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JAIRO FILHO SOUSA DE ALMEIDA

UNDERSTANDING APPROACHES IN URBAN PLANNING FOR ALLEVIATING DISASTER IMPACTS

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COMPREENDENDO O PLANEJAMENTO URBANO COMO FORMA DE MINIMIZAR IMPACTOS EM DESASTRES

Dissertation presented to the Graduate Program in Smart and Sustainable Cities of Universidade Nove de Julho – UNINOVE, as a partial requirement to obtaining the Master's degree in Smart and Sustainable Cities.

Supervisor: Prof. Tatiana Tucunduva Philippi Cortese, Dr.

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by

Jairo Filho Sousa de Almeida

Dissertation presented to the Graduate Program in Smart and Sustainable Cities of Universidade Nove de Julho – UNINOVE, as a partial requirement to obtaining the Master's degree in Smart and Sustainable Cities, being the Examining Board composed by:

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“It is worse, much worse, than you think. The slowness of climate change is a fairy tale, perhaps as pernicious as the one that says it isn’t happening at all, and comes to us bundled with several others in an anthology of comforting delusions: that global warming is an Arctic saga, unfolding remotely; that it is strictly a matter of sea level and coastlines, not an enveloping crisis sparing no place and leaving no life undeformed; that it is a crisis of the “natural” world, not the human one; that those two are distinct, and that we live today somehow outside or beyond or at the very least defended against nature, not inescapably within and literally overwhelmed by it; that wealth can be a shield against the ravages of warming; that the burning of fossil fuels is the price of continued economic growth; that growth, and the technology it produces, will allow us to engineer our way out of environmental disaster; that there is any analogue to the scale or scope of this threat, in the long span of human history, that might give us confidence in staring it down.”

The Uninhabitable Earth - Life after warming

(Wallace-Wells, 2019)

ABSTRACT

Disasters have become one of the main problems in different parts of the world, affecting thousands of people directly or indirectly, making them homeless, missing, injured and dead, causing destruction wherever they are happening, and causing social and economic destruction that leads to billions in losses annually, making the creation and implementation of disaster mitigation and resilience policies a fundamental agenda in the context of urban planning. Like other sciences, urban planning accumulates precision and resources based on scientific academic research advances. This research aims to understand how current academic research on urban planning addresses disasters, catastrophes and calamities. The systematic literature review methodology was used to answer this research question, guided by the PRISMA protocol and using explicit inclusion and exclusion criteria. This research returns 301 papers on urban planning related to disasters, and the results were grouped according to the disaster category. The research gathered guidelines on how urban planning can reduce disaster risks and create adaptation and resilience mechanisms. The results led to the discussion of related issues, such as climate justice and the accelerated urbanization phenomenon, which appear to aggravate an increase in disasters.

Keywords: disasters, urban planning, resilient cities, disaster prevention, urbanism, climate justice.

RESUMO

Os desastres se tornaram um dos principais problemas em diversas partes do mundo, eles afetam milhares de pessoas de forma direta ou indireta, deixando-as desabrigadas, desaparecidas, feridas e mortas, causam destruições por onde passam, gerando prejuízos sociais e econômicos que totalizam perdas bilionárias anualmente, tornando a criação e implantação de políticas de mitigação e resiliência de desastres uma pauta fundamental no contexto do planejamento urbano. Assim como outras ciências o planejamento urbano ganha precisão e recursos ao passo que a pesquisa científica acadêmica sobre a temática avança. Essa pesquisa surge com o objetivo de compreender como a pesquisa acadêmica científica sobre o planejamento urbano discute os desastres, catástrofes e calamidades. Para responder essa pergunta de pesquisa foi utilizado a metodologia de revisão sistemática da literatura, guiada pelo protocolo PRISMA, utilizando critérios de inclusão e exclusão explícitos, foram selecionados 301 artigos sobre planejamento urbano que dentro desse contexto discutisse desastres, os resultados foram agrupados de acordo com a categoria dos desastres. A pesquisa agrupou diretrizes de como o planejamento urbano é capaz de reduzir os riscos de desastres, criar mecanismos de adaptação e resiliência. Os resultados direcionaram para discussão de assuntos correlatos como a justiça climática e o fenômeno acelerado da urbanização, que surgem como vetores de aumento de desastres.

Palavras-chave: desastres, planejamento urbano, cidades resilientes, prevenção de desastres, urbanismo, justiça climática.

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LIST OF ABBREVIATIONS AND ACRONYMS

COP - Conference of the Parties (a.k.a. United Nations Climate Change Conference).
CRED - Centre for Research on the Epidemiology of Disasters.
DRR - Disaster Risk Reduction.
IPCC - Intergovernmental Panel on Climate Change.
PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses.
UN - United Nations.
WMO - World Meteorological Organization.

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1 INTRODUCTION

1.1 Contextualization

Earth's atmosphere composition makes up a complex system capable of regulating factors such as climate, hydrological cycle and heat retention, among other elements. Nevertheless, this system has cyclical characteristics, showing slow natural transformations, like the occurrence of ice ages that happen every 150 million years. The last ice age occurred more than 2.5 million years ago, in the Quaternary Period, during which the average global temperature was 7ºC. The current average global temperature is 15ºC, an increase of approximately 8ºC in more than 2.5 million years (Bradley, 1999; IPCC, 2022).

This natural flow of climate change has been accelerated in recent years, since the beginning of the Anthropocene era, a period that begins around the 18th century. The pace of industrial production and human activities has caused a large amount of greenhouse gases to be released into the atmosphere (Crutzen, 2006). This release comes from different sources, but they are all associated with the lifestyle and human production that emit 31% of greenhouse gases in factories, 27% in electricity production, 19% in vegetable cultivation and animal husbandry, 16% in the transport sector, and 7% in heating and cooling systems (Gates, 2021).

One of the main problems related to the increase in the concentration of greenhouse gases in the atmosphere is the accelerated global warming. Researchers from the Intergovernmental Panel on Climate Change (IPCC) informed that Earth has already warmed by 1.1ºC in the Anthropocene era. The researchers also argued that such warming was caused by human activity and is directly associated with the increase in frequency and intensity of extreme weather events throughout the world (IPCC, 2022).

Disasters caused by extreme weather events and biological hazards are already happening, and humanity is experiencing the devastating impacts of these events. Reports from the Centre for Research on the Epidemiology of Disasters (CRED) point out that, in the 2001-2020 period, extreme weather events caused an average of 347 disasters per year, resulting in the death of

61,212 people annually, causing a financial loss of US$ 153.8 billion per year, while in 2021 the numbers were US$ 252.1 billion in losses and 10,492 deaths (CRED, 2022).

Human interference in global warming is not a new topic for discussion. As climate science research advances, humanity starts to better understand the links between the elements that constitute the climate. Discovered in 1640, carbon dioxide was associated with greenhouse effect in 1824 (Ball, 2005). After these discoveries, research advanced significantly. In 1896 there were the first projections about the relation between global warming and an increase in the emission of greenhouse gases (Arrhenius, 1896).

Along with the projections of climate change and the advancement of climate science, global discussions generated climate protocols and agreements capable of mitigating the increase in average global temperature. Kyoto Protocol (Böhringer, 2003), the first agreement to stipulate a metric for reduction of greenhouse gas emissions, was followed 18 years later by the Paris Protocol, establishing sustainable limits for global warming (Christoff, 2016).

Despite the creation of protocols and agreements to mitigate climate change, emissions continue at an accelerated pace, and it is expected that the average temperature will rise in the coming years, also increasing the occurrence of extreme weather events and related disasters, risking billions of lives across the planet (Huber & Gulledge, 2011).

Although extreme weather events occur on all continents, some regions are more susceptible and vulnerable to disasters than others. Among many factors, we can list altitude, distance from the coast, tropic, population density, socioeconomic factors, etc. (Cavalcanti, 2016). Disaster risk reduction is associated with the creation and implementation of adaptation and climate resilience policies, responsibility assigned to urban planning and public managers, who must develop guidelines to minimize disaster risks (Duarte, 2009; Vicuña et al., 2022; Yu et al., 2021).

Such increase in the frequency and intensity of extreme weather events also raises the risk of disasters, making it necessary to create and implement urban planning policies capable of adding climate adaptation and resilience to cities (Cremen et al., 2022; Vicuña et al., 2022).

1.2 Research problem

Urban planning emerges in history as a tool capable of guiding the development of a city through its needs and limitations, leading it to sustainable socioeconomic development. In addition, urban planning has also become responsible for creating tools for adaptation and resilience to climate change, reducing disaster risks (Duarte, 2009).

Since the beginning of climate science, the importance of research and scientific production has become evident as a way of advancing the discussion and protocols created based on empirical scientific discoveries. This method exists since the discovery of carbon dioxide in 1640, until the elaboration of the last IPCC reports, which are produced only with scientific academic knowledge.

Urban planning arises as an instrument that requires constant updating, covering regional social changes and climate change, ensuring not only policies capable of reducing disaster risks, but also reducing inequalities, ensuring climate justice.

Considering that urban planning emerges as a tool capable of lowering disaster risks through the creation of policies and guidelines for adaptation and climate resilience, a question arises: “How does academic research in urban planning address the issue of disasters?”. This question will orientate whether research in urban planning suggests urban planning as a disaster risk reduction tool and how it happens.

1.3 Goals

1.3.1. General objective

To analyze how urban planning can reduce the impacts of a disaster.

1.3.2. Specific objectives

a) Quantify the most cited categories of climate disasters in academic studies in urban planning, according to Disaster Category

Classification and Peril Terminology for Operational Purposes, by Centre for Research on the Epidemiology of Disasters (CRED);

b) Compare the number of published studies with the number of reported disasters;
c) Identify adaptation and resilience actions for each type of disaster;
d) Assess how the phenomenon of urbanization affects research on climate disasters in urban planning.

1.4 Study delimitation

Urban planning is a regulatory instrument for the public administration of countries, states and municipalities. Although its creation considers scientific publications, the urban plan is often prepared based on laws, decrees and other government documents that were not considered in this study, as well as news, interviews, event summaries, or any other material, except scientific articles. Therefore, the present work will answer the research question considering only the academic view of the study of disasters through urban planning.

1.5 Relevance and justification

The justification for this work is given by the importance of urban planning for the socioeconomic development of cities, being also one of the main instruments for creating disaster risk reduction strategies in the context of climate change. To comprehend how scientific research contributes to the development of disaster understanding in urban planning generates knowledge about which are the most portrayed disasters in that area, as well as the motivations for carrying out the study and the main considerations of academic research in urban planning in each disaster category.

In addition to providing an overview of which factors correlate research on disasters and urban planning, this study can guide the creation of research agendas presenting the themes that could not be answered and that demand more research on the subject. The social vulnerabilities that influence the increase in disaster risk will also be listed.

2 THEORETICAL FRAMEWORK

2.1 History of climate science

One of the important facts in the beginning of studies on climate change within science occurred in 1640, when the Belgian alchemist Jan Baptist Van Helmont discovered carbon dioxide (Ball, 2005). More than a century after the discovery, the French Joseph Black developed a detection method that became known as the first instrument to detect CO_2 in the atmosphere. Black's principles were perfected and are still used today as a method of detecting carbon dioxide in the air (Gulzar et al., 2020).

Helmont and Black studies did not make any association between carbon dioxide and global temperature. This knowledge only came to light in 1824, when Jean-Baptiste-Joseph-Fourier proposed a model in which the gaseous composition of the atmosphere played a regulatory role in temperature. The model proposed by Fourier described the greenhouse effect (Fourier, 1827). Approximately three decades after Fourier's publication, scientist Eunice Foote presented the first empirical evidence on the effect of carbon dioxide on global warming (Foote, 1856).

