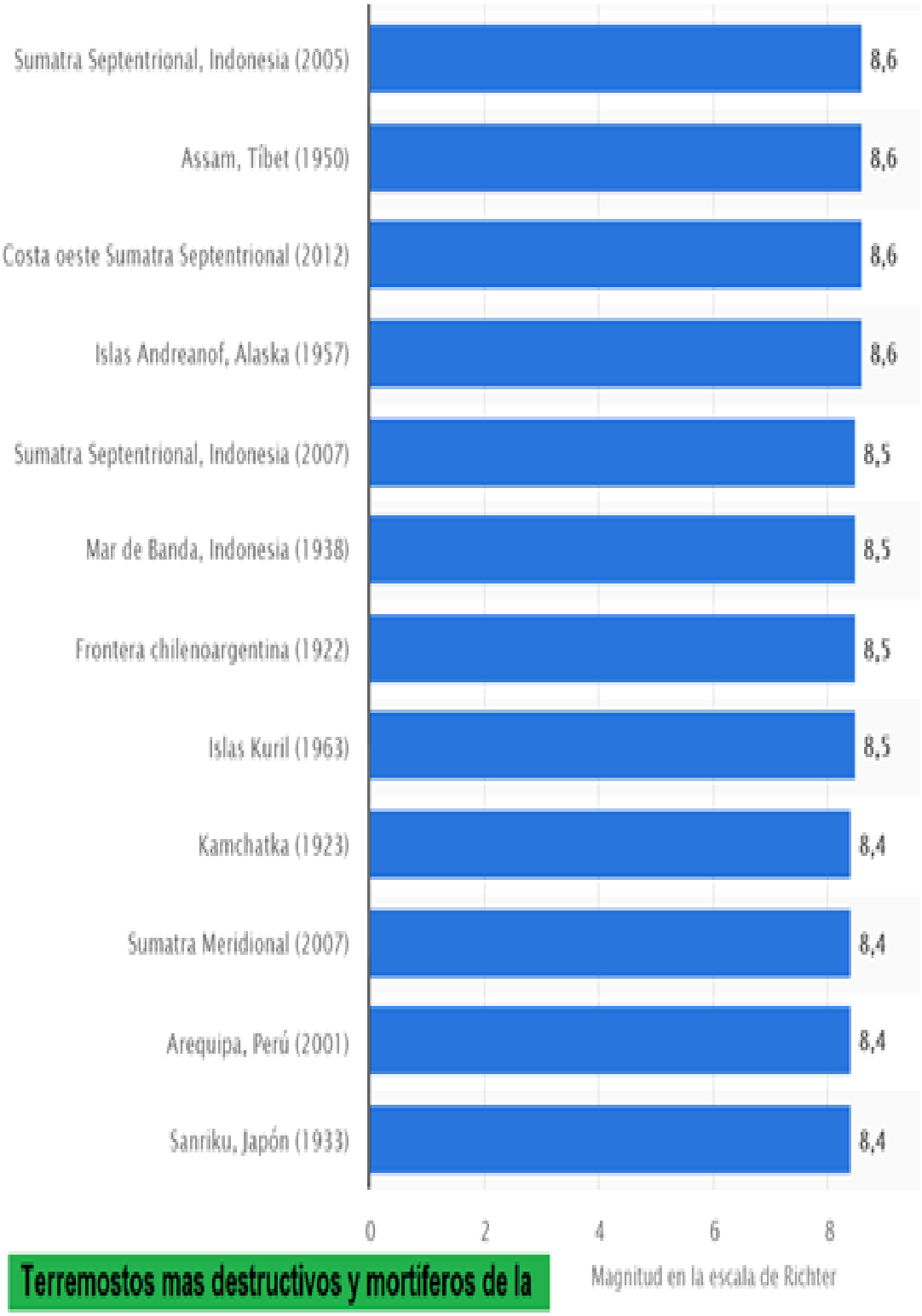

Fig. 1: Destructive earthquakes

Source: (Statista, 2020)

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Also, we have a level 2 earthquake, of magnitude 7.80, it happened in the Republic of Peru, it was on May 31, 1970, with more than 66,000 deaths, they consider it the most destructive earthquake and left between 50,000 and 80. 000 people affected and with loss of their livelihoods. (Statista, 2020). The level 3 earthquake is considered, it occurred in the Republic of Chile on January 25, 1939, with more than 24,000 deaths, in the city of Chillán, a magnitude of 7.8 on the Richter scale is recorded, with fatalities between 24,000 and 40,000, according to various official sources of the Chilean state. So successively, we have recorded earthquakes in the world, see Figure 1. Research refers to using knowledge management, C + T + I + e, in future individual, group and multidisciplinary work, to achieve sustainable development, development sustainable and resilience In the city of Chillán, a magnitude of 7.8 on the Richter scale is registered, with fatalities between 24,000 and 40,000, according to various official sources of the Chilean state. So successively, we have recorded earthquakes in the world, see Figure 1. Research refers to using knowledge management, C + T + I + e, in future individual, group and multidisciplinary work, to achieve sustainable development, development sustainable and resilience In the city of Chillán, a magnitude of 7.8 on the Richter scale is registered, with fatalities between 24,000 and 40,000, according to various official sources of the Chilean state. So successively, we have recorded earthquakes in the world, see Figure 1. Research refers to using knowledge management, C + T + I + e, in future individual, group and multidisciplinary work, to achieve sustainable development, development sustainable and resilience(to Brett W. Robertson, 2019), in this context the motivation is deepened, through the question as a question of:

- *What are the factors that influence natural disasters due to seismic activity?*

In order to find information and data to answer these questions, we have carried out a search for scientific information (Journal) in journals indexed in Scopus and Web of Science (WoS), Google Academic, Academic and IJISRT, in a period of duration from the year 2011 to 2022. Studies that identify some factors that influence the reduction of risk and vulnerability due to disasters of seismic activity are highlighted, with emphasis on the technology used, the media and ICTs[2], all of them that support the investigation and can give us information on disasters due to seismic activity (earthquakes), as well as the explanation and treatment used. The most important literature is: (1) A Conceptual Frame Using 'Knowledge' As a Lens for Deconstructing the Sendai Framework Priority 1: Understanding Disaster Risk (2018), (2) Review: Towards an operationalization of nature-based solutions for natural hazards(2019), (3) Using a combination of human insights and 'deep learning' for real time disaster communication(2019), (4) Disaster risk reduction and innovations (2019), Artificial intelligence in seismology: Advent, performance and future trends(2021), (5) Disaster resilience of optical networks: State of the art, challenges, and opportunities(2021).

B. Motivation

In the process of searching for information on the factors influencing disasters due to seismic activity, we have found literature, which we have focused on since 2011, having the Hyogo Framework for Action (2005-2015) and the Sendai Framework (2015-2030).

The investigations are framed under the post-disaster criterion, as "after", referring to the reactive management of disaster risk. Also, currently applied social research has been detected, that is, they already take into account the present of disaster risk management, and the phrase "during..." is used, evoking the current moment.

In this context, a space and theme has been found that can be addressed, and it is favorable to participate, due to the lack of deconstruction and the gaps detected in the literature, in terms of a more detailed description of the knowledge of the factors and components that affect the disaster, under the multidisciplinary scientific lens(Takako Izumi, 2019).

This assertion constitutes the preamble to update the text and terminology used in the deconstruction of the key processes and sub-processes in the risk of disasters due to seismic activity, under the lens of scientific research, and the usability of technology, innovation and entrepreneurship (SMarco de SENDAI, 2014). The absence of factors in the modeling and integration design that influence disasters due to seismic activity is a special motivation to contribute efficiently and systemically in the study of coping to manage the risk of seismic disaster.