Foote's results were enhanced in 1872 by the physicist John Tyndall, who created an experiment capable of identifying the heat absorption capacity of carbon dioxide, hydrogen, nitrous oxide, water vapor, among other substances. This experiment showed that some gases have the physical property of retaining heat, while others do not (Tyndall, 1872). In 1879 the physicist Jožef Stefan presented the first mathematical model capable of calculating the power of a heated object, pointing out that the power is proportional to the fourth power of its temperature (in Kelvin), a formula known as the Stefan-Boltzmann Law (Stefan et al., 1879).

Stefan's Law was used in 1896 by the chemist Svante Arrhenius to calculate the impact on Earth's temperature in case there is an increase in the concentration of carbon dioxide in the atmosphere. In a paper published in the Journal of Science, Arrhenius presented a model where the average temperature of the planet would rise approximately 5ºC if the atmospheric concentration of CO_2 doubled (considering the amount of carbon in the atmosphere at the time of the study) (Arrhenius, 1896).

Along with Arrhenius' discovery, which was not as accurate as the current studies, global warming denial also emerged. In 1900 the physicist Knut Ångström criticized indicators used by Arrhenius, hypothesizing that CO2 contribution to the increase in atmospheric warming was negligible, claiming there was a saturation in global warming (Crawford, 1997).

Contrasting with Ångström's theories, in 1938 the Canadian engineer Guy Callendar carried out an empirical study where he manually tabulated data collected by weather stations around the world since 1880. His study concluded that greenhouse gases emitted by human actions caused an average increase of 0.003ºC per year (an indicator based on the concentration of pollutants emitted in the studied period). This was one of the main warnings about the relationship between the increase in CO2 in the atmosphere and global warming (Callendar, 1938).

Another relevant indicator for climate science emerged in 1955, when the chemist Hans Suess identified that the proportion of isotopes of carbon dioxide molecules found in the atmosphere indicated that a large part of these molecules were released through the burning of fossil fuels, warning about the impact of these emissions in accelerating global warming (Suess, 1965).

Arrhenius' theories were refined in 1956 by the physicist Gilbert Pass, who pointed out that the average global temperature would rise by 3.6°C if the concentration of carbon dioxide in the atmosphere at the time of the study doubled. Gilbert also concluded that industrial human activity was the largest source of CO2 emissions, surpassing emissions from volcanic activities (Plass, 1956).

Although the existence of a self-regulation mechanism on planet Earth, the homeostasis of this system can be broken if the emission level of greenhouse gases exceeds the absorption capacity. Roger Revelle (1957) reported that human activity was returning to the atmosphere and to the oceans an amount of organic carbon higher than their absorption capacity, causing allostasis in the climate system (REVELLE & SUESS, 1957).

After these discoveries, climate science advanced significantly. In 1960 the first meteorological satellite was launched. In the same decade paleoclimatology advanced in the studies of ice cores and ocean sediments. A study developed by Manabe and Wetherald indicated, with high confidence, that the average global temperature would increase by 2.36ºC if the concentration of carbon dioxide in the atmosphere doubled (Manabe & Wetherald, 1967).

Considering climate research progress and computational power improvement, more accurate studies emerged, such as the model created by James Hansen, who analyzed the global climate in a three-dimensional way and developed projections about the course of global warming. Hansen presented his results to the North American Congress in 1988, empirically demonstrating the causes of global warming and that these indicators were already present (Hansen et al., 1988).

In the same year that James presented his results to the United States Congress, the Intergovernmental Panel on Climate Change (IPCC) was created by the United Nations (UN), with the aim of bringing together groups of researchers to organize studies on climate science and identify the scientific discoveries achieved so far (IPCC, 2010).

The creation of the IPCC was a major advance in the fight for climate mitigation and resilience. The panel was divided into 3 working groups focused on studies of physical climate change (WG1); investigation of impacts, adaptation and vulnerabilities (WG2); and, finally, climate change mitigation research (WG3). The three groups consisted of volunteer researchers from different parts of the world, ensuring diversity (Cortese & Natalini, 2014).

In 1999 the climatologist Michel E. Mann presented the results of his research, pointing to a slow cooling tendency on Earth’s average temperature between the year 1000 and the beginning of the 19th century. The researcher also indicated the existence of a global warming throughout the 19th century. These results were obtained through the analysis of tree rings, whose thermal changes impact their formation (Mann et al., 1999).

2.2 Climate agreements

The previous chapter showed that climate science presents empirical information on the causes and effects of climate change. However, along with climate science emerged movements, agreements and agendas to mitigate climate change and create adaptation and resilience guidelines, reducing the risk of disasters. The second United Nations Conference on Environment and Development, ECO-92, took place in the city of Rio de Janeiro, Brazil, in 1992, establishing one of the first global pacts to reduce emissions (Novaes, 1992).

In 1997, 5 years after ECO-92, was held the third Conference of the Parties (COP)— (a.k.a. United Nations Climate Change Conference—, where the Kyoto Protocol was signed, whose main objective was to establish goals to contain the emission of greenhouse gases, mainly in developed countries. The agreement was signed by 175 countries, assuring the achievement of the initial goals between 2008 and 2012, and reaching an 18% reduction in the emission levels registered in 1990 between 2013 and 2020 (Böhringer, 2003).

The discussions about lowering the emission levels continued. In 2007 the COP-13 took place, where the Bali Roadmap was defined, providing suggestions for the successor of the Kyoto Protocol (Christoff, 2008). Debate on the Bali Roadmap continued during COP-15, which resulted in the Copenhagen Agreement. The main objective of this agreement was the creation of goals to follow the recommendations of the fourth IPCC report, that emphasized the importance of keeping the increase in the average global temperature below 2ºC (Christoff, 2010; Fisher, 2010).

Nevertheless, setting goals does not guarantee results if the protocols are not followed. This topic was heavily discussed in 2010, during COP-16, in Cancun, Mexico, where some countries, such as Japan, Canada and Russia, announced that they would not participate in the second stage of the Kyoto Protocol with ambitious goals, suggesting a discussion about the need to create a new protocol with new goals (Freestone, 2010).

In 2012 the COP-18 was held in Doha, Qatar. The objective of this conference was to establish the continuity of the Kyoto Protocol, starting its second phase, with steps to reduce greenhouse gases. The continuity of the protocol also maintained the annual collection of US$ 10 billion for the reduction of climate disasters in developing countries (Lee et al., 2012; Suarez et al., 2013).

3 years after the start of the second phase of the Kyoto Protocol, the Paris Agreement, signed in 2015, emerged at COP21, with the main objective of keeping global warming below 2ºC, limiting it to 1.5ºC, compared to the pre-industrial revolution period. To achieve this goal, the agreement stipulated a 50%

reduction in emissions by 2030, reaching neutrality by the end of the 21st century (Christoff, 2016; Lal, 2016).

In 2015, the United Nations (UN) published 17 objectives for sustainable development, establishing not only environmental goals but also goals for sustainable socioeconomic development, aiming the reduction of inequalities. The 17 objectives were detailed in 169 goals that must be met by 2030 (Hák et al., 2016; SDG, 2019).

Despite all the efforts to create goals and guidelines for mitigating climate change, the number of disasters reported in the last 30 years (figure 1) suggests a growth pattern in the number of reported disasters, which indicates that the cities need additional mechanisms to climate agreements for disaster risk reduction (CRED, 2022).

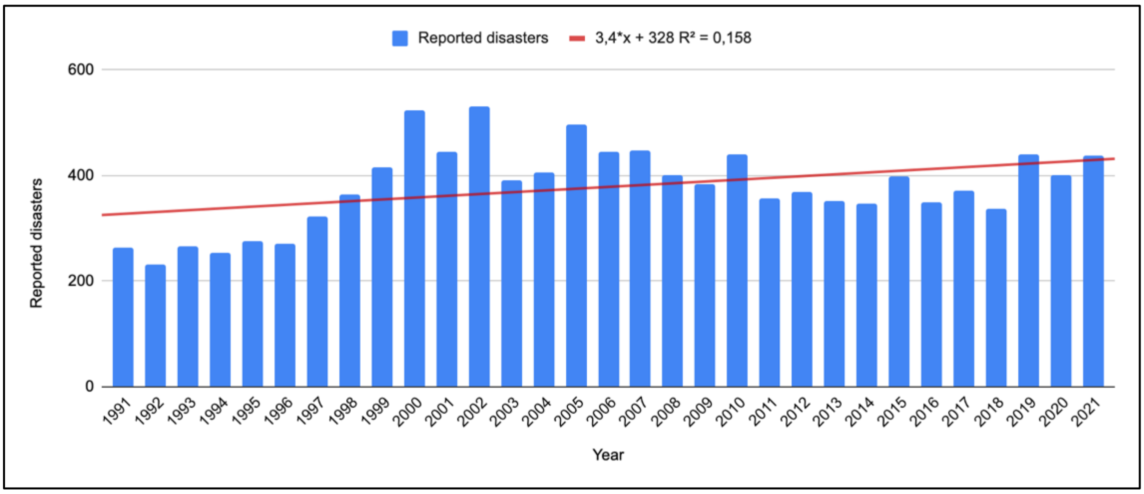

Figure 1 - Number of reported disasters per year and growth trend, derived from (CRED, 2022).

2.3 Anthropocene, climate change and extreme weather events

Paleoclimatology, a science that studies climate variations throughout Earth's history, determined that several times the planet has undergone drastic changes in climate. During the Quaternary period, about 2.5 million years ago, Earth faced a glacial era, when the average global temperature was around 7ºC. This temperature currently remains around 15ºC, indicating an increase of approximately 8ºC in more than 2.5 million years (Bradley, 1999; IPCC, 2022).

The Anthropocene period started around the 18th century along with the Industrial Revolution. It is characterized by evidence of significant impacts of human activities on global ecosystems, causing changes in climate. Compared to the period before the Anthropocene, the average global temperature has already increased by 1.1ºC, according to 2021 records. It is expected that this increase will reach 1.5ºC by 2026, considering the level of current greenhouse gas emissions (Crutzen, 2006; IPCC, 2022; Ruddiman, 2013).

This accelerated warming also causes an increase in extreme weather events, which are events with frequency and intensity out of the expected for a region in a given period. Usually, the climate of a region is defined by temperature variation and amount of rain and winds over the time. The World Meteorological Organization (WMO) determines that such definition must consider at least 30 years of data (Cortese & Natalini, 2014).

These extreme weather events are often related to disasters, especially when they occur in regions without climate adaptation and resilience mechanisms, damaging life, the economy and the environment (Lubchenco & Karl, 2012; Stott et al., 2016). Although climate changes happen all over the planet, the occurrence of disasters caused by climatic and biological events has an irregular distribution between continents, as presented in figure 2 (CRED, 2022).

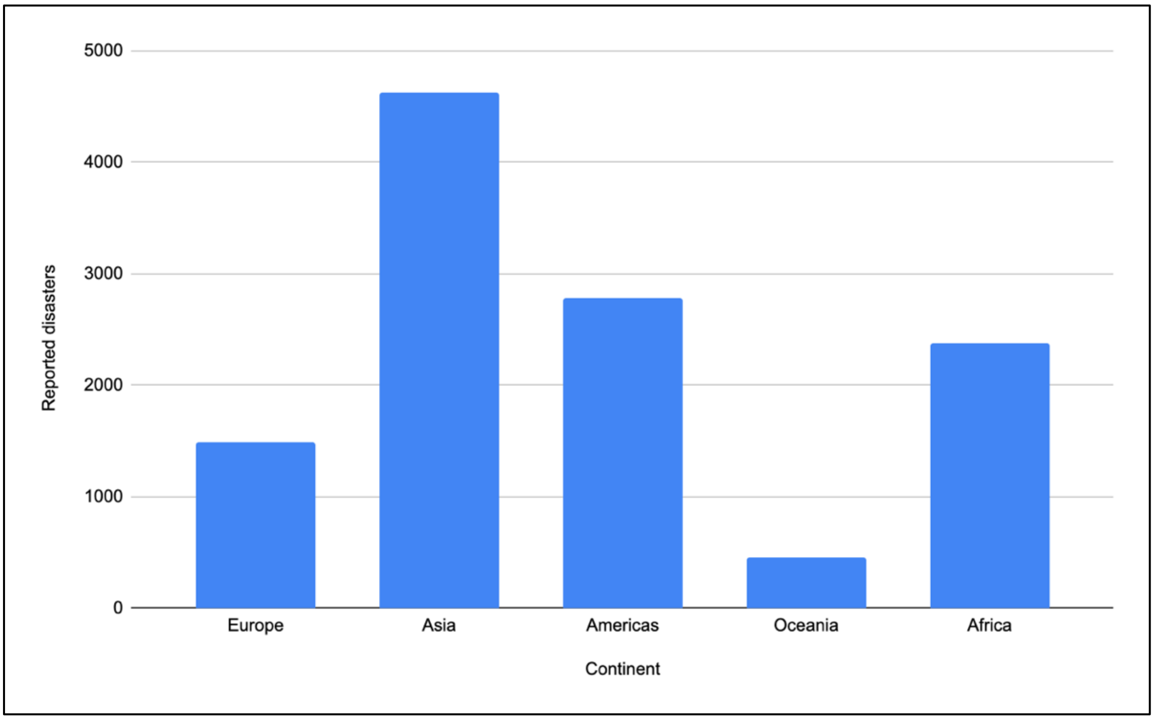

Figure 2 - Geographical distribution of reported disasters in the last 30 years (1991-2021), derived from (CRED, 2022).

Several factors influence the climate of a region, such as geographic location, altitude, distance between the tropics, in addition to the climatic seasons (Cavalcanti, 2016). Although these factors create natural hazards, disasters caused by climatic and biological events are considered unnatural disasters. The degree of devastation is often associated with a lack of adaptation and resilience policies and planning, responsibilities assigned to urban planning and public managers. The relationship between urban planning and disasters is discussed in the “Results and Discussion” section of this work.

2.4 Urban planning

Urban planning emerges as a tool capable of guiding the social and economic development of a region in a safe and sustainable way, ensuring good practices in land use and scaling the local population density (dos Santos Monteiro, 2018; Duarte, 2009). The first records of territorial planning appeared in prehistory, with the end of the Paleolithic era (10,000 BC), a period in which hunting animals and gathering food for consumption fed less than 4 people per square kilometer (Mumford, 1961).

Confronted by this scenario, in order to guarantee the survival of humanity, a movement known as the agricultural revolution (9,500 - 8,500 BC) started, when *Homo Sapiens* began to divide tasks and demarcate the use of land for growing food and raising animals for consumption (Harari, 2013). Many urban elements emerged in prehistory. Nomads built walls for a better territorial division and stairs to facilitate locomotion to higher regions, and even rudimentary forms of sewage system began to appear in the Neolithic era (Mumford, 1961).

These elements led villages based on agriculture to become cities with economic, political and social elements, a movement known as Gordon Childe's first urban transformation (Childe, 1950). These and other urban advances allowed the emergence of the cities that exist today.

> “The city of today is the cumulative result of all other cities from before, transformed, destroyed, rebuilt, produced by the social transformations that have taken place over time, engendered by the relationships that promote these transformations” (Encarnação, 1989).

These transformations not only change cities, but also the way they are planned and managed, giving new meaning to urban planning, which now deals with urban mobility, preservation of natural resources, health, education, and climate change, no longer being a structure restricted to real estate design (Duarte, 2009).

The creation of urban planning arises from the critical analysis of a region, considering the reality of space and the social interactions that occur in it. After this analysis, urban planning must implement an adaptation or a change for local improvement. This proposal must be based on reality and can be done without harming society (Duarte, 2009).

The development of a comprehensive urban planning requires the participation of a multidisciplinary team, considering aspects of sociology, economics, geography, engineering, law, administration, public management, and society, without limiting the discussion to a group. Ensuring the engagement of all stakeholders involved is essential for creating an urban planning aimed at reducing inequalities (Dewey, 1995; Duarte, 2009).

In addition to guiding the development of cities, urban planning emerges as a tool to ensure the resilience and adaptation of cities to climate change, creating mechanisms to reduce the risk of disasters (Borie et al., 2019; dos Santos Monteiro, 2018). The “Results and Discussions” section of this work discusses how current urban planning research addresses climatic and biological disasters.

3 METHODOLOGY

To answer the research question “How does current research in urban planning address climate disasters?”, the systematic literature review (SLR) methodology was adopted, a method capable of providing answers based on relevant scientific evidence (Tranfield et al., 2003) following explicit pre-defined inclusion and exclusion criteria. This method is able to select studies in a non-biased way for decision making and reaching conclusions (Higgins et al., 2019).

The methodology utilized in this work was divided into 3 steps, according to the model proposed by (Cortese et al., 2022)and (Yigitcanlar et al., 2019):

- Research objective planning, research question and creation of study eligibility criteria (chapter 3.1);
- Systematic literature review conduction (chapter 3.2);
- Description of results and discussion (chapter 4).

In order to assure replicability of this study, the PRISMA protocol (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) was used to guide and document all steps of the systematic literature review. The descriptive checklist of the methodology is in Appendix A (Page et al., 2021).

3.1 Systematic literature review planning

At this phase, the systematic literature review planning is carried out, which begins with the identification of the research objective, an essential element for the elaboration of the research question (Thomas et al., 2019). As described in section 2, climate science has been providing the population with reliable information about climate change and its impacts. We have also seen the creation of climate agendas for mitigation and resilience to disasters, catastrophes and calamities, aiming to identify how academic research in urban planning addresses such issues.

With the research objective defined, the research question was elaborated: "How does current research in urban planning address climate disasters?". At this point, it was determined that all studies related to "urban planning" and containing at least one of the words “disasters”, “catastrophes” or “calamities” in the title, abstract or even in the keywords should be considered for the initial sample composition. The words “calamities” and “catastrophes” were considered synonymous with “disasters”, used to increase the scope of the study.

The initial sample composition included studies from the Web of Science and Scopus databases, as they are the two databases with the most indexed journals on the subject addressed. In this study, no time interval was defined, thus all published studies until the date of collection were considered (Martín-Martín et al., 2018). For data collection in Scopus and Web of Science, the following search expressions were used:

Indexing Database	Query
Scopus	TITLE-ABS-KEY(("urban planning") AND ("disaster" OR "catastrophe" OR "calamity"))
Web of Science	TS=(("urban planning") AND ("disaster" OR "catastrophe" OR "calamity"))

Table 1 - Search expressions.

The collected materials were grouped for the initial sample composition (DS-01), which contains 2,644 documents (589 from Web of Science and 2,055 from Scopus). Before starting the analysis and classification of the materials, all materials written in a language other than English were excluded from the sample, generating the DS-02 sample, as well as all materials that were not scientific articles, such as books, book chapters, theses etc. (sample DS-03). The removals listed above were made using the filtering tools from the Web of Science and Scopus databases.

The DS-03 sample was submitted to a bibliometric analysis with the Bibliometrix 4.0.0 tool in R, to ensure an unbiased result. Before the analysis, duplicate documents were removed. At this stage, 362 duplicate studies were removed. A new sample containing only unique articles in English from the two databases was generated (DS-4). From this sample, bibliometric graphics were produced, allowing its validation, presenting an overview of the topics covered, and evidencing the connection with the research question [58]. The detailed results of the bibliometric analysis and the source code written by the author is available in Appendix B.

Before starting the systematic review of the literature, the inclusion and exclusion criteria were established, following the methodology proposed by (Costa et al., 2022)and (Liao et al., 2017):

I/E	Criteria	Criteria explanation
Exclusion	Search engine reason (SER)	SER: A paper has only its title, abstract, and keywords in English but not its full-text.
	Without full-text (WF)	WF: A paper without full text to be assessed.
	Non-related (NR)	NR-1: A paper is not an academic article. For example, editorial materials, conference reviews, contents, or forewords.
		NR-2: Retrated paper.
		NR-3: Definition of vulnerability, catastrophes, disasters and calamities are not associated with urban planning or does not mention urban planning.
	Loosely related (LR)	LR-1: Other kinds of disasters. For example, terrorism, social disasters.
		LR-2: Urban planning, disaster, catastrophe or calamity is only used in keywords and/or references.
	Partially related (PR)	PR-1: Disaster, catastrophe or calamity is only used as a cited expression.
Inclusion	Closely related (CR)	CR: Disaster, catastrophe or calamity is the one of several objects that to be reviewed, surveyed, or discussed in the context of urban planning.

Table 2 - Inclusion and exclusion criteria.

3.2 Systematic literature review conduction

After building the initial sample and defining the inclusion and exclusion criteria, 1,039 documents in the DS-4 sample were analyzed. The first analysis carried out aimed of separating the articles with information in urban planning in the context of disasters caused by climatic events. To ensure the quality of the results, avoiding bias, the following analysis criteria were established (Thomas et al., 2019):

- The paper should explicitly use the concept of “urban planning”, considering the synonyms usually found in related academic articles and books: “town planning”, “city planning”, “planning theory” (Taylor, 1998).
- Some disasters were considered caused by extreme weather events, such as geophysical, meteorological, hydrological, climatological, and biological disasters, as described in Disaster Category Classification

and Peril Terminology for Operational Purposes, excluding any other type of disaster, such as terrorist attacks (CRED, 2009).

After this classification, a new sample was generated with the studies classified as "closely related", following the criteria described above. These studies were classified according to the category and type of disaster (CRED, 2009). The table with the articles from the DS-5 sample is in Appendix B; the flow of execution of the systematic literature review is illustrated in image 1 (Page et al., 2021); and the results of this survey and the discussion of the results are in section 4 of this document.