From the perspective of citizen science, social engineering, the environment and other scientific areas, it is necessary to deepen the elements, in order to detect the factors that affect and influence natural disasters due to seismic activity, and with the support of technology and investigation, we will find the explanation of the disasters due to seismic activity and will come to propose an adequate treatment to achieve the significant reduction of damage to humans and livelihoods. (Jacek Raka, 2021).

As of 2017, we have been working on the review of the Journal and we have found the use of different and inaccurate terminology, associated with disasters, in the explanation of risk factors and components, identified threats, vulnerabilities, in the intervening processes and sub-processes, in the key elements, in the temporality of occurrence of seismic activity and the multiple and varied forms of application, used by experts to establish concepts, both in the theoretical part, as well as in the operational part[3].

[2](Jacek Raka, 2021)

[3](Pengchengjiaoa, 2016)

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C. Objective and temporality

The objective of the research is to systematically and selectively review all the important, developed aspects of the factors and components that influence natural disasters due to seismic activity, taking into account a time period from 2011 to October 2022.

D. Main contributions

The elaboration of the architecture of the factors and components that have an influence on disasters due to seismic activity (earthquakes), which can be taken into consideration in future studies, due to the importance they have in research and disaster risk reduction projects and vulnerability, the help of Information Technology (IT) plays a key role in the preparation and presentation of the article, which aims to reduce structural and non-structural vulnerability.

E. Article Organization

The research is composed and organized in six (6) sections: in the first instance we have section 1 and we present the introduction and address the problem and the justification, in section 2 the motivation, objective, temporality and contribution are addressed, in section 3 we have the Background and theoretical aspects of human and disasters due to seismic activity, the theoretical and practical justification with the presentation of the architecture of the factors and components involved, in section 4 we have considered the research methodology, with the detail of the form, phases and development of the literature review, the sources, and corresponding statistics, in section 5 we present the results, analysis and pertinent discussion, and in section 6 we present the conclusions, recommendations,thanks and bibliography.

II. BACKGROUND AND THEORETICAL ASPECTS OF THE HUMAN AND DISASTER BY SEISMIC ACTIVITY

Natural disasters must be identified and characterized, under a detailed and deconstructive conceptual framework, where the risk of disasters as a probability of occurrence, is associated with the interaction of Human - Nature - Technology (EYY Chan†, 2019).

The usability in the human-technology interface leads us, and it is convenient, to make use of theories related to the factors that influence disasters due to seismic activity, and the forms of relations of the Inputs (cause) - Process - Output (effect), which influence the magnitude (metric) and scope of disasters (magnitude). Using the literature, we have located seventy-seven (77) theories, and of which we have concentrated efforts, that seek to explain how the Human-Nature Interaction is sustained.

In the process of identification and relationship with the factors and variables of the research, we have finally adopted six (6) theories, the same ones that expose and support the principles of the research presented.

A. Theoretical justification

In the context of theoretical justification, we take six theories as a reference, after reviewing a little more than seventy, the same ones that are directly related to the factors and components that influence disasters due to seismic activity with the investigation, they are:

- Diffusion of innovations theory (Everett Rogers, 2003). Diffusion is the process by which an innovation is communicated over time, among the participants of an integrated social system. The innovations are dynamic, and include the physical infrastructure, the economic sectors that are associated in a network. Communication channels interact and represent the way to transfer and coordinate actions in real time, to mobilize human talent and material resources with the necessary immediacy, accompanied by the social system. These elements and components influence disaster risk management and vulnerability reduction.
- **Media wealth theory**(Bergin, Richard 2016). El-Shinnawy, M., & Markus, ML (1997). Indicates the importance of the ability of information to change understanding, through personal means of communication, richer, are more effective in communicating problems, such as phone calls, video conferences and email, which allows the transmission of gestures and language bodily. The means of communication that are currently used, facilitate and interact in the actions and exercises of people and represent the way of making decisions and coordinating the actions that are required, to attend and be present in places that merit the presence of talent. human and material resources. These actions accompany the processes that affect disaster risk management and vulnerability reduction,
- **Organizational information processing theory**(Galbraith, JR (1974, Haußmann, C., Dwivedi, YK, Venkitachalam, K.). Organizations need quality information to deal with environmental uncertainty and improve their decision making. Environmental uncertainty arises from complexity of the environment and dynamism, or the frequency of changes in various environmental variables.There are two strategies to deal with uncertainty and the increase in information needs: (1) develop buffers to reduce the effect of uncertainty and (2)) implement structural mechanisms and information processing capacity to improve the flow of information.The safety and protection of humans, accompany the activities of the processes and sub-processes, of the elements and components, of disaster risk management,where the most notable point is the materialization of disaster risk, with the reduction of vulnerability, of the physical infrastructure, where humans and non-humans interact.

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- **Phenomenology theory**(Dreher, J. (2012). Phenomenology: Alfred Schütz and Thomas Luckmann). Phenomenology as a discipline is different, but it is related to other key disciplines of philosophy, such as ontology, epistemology, logic, and ethics. They tell us that each person has a particular way of seeing the world and processing what he lives, according to his own perceptions, beliefs and values, which generates a unique personality. In a planned way, these actions are always accompanied by the processes and sub-processes of disaster risk management, which affect risk management and vulnerability reduction in society.
- **prospect theory**(Peter Walker, 2010). It is a theory of decision making under risk conditions. Managing disaster risk efficiently affects the reduction of vulnerability in society. Decisions are based on human judgment and look closely at the risk to be crossed and exposed. Judgments are assessments of the external state of the world, and sometimes they become especially difficult, under conditions of uncertainty, when it is difficult to clearly foresee the consequences or results of events.
- **social learning theory**(Cook K., Rice E., (2014). Social learning theory or SAT, is the theory in which people learn new behaviors, through reinforcement or punishment, or through observational learning of social factors of their close and not-so-close environment. The way to protect life, protect humans, associated with the survival instinct, indicates that many times we must generate selective and measurable learning for humans. Disaster risk management directly compromises participation of humans, with the objective of reducing the risk of disasters and reducing vulnerability, both of people, materials, physical infrastructure, business and institutional network and society in general.

B. Human Interaction - Disasters – Technology

The demonstration, manifestation and explanation of the interaction of the Human-Disaster, dates back to the Primitive Age, according to Villalibre Calderón, Cristina (2013), the Human since its first years of existence, in the interaction with the first Disaster, that can be documented throughout history, this dates back more than 47,000 years and corresponds to the eruption of the Sumatran volcano, which caused material and human damage, which caused the world population to decrease drastically and dramatically. In those times it is estimated that the human race went from being one million people, to a number very close to 10,000 inhabitants. The literature does not record and contain empirical evidence or know exactly what happened, however some researchers associate it with the fall of a meteorite.

C. The disaster

A disaster is an event that has a consequence and result after the impact of phenomenological events in a natural way (known as a natural disaster and comes from nature itself), it has also been identified that due to its origin, some are caused by man (Human) , to these two lines of origin, a third is added, where, in addition to those of natural origin, the intervention of the Human is added, known as of Anthropogenic or Anthropic origin (it is a mixture of natural + the intervention of the Human) (Atta -Ur Rahman a, 2019). These consummated facts by human interaction and participation, negatively affect life, families, livelihoods, sustenance to survive, to service and industrial institutions and companies and frequently leads to permanent changes in human societies and the animals that inhabit that place; in ecosystems and in the environment[4]. It is also named as "catastrophe", and it comes from the Latin catastropha and this, from the Greek katastrophe, which meant 'convulsion, tumult', and in the case of a dramatic situation, 'outcome'. Katastrophe was formed with the prefix katá- 'downwards' and the verb strephein 'to turn around', it indicates how the event has disastrous consequences (wordreference.com, 2019). Disasters reveal the vulnerability of the balance necessary for the survival, well-being and prosperity of the Human.