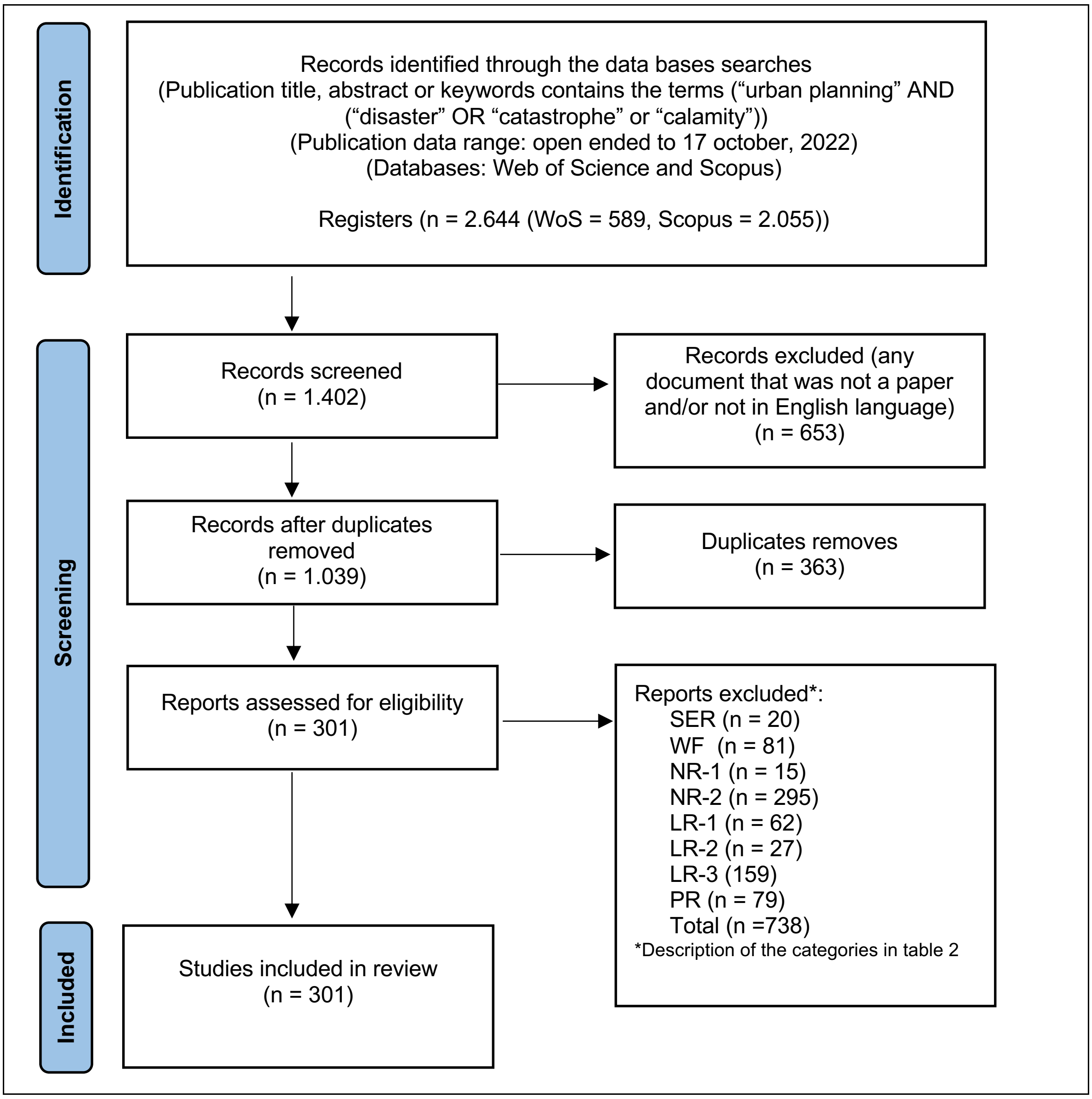

Figure X – ADD A CAPTION HERE

For comparison and discussion, the results obtained by conducting the systematic review of the literature were compared with data obtained from the database “EM-DAT The International Disaster Database”, made available by the Centre for Research on the Epidemiology of Disasters - CRED. Data collection was performed at public.emdat.be/data using the filters: (Disaster Classification: “Natural”; from 1986 to 2022). The period was chosen based on the date of the first publication found in the sample, 1986, and ended on the current date (October 20, 2022). To avoid partial conclusions regarding the current year, date discussions did not take into account the year 2022 (CRED, 2022).

4 RESULTS AND DISCUSSION

The conduction of the systematic literature review showed that 380 academic studies, collected according to the methodological criteria mentioned in the Methodology section of this work, discussed disasters in the context of urban planning, proving to be a relevant topic with complementary characteristics that will be discussed below.

4.1 General observations

About 95% of academic research on disasters in the context of urban planning has been published in the last 20 years, although the topic has gained prominence recently. Inefficient or non-existent urban planning is related to disasters. The first study of the sample, published in 1986, portrays how cities should be built in order to withstand calamities such as floods, earthquakes and cyclones. The study also brings historical records, like the Cyclone occurred in India in 1864, showing that the responsibility of disaster mitigation and resilience has been attributed to urban planning for a long time (Havlick, 1986).

In 1986, the year in which the sample of this study begins, 169 disasters caused by extreme weather events were reported. In 2002 this number reached the mark of 532 disasters (CRED, 2022). There was also growth in the number of academic publications on disasters in the context of urban planning, reaching 44 publications in 2021, which represents a growth rate of 4,300%, against a growth rate of 102% in the number of disasters (comparing growth between 1986 and 2021 for both cases).

For this purpose, only finished years were considered, so the data for the current year (2022) were not considered. The arithmetic variation rate was made considering the following variation calculation, where Δ_r means the arithmetic variation, Q_0 indicates the initial value (number of publications and events occurred in 1986) and Q_n represents the final value of the sample (number of publications and events occurred in 2021). To reach the percentage value, the value was multiplied by 100. The calculation performed by the author is available in Appendix X (Oliveira 2017).

$$\Delta_r = \left(\frac{Q_n}{Q_0} - 1\right) * 100$$

There is a great disparity between the growth rates of publications on disasters in the context of urban planning and the number of reported disasters. Despite this disparity, it is clear that both are growing, as shown in Figure 3, which illustrates the accumulated growth between 1986 and 2021 in the number of publications and reported disasters.

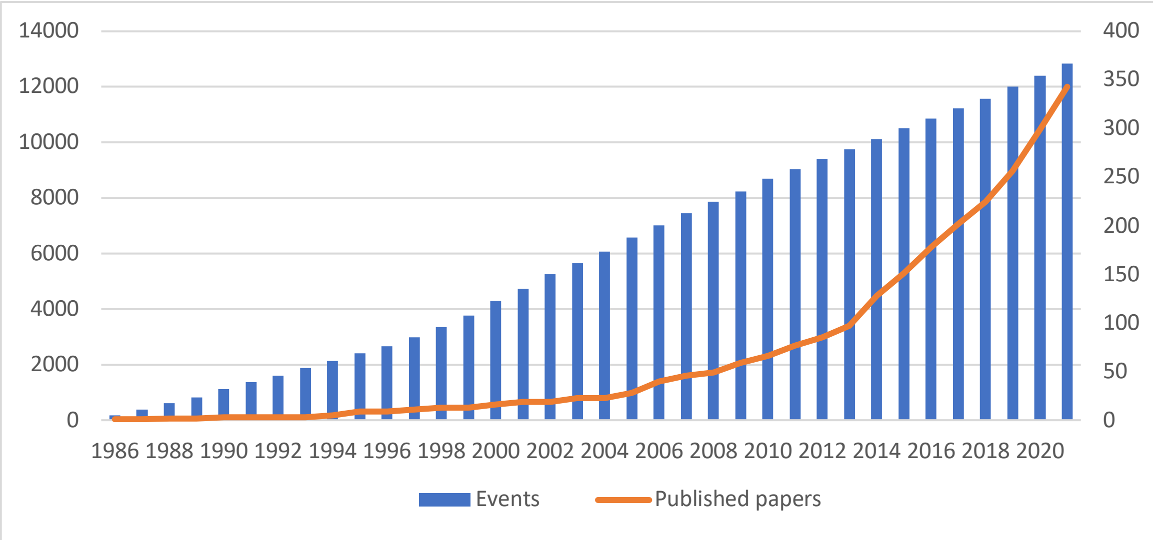

Figure 3 - Occurred events and published works by year, derived from author and (CRED, 2022).

4.2 Geospatial observations

Although climate disasters affect all living beings on the planet, directly or indirectly, the geographical distribution of disasters does not occur homogeneously (Wallace-Wells, 2019). During the conduction of the Systematic Literature Review, a geographic disparity was found in the number of publications by country. This indicator was constructed considering the affiliation of the first author (Aria & Cuccurullo, 2017).

The analysis of publications by country showed that China was in first place, reaching 54 published papers, representing 14% of the total sample, followed by the United States, with 52 publications. Italy and the United Kingdom had 8% and 7% respectively. The number of studies from these two regions together exceeds the amount of works published by the United States, which occupies the first place in number of publications. The geographical distribution of publications is indicated in figure 4.

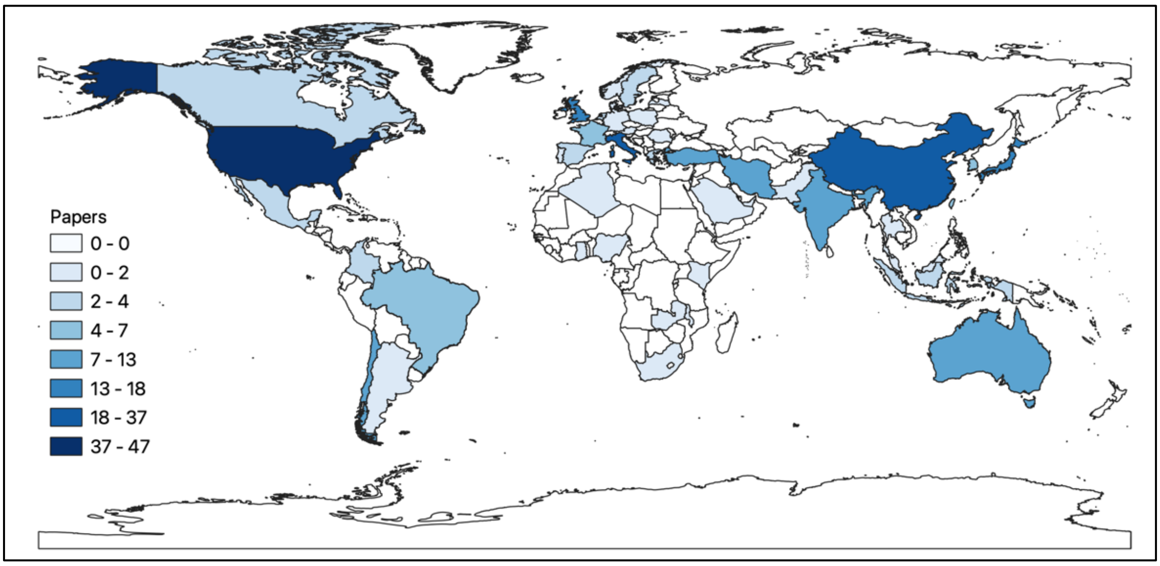

Figure 4 - The geographical distribution of publications.

A comparative grouping between the disasters reported by CRED from 1986 to 2021, along with the number of publications in the sample grouped by continent, made it possible to analyze the amount of research produced, the number of reported disasters, deaths, affected and homeless people, and economic damage accumulated by continent over these years (CRED, 2022). According to table 3:

Continent	Publications	Reported Disasters	Deaths	Affected people	Homeless	Damage
Asia	108	2972	739975	5330051241	93656219	$ 144.391.241,00
Americas	77	1768	35332	223513283	4384449	$ 614.203.730,00
Europe	79	1079	117036	19800118	435796	$ 116.324.534,00
Oceania	13	239	1337	16900695	33310	$ 45.076.800,00
Africa	21	637	53481	174462831	2120532	$ 1.118.800,00
N/A	5	-	-	-	-	-
Total	301	6695	947161	5764728168	100630306	$ 921.115.105,00

Table 3 - Disasters and damages, derived from author and (CRED, 2022).

The analysis indicated that the Asian continent accumulated the largest number of reported disasters, homeless people and deaths. This was also the continent that most developed research on disasters in the context of urban planning. Another characteristic feature of Asia was that economic damage caused by disasters in the continent represented only 15.6% of the global losses suffered in the period, which indicates that the extent of financial damage is not proportional to the number of published works. This pattern also occurred on the

European continent, which concentrates 28% of the research and only 12% of the economic losses in the period (CRED, 2022).