D. Practical justification

In the process of reviewing the State of the art literature, we have come to detect some gaps and elements of approaches, to present in a deconstructive way the management of disaster risk due to seismic activity, accompanied by Human-Disaster-Technology interaction.(Kaylin Rochford, 2019). In our case, we treat it as a challenge and at the same time an opportunity, in the contribution by the research of the Presentation of the Influence Factors of Disasters due to Seismic Activity, included in the Architecture of a Conceptual Model, always oriented to the Reduction of Vulnerability. The operationalization of the research associates the Sendai Framework (2015-2030) with the selected theories, at this point the Priority Objective I refers to knowledge, understanding and understanding of Disaster Risk, with the invaluable help of Science, Technology, Innovation and Entrepreneurship (C+T+I+e)[5]. During the processing of information, access and review of the literature, referring to disaster risk management, we were able to identify the factors and operational components that can be practically applied in Vulnerability Reduction.

[4](Stephen Flood, 2022)
[5](Fernandez Arce & Chavarría Córdova, 2012)

➢ *Conceptualization of factors influencing disasters due to seismic activity*

Physical structure of housing. -The structure of a house is the one that receives and supports loads, such as its own weight, the weights of furniture, materials, people and their effects. https://www.google.com.pe/search?Estructura+física+de+vivienda.
Social Infrastructure. - Set of elements or services necessary for the operation of organizations and the development of activities and are intended to contribute to satisfying the basic needs of the population, such as health, education, transportation, etc. https://www.wordreference.com/definicion/infraestructurasocial/
Economic Activity Infrastructure. -A set of elements or services necessary for the operation and development of economic activity and are intended to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructuraeconómica/
Educational infrastructure. -Set of elements or services necessary for the operation and development of the educational activity in order to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructuraeducativa/
Technological infrastructure. - Set of elements or services necessary for the operation and development of the technological activity and are intended to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructuratecnológica/
Communication Infrastructure. - Set of elements or services necessary for the operation and development of communication activities and are intended to help meet the needs of people. https://www.wordreference.com/definicion/infraestructuracomunicación/
Institutional Business Infrastructure. - Set of elements or services necessary for the operation and development of business and institutional activity and are intended to contribute to meeting the needs of people.https://www.wordreference.com/definicion/infraestructuraempresarialinstitucional/
Structural and Technical Grade. - The level reached structurally in the unit or service is considered, with the technical element.https://www.wordreference.com/definition/gradestructurallytechnical/
Infrastructure Medical Services. - Set of elements or services necessary for the operation of the health activity and are intended to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructuraserviciosmedicos/
Land Transport Infrastructure. - Set of elements or services necessary for the operation of the land transport activity and contribute to satisfying the needs of people.https://www.wordreference.com/definicion/infraestructuratransporteland
Institutional Political Infrastructure. - Elements or services necessary for the functioning of the institutional political activity and are intended to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructurapolíticainstitucional/
Port Air Infrastructure. - Set of elements or services necessary for the operation and development of air and port activity and are intended to contribute to meeting the needs of people. https://www.wordreference.com/definicion/infraestructuraaéreoportuario/

III. METHODOLOGY

The development of the research includes a methodological phase of literature search and review (LBD), and consultation on the Internet virtual network has been important, to extract statistical data and information on natural disasters due to seismic activity (earthquakes), and of findings and results on the factors of influence, the gravitating components in the harmful and devastating repercussions for humans[6]. We have been able to locate and detect advances in the comprehension, understanding and explanation of the disaster, through mostly applied social research, and often with the support of epistemological evidence, citizen science, social engineering, earth science, among those with the greatest value and investigative contribution. In the planning section, we present five questions that are related to the investigation of disasters due to seismic activity, such as (1) the factors that influence disasters due to seismic activity, (2) the components that we propose for the explanation of human-disaster-technology, (3) the theories that are applied to disasters, (4) the explanation of models of human-disaster interaction and (5) the monitoring of disasters due to seismic activity.[7]. The prevention and reduction of the risk of disasters due to earthquakes and floods, prevail in the framework of the development of scientific investigations of the literature found, under the deconstructive and descriptive lens at the individual and multidisciplinary level, where the lack of collaboration at the level is still observed. of researchers and public and private educational institutions(Elena Righi, 2021). The results indicate the capture of empirical information sources and also in a narrative way, which constitute the practical, viable and available tools, in a fast, simple and easy way, to capture, register, transmit and disseminate information in real time about the earthquakes, considered as potential threats (imminent danger). The

[6](Emlyn Witta*, 2018)

[7](G. Musacchio, 2015)

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information search process includes, the objectivity and the temporality of the seismic activity (earthquakes), it gave us as a result the number of 563 scientific articles, then applying the inclusion and exclusion criteria, finally we have chosen sixty-four (64) scientific articles . See Figure 2.

A. Planning

Next, we present questions that are related to the investigation of Disasters by Seismic Activity, so we have:

Question RQ 1 What are the factors that influence disasters due to seismic activity?

Question RQ 2 What components have been proposed for the explanation of Human-Disaster-Technology by seismic activity?

Question RQ 3 What theories apply to the factors that influence disasters due to seismic activity?

Question RQ 4 How are the Human-Disaster interaction models explained by seismic activity?

Question RQ 5 How is the monitoring of disasters due to seismic activity carried out?

- *Fountain*

In order to find information and data, to answer these questions, we search indexed journals in Scopus and Web of Science (WoS), in addition, we have Journal (Scientific Articles) from Google Academic, Academia and IJISRT. See Table 1.

- *Period*

The research has taken a time horizon of searching and reviewing the literature, in the period from January 2011 to September 2022.

- *Search String*

We searched Scopus and Web of Science (WoS) journals for relevant articles as follows: (TITLE-ABS-KEY (“Scientific Knowledge” OR “Reduce the Risk Disaster”) AND TITLE-ABS-KEY (“ Information Technology” OR “Reduction of Vulnerability”)) AND PUBYEAR > 2011 AND PUBYEAR > 2022.

Google Academic, Academic and IJISRT of Paper, considered as follows: (TITLE (Information (Risk AND Disaster) AND(Technology) AND (Reduction of Vulnerability) AND PUBYEAR > 2011 AND PUBYEAR > 2022.

(https://scholar.google.es/scholar?hl=es&as_sdt=2007&q=%22risk+reduction%22++and+disaster+and+technology)

Paper and Origin	Paper Quantity	Year (Range)	Selected and Potential
Scopus - WoS	327	2022 - 2011	27
Google Academic-Elsevier	224	2022 - 2018	28
Academy	6	2022 - 2015	5
IJISRT	6	2022 - 2016	4
Total	563 Paper	2022 - 2011	64

Table 1: Scientific articles and origin

- *Selection of Articles*

We have tried to identify the articles from the Scopus and WoS journal, both from quartile 1 and 2, and we have also considered those from Google Academic, Academic and IJISRT from quartile 1, 2 and 3, which support the research and may contain information on the factors that influence disasters due to seismic activity (earthquakes), as well as the explanation and treatment, taking IT as the main axis with greater incidence, influence and effectiveness in reducing vulnerability(Mihoko Sakurai, 2019).

- *The inclusion and exclusion criteria used*

Articles that are not in thematic areas of Engineering, Computer Science, Social Science, Science and Technology, Deep Learning, Artificial Intelligence, Data Science, Innovation and Entrepreneurship Nature and Environment, Citizen Science, Earth Science and Frontier, Others are excluded.

Selection of Articles	Article Review
The condition for selecting articles is that they must contain the factors that influence disasters due to seismic activity (earthquakes). In addition, they must contain the explanation, description and treatment, taking Information Technology (ICT) as the main axis.(Munib ur Rahman, 2016)with greater incidence, influence and effectiveness in disaster risk management, disaster risk reduction prevention and vulnerability reduction.	In the process of including research in the literature review. Articles found in thematic areas of Engineering, Computer Science, Social Science, Science and Technology, Deep Learning, Artificial Intelligence, Data Science, Innovation and Entrepreneurship Nature and Environment, Citizen Science, Earth Science and Frontier, have been taken into account. others.

B. Development of the research phases

The number of publications, on natural disasters, carried out in the last ten years, with the Hyogo Framework for Action (2005-2015) and then the Sendai Agreement (2015-2030), have materialized the exceptional turn, in the direction of the investigations, being the central themes, the attention and the way of response to situations of accidents or catastrophes. The phases that prevail in the investigation are: a) Planning, explanation and temporality, b) The diagram of the literature review process, c) The results of potential and selected articles, d) The trend of publications, e) The articles selected by temporality and f) The articles selected by quartile.

- *Planning, explanation and temporality*

The prevention and reduction of the risk of disasters due to earthquakes and floods, have been translated into present investigations, that is, "during...", they are currently becoming more necessary, valuable and useful. Research aimed at studying disasters due to seismic activity,[8]They have found and constituted very important substantiated epistemological evidence, explained by experts with their own language and in accordance with the scenarios, after the tragedy (occurrence of disasters) and above all, in those that explain and account for post-disaster situations, which are eminently reactive, hand in hand with "after...", that is to say, to get the human to intervene, when the risk of disasters due to seismic activity (earthquakes) materialized. Also, it is important to mention that, in current research, we have found that there are researchers who make the framework of action, priority objectives and sustainable development of the Paris Agreement (2015) prevail. Some scientific investigations of the literature found associate it in a creative way and with an order to improve,(Elena Righi, 2021). The results indicate the capture of sources of empirical information and also in a textual, narrative and detailed way, where they explain the causes, scenarios of disasters due to seismic activity (earthquakes). The use of ICTs constitutes practical, viable and available tools, quickly, simply and easily, to capture, record, transmit and disseminate information in real time, considered as potential threats (hazards).[9]. See Figure 2.

[8](Caroline Michellier1, 2020)
[9](Callaghan, 2016)

➢ *Literature Review Process Diagram*

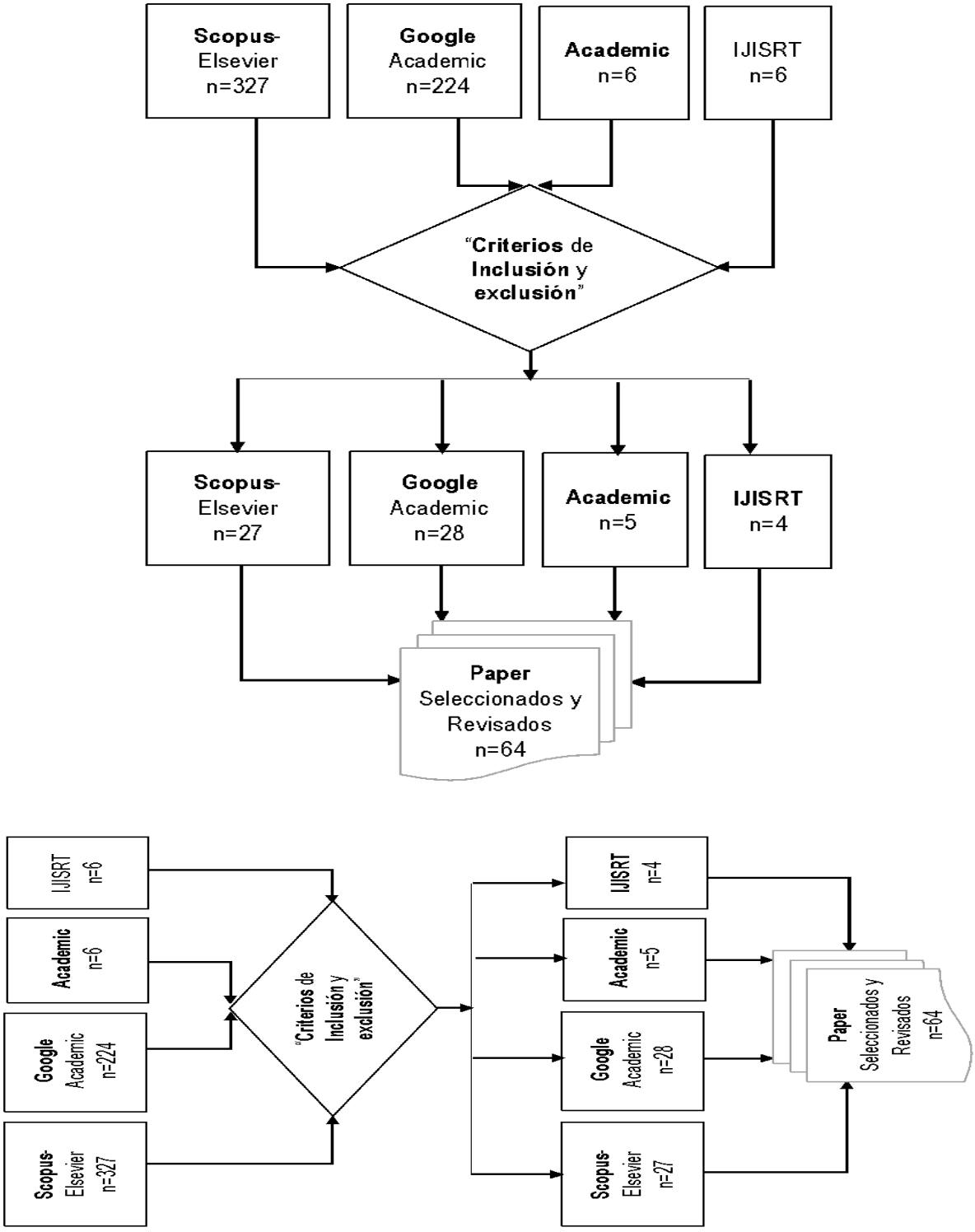

Fig. 2: Scheme of Literature Review Activities

Source: self made

C. Results of potential and selected articles

The direct reference literature is detailed in Table 2, and are considered scientific articles, which are associated with disaster risk management in cases of seismic activity, thus we have:

Qualification	Author(s)	Year	DOI	Scientific magazine
"A Conceptual Frame Using 'Knowledge' As a Lens for Deconstructing the Sendai Framework Priority 1: Understanding Disaster Risk Potential and Selected"	Toinpre, Gajendran, Ta, Mackee, Ja	2018	http://dx.doi.org741649263 1877-70582018	Scopus-Science Direct
Direct "Using a combination of human insights and 'deep learning' for real time disaster communication"	Brett W. Robertsona Matthew Johnson, Dhiraj Murthy, William Roth Smitha Keri K.Stephensa	2019	http://dx.doi.org/10.1016/j .pdisas.2019.100030	Scopus-Elsevier-Engineering, Science
"Disaster risk reduction and innovations"	Takako Izumi a, Rajib Shaw, Riyanti Djalante, Mikio Ishiwatari, Takeshi Komino	2019	http://dx.doi.org/10.1016/j .pdisas.2019.100030	Scopus-Elsevier
"Disaster resilience of optical networks: State of the art, challenges, and opportunities".	Jacek Raka, Rita Girão, Silvabc Teresa, Gomesb Georgios Ellinasd, Burak Kantarcie Massimo Tornatoref	2021	https://doi.org/10.1016/j .osn.2021.100619	Scopus - Engineering, Science
"Artificial intelligence in seismology: Advent, performance and future trends"	Rajib Shaw, Takako Izumi, Peijun Shi	2019	DOI 10.1007/s13753-016 -0104-7, www.ijdrs.com	IJDRS
"Dynamic monitoring and analysis of the earthquake Worst hit area based on remote sensing"	Mingshun Xiang, Qiuchi Deng, Linsen Duan, Jin Yang, Chunjian Wang, Jiashuo Liu, Mengli Liu	2022	https://doi.org/10.1016/ j.aej.2022.02.001	Scopus-Engineering, Science Direct.
"MyShake: Using Human Centered Design Methods to Promote Engagement in a Smartphone Based Global Seismic Network".	Kaylin Rochford, Jennifer A. Strauss, Qingkai Kong, and Richard M. Allen	2018	doi:10.3389/feart.2018 .00237	Scopus-Engineering
"Applications of drone in disaster management: A scoping Review".	Sharifah Mastura, Syed Mohd Dauda, Mohd Yusmiaidil, Putera Mohd Yusofb, Chong Chin Heoa, Lay See Khoo.	2022	https://doi.org/10.1016/j.gsf .2019.10.004 2019	Scopus-Elsevier
"Exposure Impact of potential earthquake disasters in the areas located in zone lineaments".	Edo Barlian, Johannes, Tarigan, Zulkifli Nasution, Agus Purwoko	2021	doi:10.1088/1742-6596/1811/1/012031	Journal of Physics: IJSRT
"A review on application of data mining techniques to combat natural disasters".	Saptarsi Goswami, Sanjay Chakraborty, Sanhita Ghosh	2019	http://dx.doi.org/10.1016/j .asej.2016.01.012	Scopus-Engineering

Table 2: Articles selected by content

➢ *post trend*

We present the evolution of disaster risk management publications, related to seismic activity (earthquakes), which covers a period of time from January 2011 to September 2022. Among those with the highest participation, the Scopus-WoS magazine stands out. -Elsevier with 327 publications, of which we have selected 27 articles, then we have Google-Academic-Science Direct, with 224 publications, of which 28 scientific articles were selected and finally, due to the importance of the content, we take into account the journals Academic and IJISRT with 6 articles from both and we have selected 5 and 4 respectively, adding a total of 64 articles, which are the basis of the literature review of research on the factors that Influence Natural Disasters by Seismic Activity, See Figure 3.

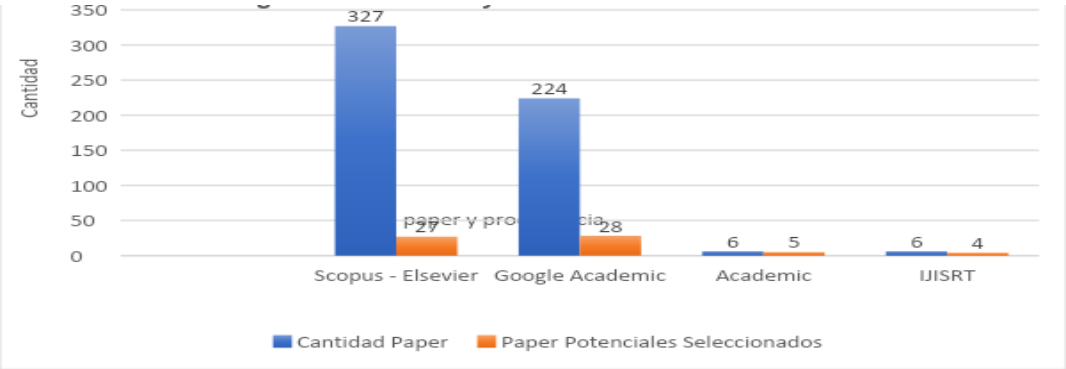

Fig. 3: Tendencia Concentracion de Literatura

Source: self made

➢ *Articles selected by temporality*

In accordance with the Paris Agreement (2015) and the Hyogo Framework for Action (2005-2015), we observe that coincident publications are made between 2011 and 2015. Later, with the Sendai Framework Agreement (2015-2030), the publications They grow and tripled, reaching a peak in 2019, and then descending until September 2022. See Figure 4.

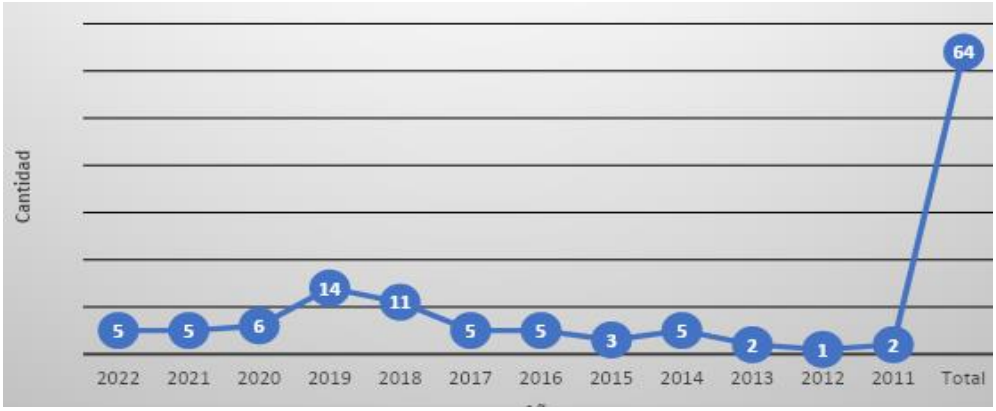

Fig. 4: Articula cientifico y temporalidad

Source: self made

➢ *Scientific Articles Selected by Quartiles*

Based on the literature review of the research, we have selected a total of 64 articles, of which 61% correspond to quartile 1 of the Scopus-WoS journal with 39 articles, followed by 28% corresponding to Scopus-WoS- Academic with 18 articles, then we have 8% and 3% belonging to the IJISRT-Academic journals with 5 and 2 articles respectively. See Figure 5.

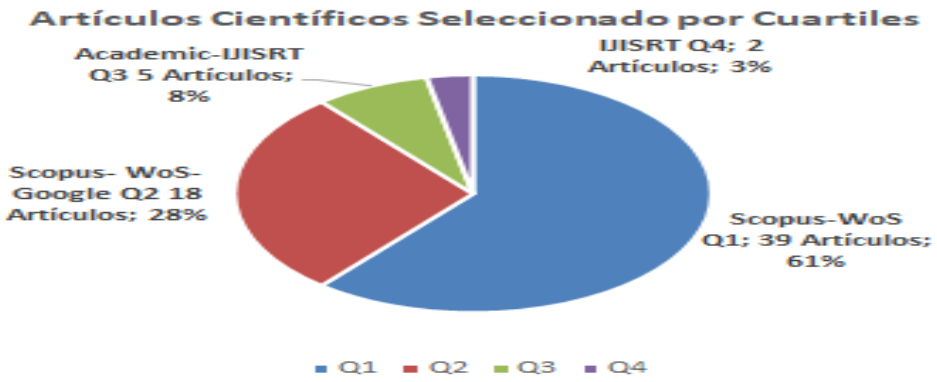

Fig. 5: Scientific articles and quartiles

Source: self made

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IV. ANALYSIS

A. Question RQ 1 What are the factors that influence disasters due to seismic activity?

According to the literature review, we have detected twelve (12) factors that have a direct influence on disasters due to seismic activity, see Figure 6 and Table 3. We detail them below:

1. Housing Physical Structure	2. Social Infrastructure	3. Infrastructure Economic Activity	4. Educational infrastructure
5. Technological infrastructure	6. Communication Infrastructure	7. Institutional Business Infrastructure	8. Structural and Technical Grade
9. Infrastructure Medical Services	10. Land Transport Infrastructure	11. Institutional Political Infrastructure	12. Port Air Infrastructure

Table 3: Influencing factors in disasters due to seismic activity

B. Question RQ 2 What components have been proposed for the explanation of man-disaster-technology by seismic activity?

Next, we detail the relationship of forty-three (43) identified components, which are associated with disasters due to seismic activity, in addition we were able to select twenty-five (25) components, associated with the interactivity and usability of technology-human-computer (see Figure 6 and Table 4), thus we have the following:

1. human settlements	2. Pedestrian accessibility routes	3. transit routes	4. population density
5. The PEA population involved	6. Electric power consumption	7. The consumption of water	8. The state of conservation of the house
9. university institutions	10. Primary education institutions	11. social mobile networks	12. Technological Platforms
13. The Twitter apps	14. Facebook apps	15. early warning system	16. public companies
17. private companies	18. Construction technology level	19. Degree of resistance of structures	20. Medical care hospitals
21. private care clinics	22. Heavy-light cargo transportation	23. public passenger transport	24. Transportation distribution delivery
25. male and female leadership	26. Community participation in decisions	27. Airports and air transport	28. Port of embarkation and disembarkation
29. higher educational institutions	30. secondary educational institutions	31. fiber optic network	32. Radio and TV communication institutions
33. home landline telephony	34. social media platforms	35. Cellular mobile telephony	36. civil construction staff
37. Civil engineering and architecture team	38. civil construction equipment	39. Disaster care equipment	40. Transport of passengers in trains
41. Dispersed taxi services transport	42. Private passenger transport	43. Interprovincial passenger transport	

Table 4: The components associated with disasters due to seismic activity

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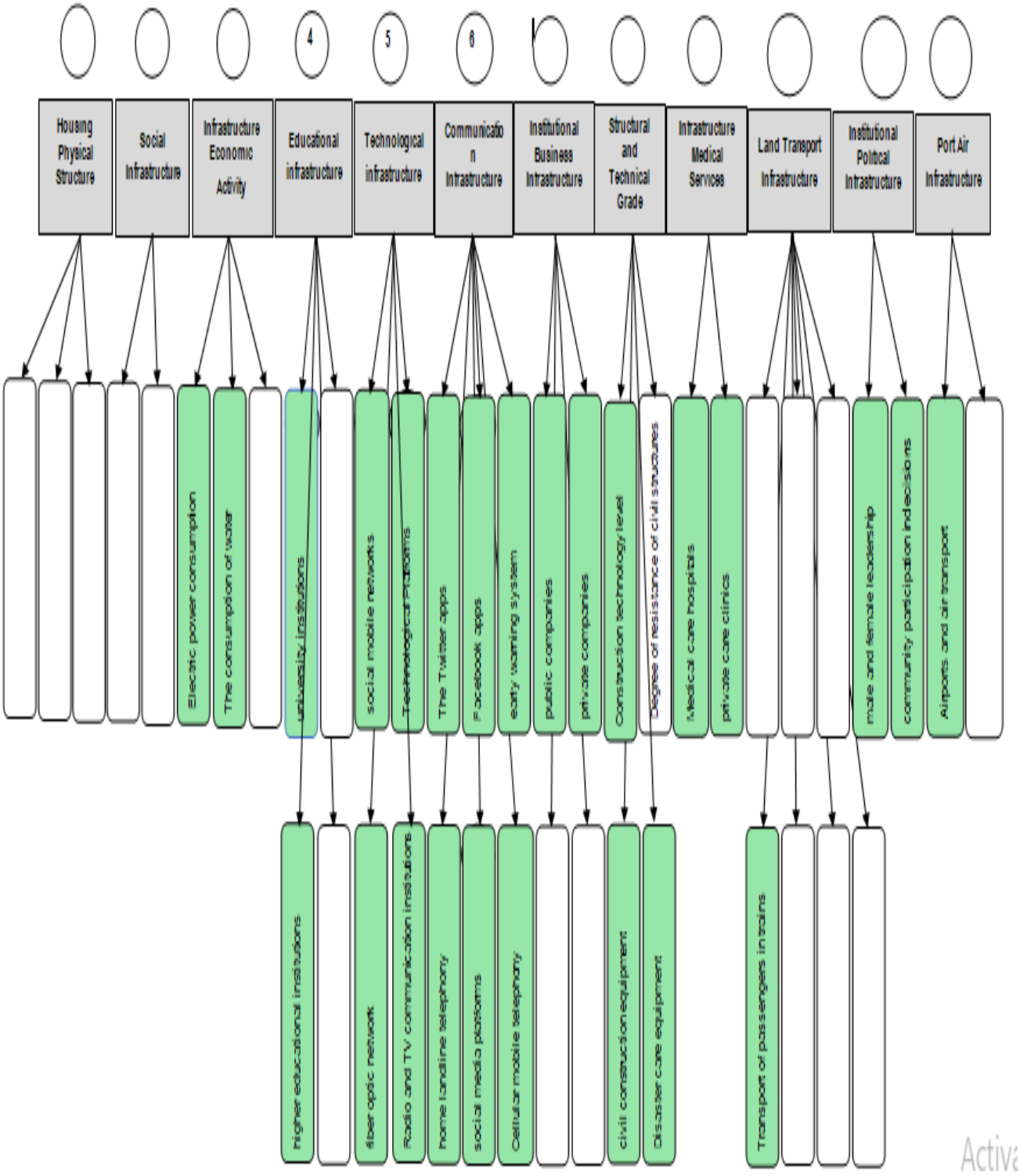

Fig. 6: Architecture of factors and components of influence in disasters due to seismic activity (Presentation of model-scheme)

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C. Question RQ 3 What theories apply to the factors that influence disasters due to seismic activity?

We have taken six theories as reference (see Table 5), the same ones that can be adapted to the establishment of a direct relationship with the investigation, they are:

No.	Theory	Author(s)	Description of factors of influence in disasters
1	**Diffusion of innovations theory**	Everett Rogers,2003	Diffusion is the communication process of innovation over time, it includes people as active participants in an integrated social system, it is dynamic that associates in a network, that interacts and represents the way to transfer and coordinate actions in real time, to mobilize to humans and material resources, which compromises factors and components that influence disasters and vulnerability due to seismic activity.
2	**Media wealth theory**	Bergin, Richard 2016). El-Shinnawy, M., & Markus, ML (1997	It points out the importance and capacity of information to change comprehension and understanding, through personal means of communication, they are almost always the most effective to communicate problems, they facilitate and interact in the actions and exercises of people, and they represent the way to make decisions, to attend and be present in the places of the seismic disaster, that merit the presence of human talent and immediate material resources.
3	**Organizational information processing theory**	Galbraith, JR (1974, Außmann, C., Dwivedi, YK, Venkitachalam, K.	Organizations need quality information to face environmental uncertainty and improve their decision making. Environmental uncertainty arises from the complexity of the environment and the dynamism, or the frequency of changes in various environmental variables, derived from the seismic disaster.
4	**Phenomenology theory**	Dreher, J. (2012). Phenomenology: Alfred Schütz and Thomas Luckmann	The study of phenomenology is related to other disciplines, such as science, philosophy, such as ontology, epistemology, logic, and ethics. Humans have a particular way of seeing the world and processing what they live by experience and according to their own perceptions, beliefs and values, which generates a unique personality.
5	**prospect theory**	Peter Walker, 2010	It corresponds to the theoretical model of decision-making under risk conditions. Managing disaster risk efficiently affects the reduction of vulnerability in society. The decisions are based on the judgments of humans and they look closely at the risk, to which they are exposed and through which they have to transit, judgments and values are involved in conditions of uncertainty, where it is difficult to clearly foresee the consequences and results of the events.
6	**social learning theory**	Cook K., Rice E., (2014	It is part of the social learning theory or SAT, known as the theoretical model where people learn new behaviors, through reinforcement or punishment, or through observational learning of social factors in their close and not-so-close environment. The way to protect life, associated with the survival instinct due to disaster risk.