4.3 Disasters, catastrophes and calamities

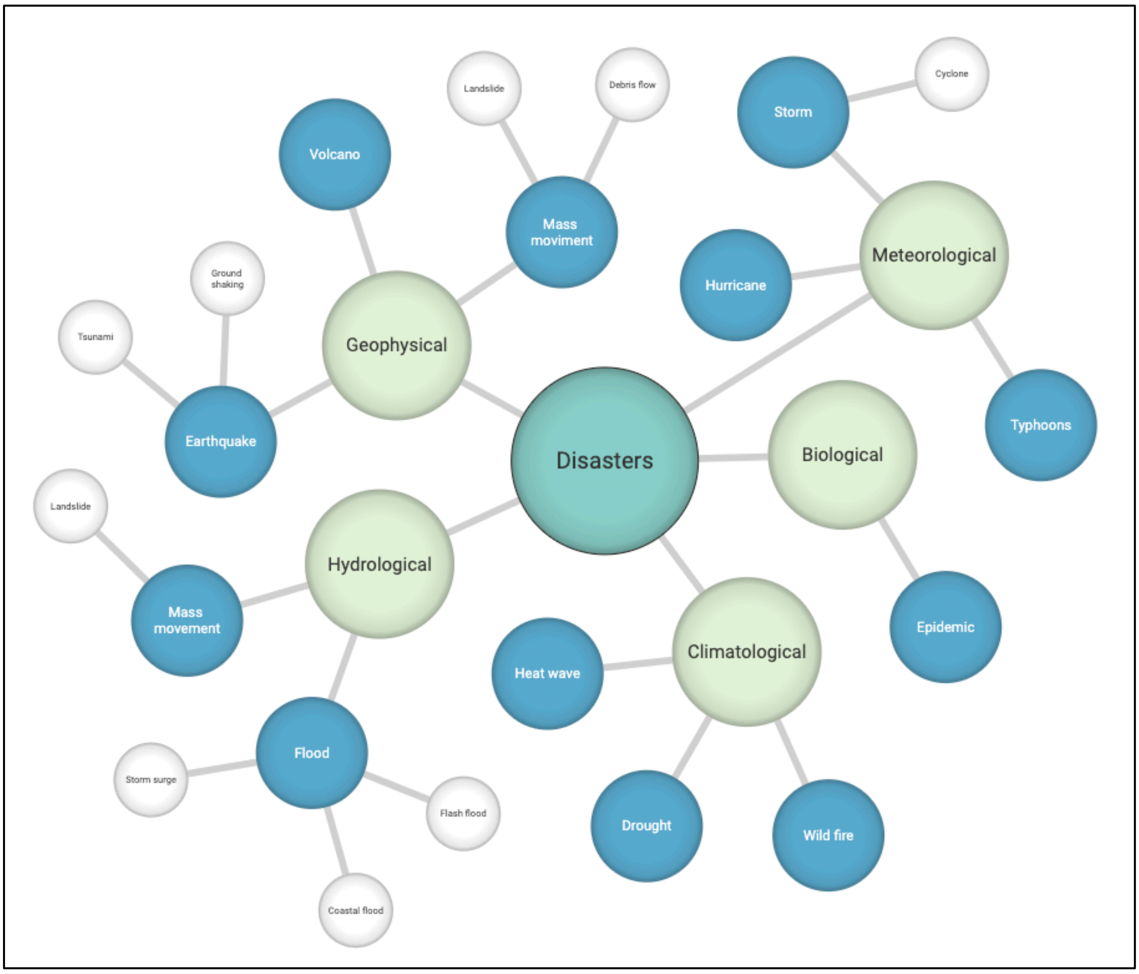

Figure 5 - Disasters categorization, derived by (CRED, 2009).

Storms, earthquakes, tsunamis and other events are natural hazards that cannot be controlled, but the disasters caused by these events can be reduced through efficient risk management (Sharma & Priya, 2001).

4.3.1 Hydrological disasters

A storm can last a few hours, but the disasters caused by a storm can take years to repair, in some cases even being irreparable (Gates, 2021). Weather events occur all over the planet, but some regions have social, economic and geographic vulnerabilities that make them more susceptible to disasters (Jacobs, 2019).

Hydrological events, such as floods, are among the disasters responsible for more damage and losses around the world. Between 1986 and 2022, hydrological disasters represented 42% of the number of disasters in the period. Considering the high rate of negative impacts, these events are usually prioritized in agreements related to climate agendas (CRED, 2022; Alexander Fekete, 2019).

The analysis of hydrological disasters in the sample showed that during the studied period there were 5,531 hydrological disasters, divided into floods (89%) and wet landslides (11%). These disasters affected 3,406,541,759 people worldwide, directly or indirectly, and caused the death of 269,908 people, leaving 77,197,134 people homeless and generating a total financial loss of US$ 97,851,066.00 during the period (CRED, 2022).

The historical analysis of hydrological events shows heterogeneity in the occurrence of these events, affecting the regions differently in frequency and intensity. China, India and Indonesia are the countries that occupy respectively the first three positions in the ranking of countries with more reported hydrological disasters in the period, followed by the United States, Philippines and Brazil. The map with the geographical distribution of reported disasters is represented in figure 6 (CRED, 2022).

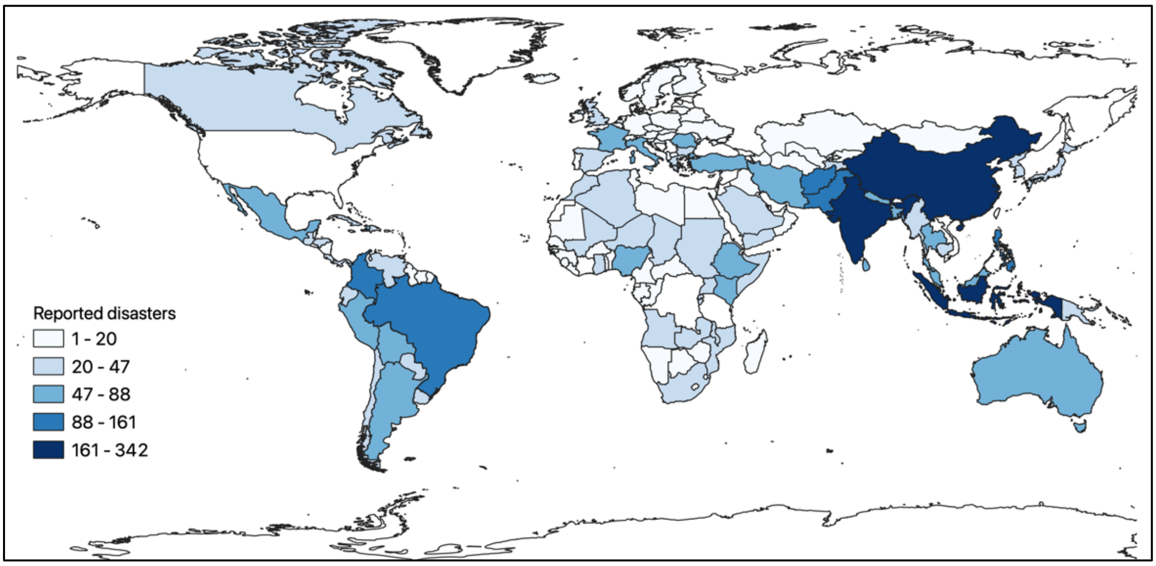

Figure 6 - Geographical distribution of reported hydrological disasters. By author.

The number of disasters caused by extreme weather events has increased over time (Sharma & Priya, 2001). Another factor observed when analyzing the number of hydrological disasters reported was an accumulated growth over the years, as well as an increase in the number of published studies, as shown in figure 7 (CRED, 2022). This growth in the number and intensity of extreme weather events confirms the projections published by the Intergovernmental Panel on Climate Change that global warming is already causing changes in the frequency and intensity of weather events (IPCC, 2022).

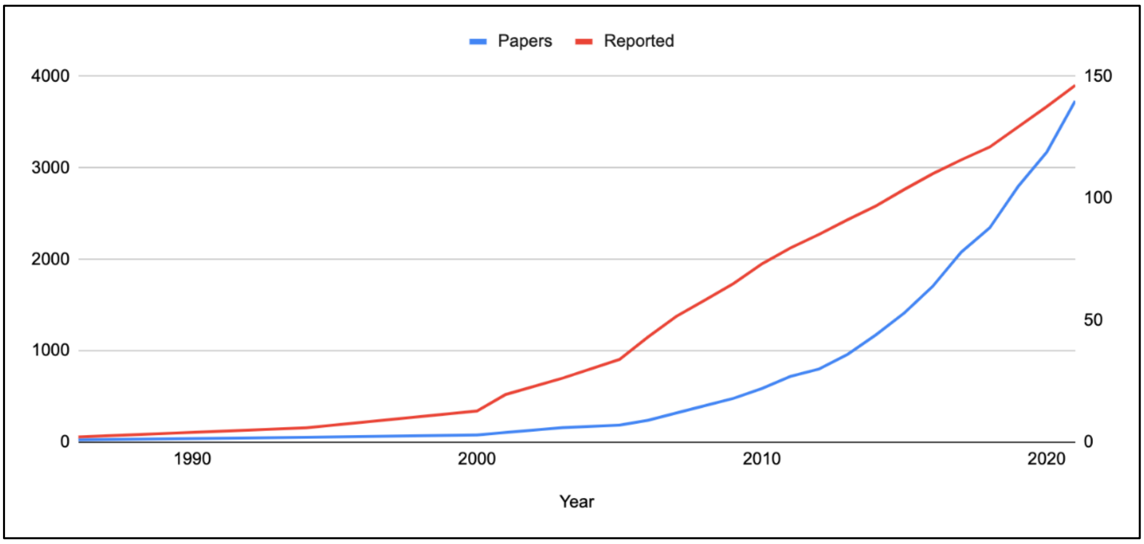

Figure 7 - Accumulated number of hydrological disasters reported and publications. By author and (CRED, 2022).

4.3.1.1 Floods

Changes in frequency and intensity of rainfall test the ability of cities to drain rainwater, but sometimes the amount of rain overloads urban water systems, exceeding the drainage capacity of water, causing floods (Duan et al., 2022). These phenomena do not originate only from the rains; floods can happen through the overflowing of rivers, rise in sea level, in addition to human causes, such as the breaking of dams (Fang et al., 2021).

Regardless of the cause, floods present a real danger to cities, being considered one of the most disastrous events, reaching all continents and wreaking havoc everywhere, affecting agriculture, destroying entire crops, damaging homes and public buildings, and leaving people dead, injured and homeless (Sharma & Priya, 2001). Moreover, floods cause damage to historical cultural heritage, such as historic buildings, statues and monuments, communities, among others (Rosa et al., 2021).

The risks of flooding can be high in different situations. Large metropolises with high population density tend to also concentrate great vulnerability and exposure to disasters, such as floods (Havlick, 1986). Accelerated urbanization is a factor that further increases exposure from population to floods. The association between urbanization process and increase in disaster risk is discussed in the chapter “Urbanization, Migration and Disasters” of this work (Sanderson, 2000). In addition to urbanization, tourism is also responsible for changing the population density of regions (Nguyen et al., 2016).

Not only populations located in risk areas are impacted by floods; these disasters cause financial damage to the affected population and also impact the surrounding economy. Furthermore, other problems related to floods are the interruption in the supply of drinking water, a problem which aggravates the spread of diseases transmitted by inadequate water for human consumption, also favoring the proliferation of disease-transmitting insects such as dengue, zika and malaria (Burby, 2005; Mudenda et al., 2022).

As well as cities with high population density, cities located near coastal regions are more exposed to the dangers of coastal flooding, which usually occurs associated with storm and river floods, the so-called compound floods, which severely affect several regions of the world, such as Australia, USA, UK, and China (Fang et al., 2021). In addition to these compound floods, floods can emerge in relation with other events, such as hurricanes and tsunamis, like the disasters occurred in 2010 in the Gulf of Mexico, where floods intensified the disasters caused by Hurricane Karl (Vázquez-González et al., 2019).

The flood risk index can be calculated considering the danger level of flooding, population exposure to this danger and the social vulnerabilities associated with the studied region. Understanding a region’s risk of disasters is essential for the creation of mitigation, adaptation and resilience policies (Yu et al., 2021). The lack of efficient urban planning, with policies and strategies for mitigation and resilience in case of flooding, greatly increases the damage caused by these disasters, as observed in Port Harcourt, Nigeria, a city whose urban planning does not have policies for disaster risk reduction and is constantly hit by devastating events (Echendu & Georgeou, 2021).

Urban planning has a direct impact on how cities face floods. Therefore, it is necessary to identify and map sensitive areas to flood risks using geolocation data, considering various factors such as distance between rivers and coastal zones, geographic elevation, population density, damage caused by previous disasters, elementary information for creating urban planning with disaster mitigation and resilience policies (Johnson et al., 2022; Thouret & Laforge, 1994; C. F. Wu et al., 2021).