Table 5: The theory and factors of influence in disasters

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D. Question RQ 4 How is technological usability achieved in disasters due to seismic activity?

In the literature consulted, the scientific articles highlight the intensive use of technology (see Table 6). Next, we have the following technological resources:

Technological Resource	Usability in disasters due to seismic activity	Literature
Social networks	It is a valuable resource for obtaining information "during a disaster", referring to the importance of communication.	1,2,6,7,9,11,14,15,16,17,18,21,22,25,27,28,31,32,33,34,36,43,62,
The Artificial Intelligence (AI) System	It is established as an immediate response to disasters, including those generated by seismic activity, the realistic prediction of earthquakes is essential for the evaluation of seismic risk. AI in seismology evaluates the performance of leading techniques, including machine learning and deep learning, in seismic data analysis	1,2,6,9,11,13,15,18,22,25,27,28,31,32,33,35,36,62,63,
The Twitter App	They highlight the speed and effectiveness of the messages aimed at providing communication, assistance and immediate help.	1,3,6,9,11,27,32,34,
Facebook	They are used extensively to send information and include text, image, interactivity, sound, location, and other elements.	3,6,9,11,32,34,
Optical Networks	At present they prevail, due to the high capacity and long-distance transmission range, they have been used as the main communication technology in scenarios of all kinds of disasters.	4,6,11,18,22,27,
The Global Seismic Platform	It uses citizens' smartphones to detect earthquakes and record them. The goal is to reduce the risk of earthquakes and provide users with a resource for science and information on earthquakes and seismic activity worldwide.	1,4,5,6,7,8,9,13,14,2122,63,66,67,68,69,18,25,27,28,
The Drones	In disaster situations, the geographic location involves inaccessible areas and sites, and the resource is invaluable, with the help of drone technology, the concerted effort and cooperation of multidisciplinary teams becomes relevant, together with data based on empirical evidence from earthquakes.	4,58,62,11,22,34,
Open Source Big Data Platform	A scientific research framework has been proposed, to build a database of disaster risk management by seismic activity in a gradual manner.	1,4,6,7,8,9,11,14,43,66,70,71,13,17,18,25,27,28

Table 6: Technological Usability in disasters due to seismic activity

E. Question RQ 5 How is the monitoring of disasters due to seismic activity carried out?

We have found information that allows us to point out that follow-up and monitoring in disaster situations due to seismic activity, obeys to take into account and with acceptance, the different forms of communication, in real time, intensively and with globalized characteristics, which generally They are limited by the capacity of wealth and human talent that countries have and in political and governmental decisions, in reference to the acquisition and implementation of infrastructure, materials, equipment and with people prepared to attend disasters. The study of factors and components of influence in seismic disasters has detected that monitoring and follow-up includes the following technological resources:

Resource Technological	Monitoring in disasters due to seismic activity	Literature
The networks social	They are currently used, to send and receive information, "after...", "during..." and "before...", referring to the importance of communication in seismic disasters.	1,3,4,5,6,7,8,9,11,13,14,15,16,17,18,21,22,23,25,27,28,32,34,
Artificial Intelligence [AI]	This technological resource allows and facilitates information for decision-making in global disaster scenarios.	1,3,4,6,11,16,18,22 25,27,28,33,
Twitter	It allows individual monitoring, through messages addressed to users affected and not affected by disasters.	1,3,6,7,11,16,27,32,
Facebook	Interactivity with users opens coverage and citizen participation in disaster risk situations due to earthquakes.	4,6,7,11,16,27,32, 3. 4
Technological platform	Communication using national and local ICT platforms facilitates the follow-up and monitoring of disasters.	1,4,6,7,8,9,13,14, 15,17,18,22,23,25, 27,34,35,
Optical Networks	Listed as the main communication technology, it is valuable for high capacity, time and long-distance transmission.	4,11,13,16,22,27,29, 32,33,34,
Global Seismic Platform	It allows communication with millions of users. To which useful information for follow-up and monitoring is sent and received.	4,6,8,9,13,14,16,18, 21,25,27,28,32,35
Global Positioning	System that allows to locate any user or object on earth, with a precision of up	4,5,6,7,8,13,14,15,

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System (GPS)	to centimeters with differential GPS.	16,18,22,25,27,29, 33

Table 7: Monitoring in disasters due to seismic activity

V. DISCUSSION OF RESULTS

The systematic review of the literature initially allowed us to detect 563 scientific articles related to disaster risk management. In the process of selecting and applying the researcher's criteria, sixty-four (64) potential investigations were chosen, those framed in seismic activity (earthquakes), in a period of time from January 2011 to September 2022. We managed to identify twelve (12) factors and forty-three (43) components, duly related and taken into account given the importance they present in disasters due to seismic activity. . This academic work generates a special motivation for us, added to the experiential experience and empirical evidence, which should be interpreted as updated and available inputs to be used in scientific discussion.

A. Question 1 What are the factors that influence disasters due to seismic activity?

The influence factors detected and with the highest incidence are related to: (1) Physical structure of housing, (2) Social Infrastructure, (3) Economic Activity Infrastructure, (4) Educational Infrastructure, (5) Technological Infrastructure, (6) Communication Infrastructure, (7) Institutional Business Infrastructure, and others also appear, with less consideration and importance, such as (8) Structural and Technical Degree, (9) Medical Services Infrastructure, (10) Land Transportation Infrastructure, (11) Institutional Political Infrastructure and (12) Port Air Infrastructure.The publications are in accordance with the Paris Agreement (2015), the Hyogo Framework for Action (2005-2015) and the Sendai Framework (2015-2030), until September 2022. An opportunity opens up on this path of individual and group research with multidisciplinary participation, which allows internationalization in the network and collaborative participation.

B. Ask2 What components have been proposed for the explanation of man-disaster-technology by seismic activity?

[xvii] Secondary educational institutions, [xviii] The fiber optic network, [xix] Radio and television communication institutions, [xx] Fixed home telephony, [xxi] Social media platforms, [xxxii] Cellular mobile telephony, [xxiii] Civil construction equipment, [xxiv] Disaster response equipment, [xxv] Passenger transport in electric trains. During the last decade, research opportunities with multidisciplinary participation, networking and mutual collaboration have been presented, the investigations generically indicate the importance of the components, and the lack of description and details in the process of interrelation and usability is appreciated. This academic gap of a scientific nature in disasters due to seismic activity, constitutes a scientific opportunity and challenge, with professional motivation, to exchange criteria and agree on improvements in the acceptance of definitions and achieve the use of appropriate terminology. The results obtained and the findings of scientific articles consulted have allowed us to enrich the presentation of components that have an influence on disasters due to seismic activity.

C. Ask3 What theories apply to the factors that influence disasters due to seismic activity?

The absence of theories in the reference literature, so that they can explain the origin and transcendence of seismic phenomenology, has allowed us to link and associate them with the presentation of six (6) selected theories that have a functional and practical relationship with human- disaster the factors and components that influence disasters due to seismic activity (see Table 8), such as:

Order	Theory	Author(s)	Year
1	Diffusion of innovations theory	Everett Rogers	2003
2	Media wealth theory	Bergin, Richard 2016). El-Shinnawy, M., & Markus, ML	1997
3	Organizational information processing theory	Galbraith JR, Haußmann, C., Dwivedi, Y., Venkitachalam K.	1974
4	Phenomenology theory	Dreher J., Alfred Schutz, and Thomas L.	2012
5	prospect theory	peter waker	2010
6	social learning theory	Cook K., Rice E.	2014

Table 8: Theories and factors of disasters by seismic activity

D. Question4 How is technological usability achieved in disasters due to seismic activity?

Researchers agree on the importance of the use of science and technology in the communication of people, groups and organizations, some research highlights the intensive use and acceptability of: i.- Social networks, ii.- The use and coverage of Platforms technologies, iii.- Twitter applications, iv) Facebook applications, v.- The early and immediate warning system, vi.- Communications companies, vii.- Business and technology, viii.- Academic and scientific networks ix.- Universities and professional schools, x.- The use of fiber optic networks, xi.- Radio and television communication institutions, xii.- Fixed home telephony, xiii.- Cellular mobile telephony, and others . Currently, we highlight those that bring greater usability and value to users,

E. Ask5 How is the monitoring of disasters due to seismic activity carried out?

The follow-up and monitoring of disasters due to seismic activity take into account the acceptance of the user, the forms of communication are valued immediately, in real

time, participatory and intensively open and safe, the researchers realize that they have limitations of human implementation, technology and materials, many of them fall on political decisions and government management. The study of factors and components of influence in seismic disasters indicate that follow-up and monitoring includes the following elements:

a.- Social Networks, b.- Artificial Intelligence (AI), c.- The Twitter Application, d.- The Facebook Page, e.- The Technological Platform, f.- Optical Networks, g.- The Platform Global Seismic and h.- The GPS - Global Positioning System.

VI. CONCLUSIONS AND RECOMMENDATIONS

- Scientific studies of disasters due to seismic activity (earthquakes) and heavy rains (floods) are of universal priority, in this line of research, the study of the factors of influence in disasters due to seismic activity constitutes a scientific challenge, and important professional motivation. globalized. In the investigation we have managed to identify twelve (12) factors and forty-three (43) components, duly related to seismic activity, due to the importance they present, we have considered twenty-five (25) components, those that have the highest incidence in disasters due to seismic activity. , which are related to human-disaster-technology.
- We have concluded that the identification of the influence factors in disasters due to seismic activity correspond to: (1) Physical structure of housing, (2) Social Infrastructure, (3) Infrastructure of Economic Activity, (4) Educational Infrastructure, (5) Technological Infrastructure, (6) Communication Infrastructure, (7) Business and Institutional Infrastructure, (8) The Structural and Technical Degree, (9) Medical Services Infrastructure (health), (10) Land Transportation Infrastructure, (11) Institutional Policy Infrastructure, (12) Air and Port Infrastructure.
- The investigation initially yields forty-three (43) designated components, and of them we consider twenty-five (25), those that are associated and affect disasters due to seismic activity, and that are related to the human-disaster-technology approach, they are : (i) Electricity consumption, (ii) Water consumption, (iii) University institutions, (iv) Mobile social networks, (v) Technological platforms, (vi) Twitter applications, (vii) Facebook applications, (viii) The early warning system, (ix) Public companies, (x) Private companies, (xi) The level of construction technology, (xii) Medical care hospitals (health), (xiii) Private care clinics (health), (xiv) Community participation in decisions (civil society), (xv) Airports and air transport,(xvi) Higher educational institutions, (xvii) Secondary educational institutions, (xviii) The fiber optic network, (xix) Radio and television communication institutions, (xx) Home fixed telephony, (xxi) Technological platforms and social networks, (xxii) Cellular mobile telephony, (xxiii) Civil construction equipment, (xxiv) Disaster response equipment, (xxv) Passenger transport in electric trains.(xxv) The transport of passengers in electric trains.(xxv) The transport of passengers in electric trains.
- Regarding technological usability in disasters due to seismic activity, the research consulted highlights the intensive use of technological resources, and those that stand out are: (1) Social Networks, (2) The Artificial Intelligence System (AI), (3) The Twitter Application, (4) The Facebook Social Application, (5) Optical Networks, (6) The Global Seismic Platform, (7) The frequent use of Drones and (8) The Big Data Platform of Open Source.
- The difference with the selected investigations, correspond to the presentation of an architecture and visual sketch of academic level, on the factors (twelve) and components of Influence (forty-three), in disasters due to seismic activity, and the association with the theories that support and sustain the scientific content of applied social research, to agree, improve and have the acceptance of concepts, opinions and criteria with the use of the terminology used and under the deconstructive lens of science, technology, innovation and entrepreneurship, which emerges of the results obtained from the sources of information (scientific articles).
- The literature review of the five hundred sixty-three (563) scientific articles indicates that work is being done on empirical and substantiated evidence of seismic disasters (earthquakes), heavy rains (floods), and to a lesser extent hurricanes, fires forestry, drought, snow and ice storms, tornadoes and others, and of the total, almost 70% correspond to post-disaster case studies, "after", and the background found identifies them as the model that has set the standard for attention to disasters (disaster risk), through reactive management and has prevailed in the last forty years, from there the information and data platforms for future research are established.
- In the current scenario due to the CoVid 19 Coronavirus Pandemic disease, it is necessary to update knowledge and focus on the needs of the "present, that is, now, during...", and the research consulted stands at 25%, and contains disaster risk reduction and prevention activities; We detected a scientific and academic vacuum, due to the lack of understanding, understanding and associativity, using new approaches to corrective disaster risk management, with the use of scientific research, science, technology, innovation and entrepreneurship.

VII. FUTURE WORK

- The empirical and substantiated evidence post-disasters due to seismic activity, constitute the elementary inputs of reactive management, the same ones that hold and have the information to work on the basis of corrective management, that is, prioritizing "the present, that is, now", therefore, it is necessary to include studies of estimation, prevention and reduction of disaster risk, with the materialization of vulnerability reduction in disasters due to seismic activity, likewise it is important to operationalize risk assessment, associated with education transversally, both in the public and private spheres.
- The identification of factors and components with influence in disasters due to seismic activity (earthquakes), do not indicate the importance of participatory and collaborative work, and multidisciplinary research teams are required.

- The integration with scientific institutions, universities, political and governmental authorities and the participation of the population in an organized manner, with the mechanisms of information, communication and dissemination of clear, timely and understandable messages, have a fundamental role in reaching incorporate the reduction of human vulnerability and livelihoods.
- At this point, technology, usability and user interactivity (human) will facilitate the creation of public and collective awareness, in the interest of being part of the processes, to drastically reduce disaster risks and vulnerability reduction. .
- The components that have been proposed for the explanation of man-disaster-technology by seismic activity indicate that follow-up and monitoring includes the following elements: (i) Social Networks, (ii) Artificial Intelligence (AI), (iii)) The Twitter Application, (iv) The Facebook Page, (v) The Technological Platforms, (vi) The Fiber Optic Networks, (vii) The Global Seismic Platform and (viii) The GPS - Global Positioning System. At this point we must highlight the ascending presence proposed by Asian (Hindu) researchers

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