In addition to mapping the risk areas, urban planning must comprehend the urban characteristics of flow, drainage and water storage as a way of understanding the drainage and water flow capacity, without causing floods (Price & Vojinovic, 2008). After understanding the water characteristics of a region, urban planning emerges as a tool capable of creating adequate land use and management policies, avoiding housing in areas susceptible to disasters and building Greenways (Yu et al., 2006). In cases where it is not possible to mitigate the disaster, urban planning must develop mechanisms to guarantee the safety of inhabitants, such as the creation of evacuation routes (Helderop & Grubesic, 2019).

Although mapping is one of the essential tools for the study of risk areas, its elaboration requires the availability of data, which are not always available in the quantity and quality necessary for the creation of maps. In contrast to this limitation, governments and communities have used volunteering crowdsourcing, real-time integrated geolocation data of the population, through social media such as Twitter, to compose accurate data on floods (de Andrade & Szlafsztein, 2015; Kankanamge et al., 2019).

The analysis of past disasters is essential to generate the knowledge needed to deal with floods. However, when analyzing past disasters, it is possible to identify the most affected groups, revealing differences based on classicism, racism and sexism, factors that increase climate injustice. The creation of an effective disaster risk reduction plan must start with the identification of risks and hazards and with the determination of the social factors that cause local vulnerabilities. An in-depth discussion on the subject can be found in the chapter “Urban planning and climate (in)justice” (Thouret & Laforge, 1994; C. F. Wu et al., 2021).

During the systematic literature review, it was observed that methodologies used by the authors can be divided into 3 groups: (a) Study of Case and Simulations, related to an event that occurred or the vulnerability of a specific location; (b) Risk Mapping and Remote Sensing, focused on risk mapping in a specific region or not; (c) Review and Survey, associated with document analysis and interviews. The division of categories is represented in figure 8.

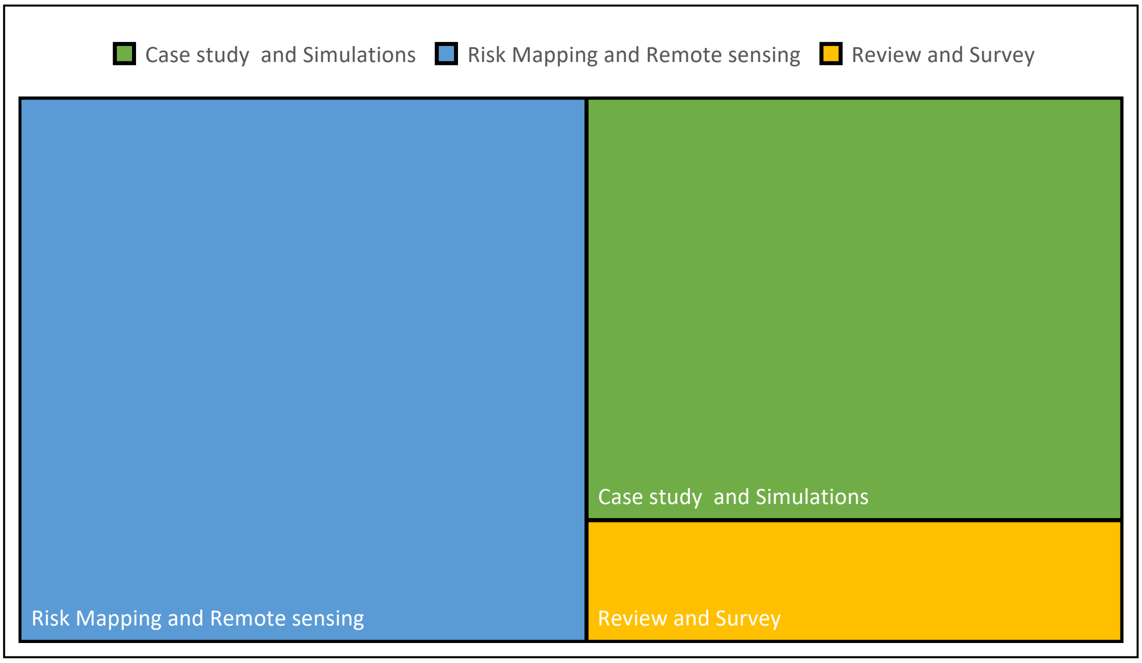

Figure 8 - Distribution of papers about flood by methodology.

The papers were also grouped according to the type of proposal identified: (a) Policy creation in urban planning, when the research recommends or provides data that can be used to create urban planning; (b) Discussion about urban planning, when the research indicates some type of discussion about an already existing urban planning; (c) Changes in urban planning, when the research suggests changes in urban planning. The surveys are grouped in table 4 according to the proposal:

Proposal	**Reference**
Policy creation in urban planning	(Echendu & Georgeou, 2021; Sharma & Priya, 2001; Thouret & Laforge, 1994)
Discussion about urban planning	(Bertilsson et al., 2019; Duy, Chapman, Tight, Thuong, et al., 2018; Echendu, 2021; Guillier, 2017; Johnson et al., 2021; Kang et al., 2009; K. Park et al., 2021; Poretti & De Amicis, 2011; Stamellou et al., 2021; M. Wu et al., 2021; Z. Wu et al., 2021; Şenol Balaban, 2016)
Changes in urban planning	(Abdrabo et al., 2020; Duy, Chapman, Tight, Linh, et al., 2018; Khailani & Perera, 2013; Liu

	& Li, 2017; Moghadas et al., 2019; Mojisola Olanrewaju et al., 2017; Rojas et al., 2017; Sciulli et al., 2015; Shi et al., 2019; Su et al., 2018; C. F. Wu et al., 2021; Yu et al., 2021)
The results can serve for urban planning	(Adikari et al., 2010; Cai & Xu, 2022; Caprario & Finotti, 2019; de Andrade & Szlafsztein, 2015; Duan et al., 2022; Fatemi et al., 2020; Garschagen, 2015; Gilbuena et al., 2013; Harwitasari & van Ast, 2011; Jha & Afreen, 2020; Johnson et al., 2022; Keen et al., 2022; Kumar et al., 2017; Lee et al., 2020; J. Li et al., 2022; Maantay & Maroko, 2009; Mudenda et al., 2022; Munpa et al., 2022; Park & Lee, 2019; Rahmati et al., 2019; Salazar-Briones et al., 2020; Sdao et al., 2011; Shinde, 2017; Song & Li, 2019; Stevens et al., 2010; Sunarharum et al., 2014; Weinstein et al., 2019; Xu et al., 2022)

Table 4 - Proposals for urban planning.

The systematic literature review pointed out that urban planning emerges as an indispensable tool for reducing damage from floods in cities and must be designed for that, creating an efficient plan for disaster prevention, considering not only the risk factors, but also the social vulnerabilities of the population. The advantages of creating a disaster risk reduction plan go beyond the security barrier, also causing economic benefits to the region and improving the overall quality of life (Esnard, 2003; Kang et al., 2009; Thouret & Laforge, 1994; Tüdeş & Yilmaz, 2009).

The research indicated that more than 77% of the papers contained research motivated by previous events, showing that research on floods in the context of urban planning is mostly done to solve already existing problems. In addition, it was noted that 63.12% of the studies were empirical.

4.3.1.2 Landslides

The hydrological landslides have several origins. They usually occur from water infiltration in the soil, which tends to stop when it is not coming from the structure, causing subsidence. In addition to these landslides, hydrological events also cause avalanches, landslides and rockfalls (CRED, 2009; Tao et al., 2022). Regardless of the cause of the mass movement, disasters associated with these events are usually related to construction in risky regions, inappropriate land use and accelerated urbanization (Y. Cui et al., 2019).

Although the sample of landslides caused by hydrological factors in the context of urban planning was relatively short, compared to the sample of floods, it was possible to identify that 100% of the studies in the sample discussed mapping disaster risks through remote sensing methodologies. From these studies, 37.5% had some discussion about urban planning, and the others only mentioned the need for urban planning to create policies to reduce the risk of landslides. The table with the categorization of the studies is found in table 5.

Reference	Methodology	Link with urban planning	Motivation
(Konig et al., 2022)	Risk mapping	Useful for urban planning	Past events
(Tao et al., 2022)	Risk mapping	Useful for urban planning	Past events
(Liu et al., 2021)	Risk mapping	Useful for urban planning	Imminent events
(Acuña et al., 2021)	Risk mapping	Useful for urban planning	Imminent events
(Y. Cui et al., 2019)	Risk mapping	Discussion about urban planning policies	Imminent events
(Sandholz et al., 2018)	Risk mapping	Discussion about urban planning policies	Imminent events
(Chan et al., 2014)	Risk mapping	Discussion about urban planning policies	Imminent events
(Indirli et al., 2011)	Risk mapping	Useful for urban planning	Past events

Table 5 - Categorization of landslides studies.

The mitigation of disasters associated with landslides is an urban planning responsibility and should start with the mapping of risk areas, which must serve as a guideline for the creation of risk reduction policies. In addition to disaster mitigation, urban planning must have strategies capable of ensuring population resilience in case of disasters, such as warnings of landslide risk and the creation of safety and escape points. Inefficient or poorly executed urban planning is a factor that increases the risk of landslide disasters (Chan et al., 2014; Y. Cui et al., 2019; Liu et al., 2021).

4.3.2 Geophysical disasters

During the period studied, geophysical disasters totaled more than $1 trillion in damage to the global economy. They caused 868,696 deaths and made more than 19 million homeless. Between 1986 and November 2022, 34 disasters caused by tsunamis, 922 earthquakes and 181 disasters caused by volcanic activity were reported to CRED (CRED, 2022).

4.3.2.1 Earthquakes and tsunamis

The seismic movement of tectonic plates causes tremors that can be felt on Earth's surface, causing ground shaking. When this movement occurs in coastal areas, tsunamis are formed (Golla et al., 2022; Ntokos & Ntokou, 2020). Within the studied period, from 1986 to 2022, 922 ground shaking geophysical disasters and 34 tsunamis were reported to CRED. China was the country with more reported earthquakes (149), followed by Indonesia (92), Iran (79), Turkey (41), and Japan (33). The distribution of disasters caused by earthquakes is represented in figure 9 (CRED, 2022):

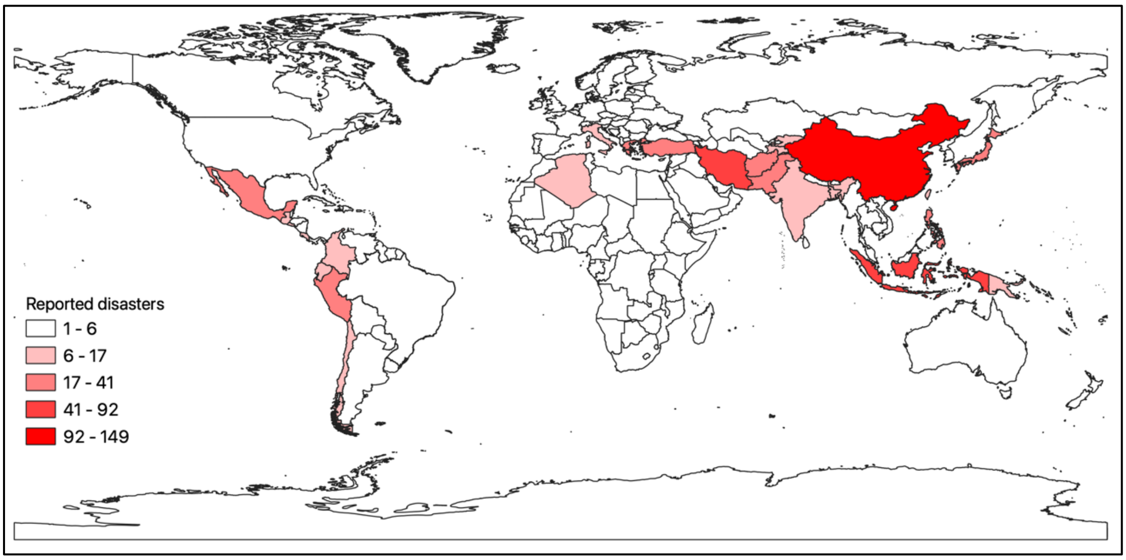

Figure 9 - Geographic distribution of reported earthquakes, derived by (CRED, 2022).

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Among the natural hazards, earthquakes and tsunamis emerge as the most devastating events (Jayakody & Amaratunga, 2021). During the studied period, these events caused 862,837 deaths, affected 151,165,937 people, leaving 19,176,623 homeless. In addition to a disproportionate geographic distribution, the historical analysis of reported disasters shows a disparity in the destruction level of events (figure 10), as represented by the Sichuan earthquake, which affected 45,610,000 people in China in 2008 (CRED, 2022).

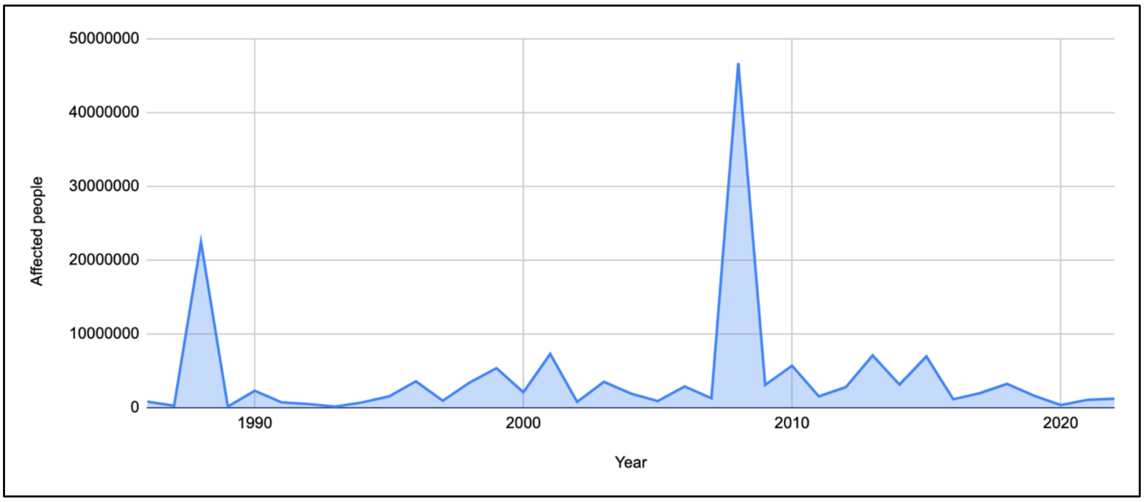


Figure 10 - Number of affected people by year. Derived by (CRED, 2022).

Although it is not possible to avoid the occurrence of earthquakes and tsunamis, urban planning emerges as a tool capable of minimizing the disasters associated with these events (Asadi & Karami, 2020; Zuo et al., 2021), which usually happen due to vulnerabilities in buildings that tend to collapse in case of earthquakes, causing landslides. To be efficient, planning for disaster risk reduction must consider the city's weaknesses and also the vulnerabilities in the construction of buildings, houses, schools, squares, and other public instruments (Bostenaru Dan & Armas, 2015).

The development and execution of a disaster risk reduction plan must be done by a multidisciplinary team, representing all stakeholders and using accurate data and information about geographic and social conditions (Masri & Moore, 1995). Normally these guidelines are important in urban planning for two reasons: (a) To mitigate imminent risks; (b) To reduce risk exposure based on previous disasters (Félix et al., 2020). During the systematic literature review the papers were classified according to these two categories, which showed that 77% of the studies in the sample were motivated by the occurrence of disasters or past events, while 23% were motivated by the mitigation of imminent events, revealing that urban planning also emerges as a tool for planning.

Present in 47.8% of the studies in the sample, risk mapping and remote sensing appear as one of the main urban planning tools to identify regions susceptible to the impacts of tectonic activities, mapping disaster risk (Ntokos & Ntokou, 2020). This mapping is an essential tool, because it allows relevant developments to create a disaster risk reduction plan, such as the creation of escape routes, as well as meeting and safety points in cases of earthquakes and tsunamis (Qüense et al., 2022)This mapping, associated with computational resources, allows the creation of simulation models capable of simulating earthquakes by identifying the most vulnerable zones (Cremen et al., 2022; Lu et al., 2020).

Although understanding the physical characteristics of a disaster is extremely relevant for creating accurate mitigation and resilience plans, it is also necessary to consider the social and economic aspects of the region, developing a vulnerability index capable of mapping the highest risk zones (Davidson, 1997). One of the social factors that increase the risk of disasters is the high urban density, a factor that has been driven by the phenomenon of accelerated urbanization in large centers and coastal regions. In order to occur safely, urbanization must create a land use planning, avoiding constructions in risk areas and adapting existing constructions in these areas or relocating them (Lei et al., 2022).

Urban planning is an essential tool to guide the growth and management of cities, being also a means for creating guidelines for disaster risk reduction, promoting adequate land use, population distribution and management of risk areas (Golla et al., 2022). This planning cannot be static, always adapting to urban dynamics, such as urbanization and verticalization of cities (Montejano-Castillo et al., 2020). In addition to ensuring the creation of urban planning, public managers must ensure its execution and updating as a way of reducing disaster risks (Fathollahi et al., 2020).

Building a resilient city requires an urban policy with guidelines for disaster risk reduction (Orhan, 2016; Vona et al., 2016). Although the discussion on disaster risk reduction and urban planning is highlighted in large urban centers, this planning must break urban boundaries and also reach rural areas, ensuring security for the population that inhabits these regions (Kabilijiang et al., 2021).

It is also up to urban planning the creation of post-disaster policies, providing guidelines for restructuring the affected areas, minimizing impacts (Wesener, 2015). Furthermore, analyzing the damages caused by earthquakes allows the development of more efficient policies to face future disasters (Shibata, 2006). Although urban planning appears as a tool capable of mitigating disasters, its implementation and execution depend on other factors, such as human and financial resources, consisting of an obstacle to solve vulnerabilities. Despite these limitations, identifying risks and vulnerabilities is a fundamental planning step for the definition of priorities (McDaniels et al., 2015).

4.3.2.2 Volcanoes

Volcanic cities, famous for tourism, carry with them the risk of destruction caused by volcanic activity. Because they are located in regions of tectonic plate movement, volcanic activities are often associated with other geophysical disasters such as earthquakes. Volcanoes are one of the greatest forces of nature. Despite the fact that these activities cannot be avoided, their destructive power can be confronted with urban planning capable of promoting disaster risk reduction policies (Ariyanti et al., 2020; Bernal et al., 2017).

During the execution of the systematic literature review, only 3 publications discussed volcanoes as a primary event, and one study associated volcanism with earthquakes. Although the sample studies have indicated that the reduction of disaster risks caused by volcanic activities should be addressed by urban planning, it was not possible to group guidelines on the subject.

4.3.2.3 Mass movement

During the conduction of the systematic literature review, there was a small number of studies on landslides in the context of urban planning, whether related to hydrological or geophysical events. In both categories were found only 8 papers on the subject. In the geophysical context, urban planning appears as an instrument capable of aggregating disaster risk reduction policies in cases of landslides, with risk mapping being the most effective way to create assertive policies (Bernal et al., 2017).

During the analysis of the materials, it was observed that only one research discussed how urban planning deals with the risk of landslides. The other papers only mentioned that the methods and conclusions are useful for urban planning, thus not being possible to highlight the role of urban planning in the context of landslides.

Reference	Methodology	Link with urban planning	Motivation
(Zhou et al., 2022)	Risk mapping	Support for planning	Imminent problems
(Modugno et al., 2022)	Risk mapping	Support for planning	Imminent problems
(Marta et al., 2020)	Risk mapping	Useful for urban planning	Past problems
(Hamma & Petrişor, 2018)	Risk mapping	Discussion about urban planning policies	Past problems
(Bernal et al., 2017)	Risk mapping	Useful for urban planning	Past problems
(Lapenna, 2017)	Risk mapping	Useful for urban planning	Imminent problems
(Del Ventisette et al., 2012)	Risk mapping	Useful for urban planning	Past problems

(Indirli et al., 2011)	Risk mapping	Useful for urban planning	Past problems

Table 6 - Categorization of massmoviment studies.

4.3.3 Meteorological disasters

In the period considered in this study, 4,073 meteorological disasters were reported to CRED. These disasters affected 1,176,163,610 people and were responsible for the death of 613,312. In addition, 33,771,039 people were left homeless during the studied period as a result of meteorological disasters. Although these events have occurred on all continents, 27% of the reported disasters were concentrated in just 3 countries: the United States concentrated 563 events, representing 13.82%, followed by China, with 313 reported disasters, and the Philippines, with 258 disasters. The geographical distribution of reported events is shown in figure 11 (CRED, 2022).

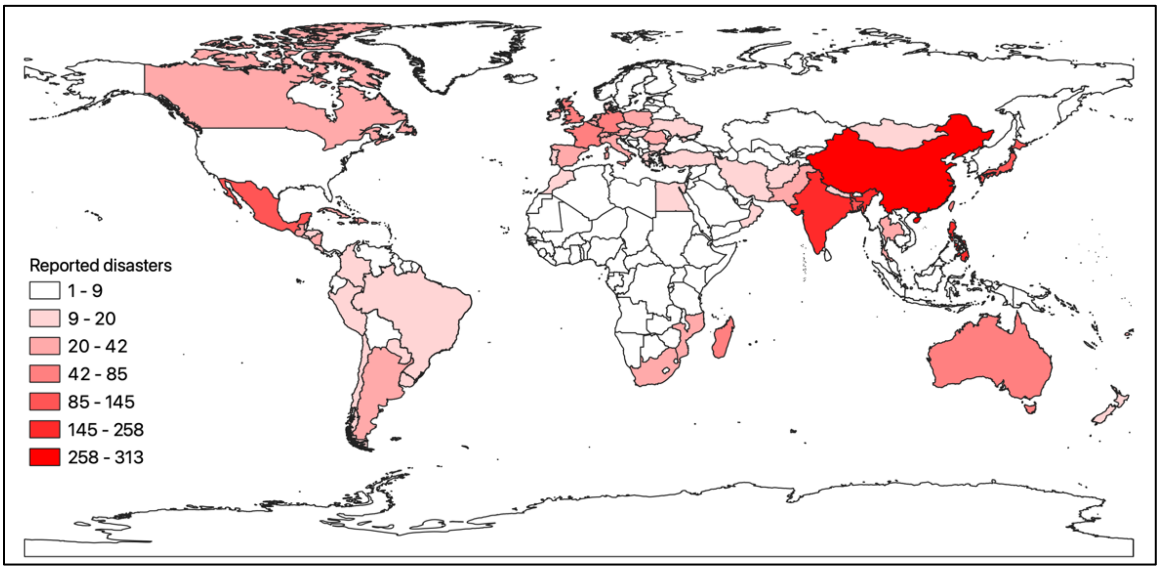


Figure 11 - Geographical distribution of reported events. Derived by (CRED, 2022).

During the systematic literature review, it was noted that 80% of the papers on meteorological disasters in the context of urban planning were related to hurricanes, of which 68.8% were related to Hurricane Katrina, which in August 2005 hit New Orleans, Louisiana, Mississippi and Alabama. Although hurricanes are considered natural hazards, the disasters associated with these events can be minimized through urban planning of susceptible areas for the occurrence of these events, considering past hurricanes as a guideline for the construction of the disaster risk reduction plan (Jouannic et al., 2020).

The creation of cities resilient to disasters caused by hurricanes requires an accurate mapping of the rivers, which should guide the urban planning (Córdoba Azcárate, 2019), together with mapping cities at risk of hurricanes in order to have evacuation plans, with escape routes that can be built through simulations (Williams et al., 2007). Although urban planners have a relevant role in disaster risk reduction, efficient urban planning, aimed at reducing inequalities and climate justice, must be built with community encouragement and participation, considering the dynamics in population density caused by tourism and urbanization (Córdoba Azcárate, 2019; Jacobs, 2019).

4.3.4 Biological disasters

During the systematic literature review, studies that addressed the topic of biological disasters in the context of urban planning were grouped and classified according to the reported disaster. 77% of the papers were related to the context of the COVID-19 pandemic, portraying scenarios in which urban planning faced this problem. The other two studies in the sample also portrayed the confrontation of existing pandemics, with no study in the sample focusing on future biological disasters.

Like other disasters, pandemics cause deaths, economic and social damage all over the world (Wang, 2021). Plans to mitigate and face biological risks must be structured by urban planning through the creation of efficient guidelines for mortality reduction (Wang et al., 2022). The success of a good policy to reduce the risks of biological disasters also requires compliance with the policies stipulated in urban planning by public managers (Shekhar et al., 2022).

For many years, urban planning prioritized the creation of policies to ensure regional socioeconomic development, not considering the reduction of biological disaster risks as a priority, leaving communities and nations exposed to disasters (Chen et al., 2021). The construction of urban planning capable of diminishing the risks of biological disasters must consider the knowledge obtained in previous disasters as a way of identifying regional vulnerabilities (Chen et al., 2021), presenting guidelines for mitigation and resilience (Allam & Jones, 2020) and preventing the collapse of health care systems (Sinha, 2000).

4.3.5 Climatological disasters

When analyzing the disasters reported within the studied period, it was observed that 958 climatological disasters were reported to CRED between 1986 and October 2022, divided into 2 in wild fires, representing 41% of climatological disasters, and droughts representing 59%. The three most affected countries were respectively the United States, China and Australia. The list with the distribution of events by country is available in figure 12 (CRED, 2022).

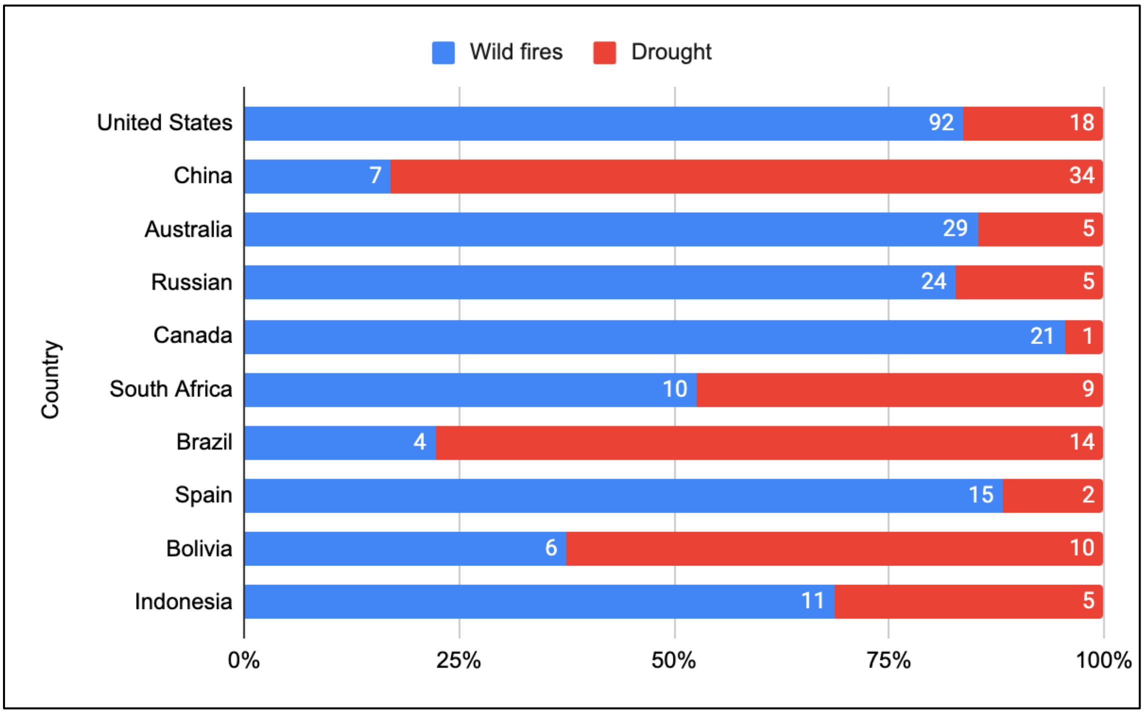


Figure 12 - distribution of events by country.

During the systematic literature review, 1.6% of the papers in the sample were categorized as climatological disasters, with 67% for wildfires and 33% for droughts. Urban planning is an instrument capable of guiding the city to achieve resilience in the event of fires, through the creation of emergency planning (Gonzalez-Mathiesen & March, 2018). In addition to minimizing the risk of fires, urban planning must also develop mechanisms for resilience, such as creating escape routes (Wolshon & Marchive, 2007).

The creation of fire risk reduction strategies requires the participation of urban planning, land use planning (Amoako et al., 2022)which have mapping resources and other firefighting tools at its disposal, such as trucks, hydrant systems and drones, that appear as tools for mapping and fighting fires in skyscrapers and forests, consisting of a valuable option in urban planning to create fire mitigation strategies (Justin Zuopeng Zhang et al., 2021).

Although there were 562 disasters related to desertification within the studied period, there was no paper in the sample that treated desertification as the central disaster of the study. Mentions of desertification as a problem caused by climate change that requires action were found in 4 papers on other disasters, requiring from urban planning the creation of an adaptation and resilience plan (Haruna et al., 2018; Manda, 2014).

4.4 Urbanization, migration and disasters

During the conduction of the systematic literature review, it was found that 52% of the studies in the sample that addressed urbanism as a discussion topic between urban planning and disasters were related to hydrological disasters. 25% of these studies were associated with geophysical disasters such as earthquakes and tsunamis. Both hydrological and geophysical disasters were related to improper land use, a common problem in regions undergoing rapid urbanization (Ahmed et al., 2020).

It was also identified in the sample that 4% of the studies pointed to urbanism as something conducive to the proliferation of infectious diseases. Climatological disasters, such as heat waves and desertification, also represent 4% of the sample. Finally, hurricanes emerged with 2%, and studies that did not specify any disaster had 13%. Detailed results, with disaster categories and publications by year, are illustrated in figure 13.

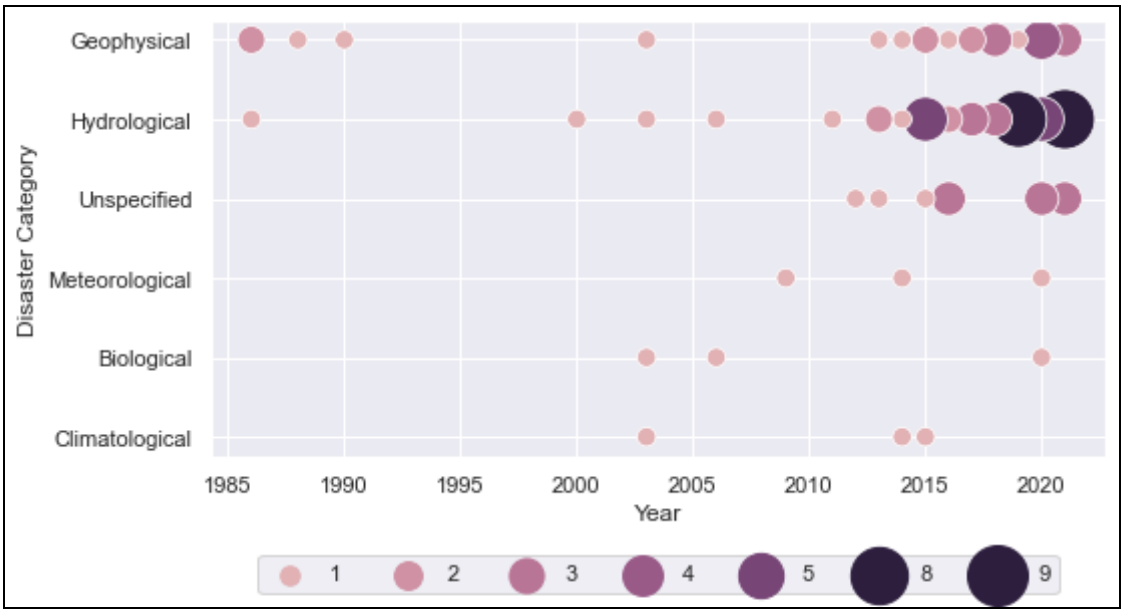


Figure 13 - Distribution of studies in urbanization as a function of time and type of disaster.

A survey presented by UN-Habitat, during the World Urban Forum, that took place in June 2022, in Katowice, Poland, pointed out that by 2050, 68% of the world's population will live in urban areas. This process, in which the population leaves rural areas and moves to urban areas, is known as urbanization (ONU, 2022). Driven by the capitalist economic model, urbanization is often seen as socioeconomic development, which, aligned with industrialization, motivates the migration of the population to industrial poles and large urban centers, where the best opportunities for life and work are usually concentrated (Cheek & Chmutina, 2022; Ríos, 2015).

However, this process is not always associated with progress, as it often occurs in an involuntary way, as a way of guaranteeing survival, driven by wars, climate change and disasters (Asadzadeh et al., 2022). Urbanization without previous planning has historically been associated as one of the factors that increase the risk of disasters in cities (Joshi et al., 2022)leaving the population vulnerable to environmental losses, property destruction and often deaths (Yifei Cui et al., 2019; Kato et al.).

Urbanization causes urban boundaries to be expanded. Reducing forest and environmental areas, this process causes a decrease in rainwater drainage, which increases the risk of flooding (Kong et al., 2021).

Urbanization and climate change are two factors that, when associated, raise the risk of disasters (K. Park et al., 2021)This process also intensifies the frequency and amount of rainfall (Caprario & Finotti, 2019)increasing the risk of floods (Z. Wu et al., 2021). Countries such as China, which have an accelerated urbanization pace, have been facing high exposure to floods in risk areas (Duan et al., 2022)and the risk of hydrological disasters are even greater in coastal areas, leaving the population more vulnerable to natural phenomena coming from the ocean, such as tsunamis and maritime floods (Qüense et al., 2022).

Accelerated and unplanned urbanization causes an increase in population density in certain regions, overloading existing infrastructure (Ahmed et al., 2018). To accommodate this population growth, geological barriers are often breached and areas considered at risk become urban areas with housing. This inappropriate land use raises the risk of landslides in these regions (Y. Cui et al., 2019).

In addition to the risk of hydrological and geophysical disasters, cities facing urbanization and migration are more exposed to biological disasters such as epidemics. Urbanization affects the ability to cope with and control the spread of infectious diseases such as SARS, tuberculosis, influenza, COVID-19, malaria and HIV (Matthew & McDonald, 2006; Shekhar et al., 2022; Spencer et al., 2020).

Urbanization is a global phenomenon. Current projections indicate a high growth that should still occur in the 21st century (M. S. Park et al., 2021). The conduction of the systematic literature review reveals that this phenomenon increases the risk of disasters in a region. Considering urbanization an inevitable process, its occurrence in a sustainable way has become a major challenge for cities (de Andrade Silva et al., 2022), whose urban planning and other public policies must be the bases to guide the urbanization process, preventing the associated problems and reducing the risk of disasters (Echendu & Georgeou, 2021).

Although urbanization is associated with negative aspects, such as congested transport, increased pollution and greenhouse gas emissions, in general the urbanization process is not a bad thing, as long as it occurs in a supervised way, along with economic growth and adequate urban planning. (Dulal, 2019). The present study showed that the elements that add risk to urbanization are: (a) Degradation of the city, forests and changes in land use; (b) Accelerated urbanization process; (c) Urbanization in areas susceptible to risks such as floods. Studies in these three categories are grouped in table 7.

Discussion	Reference
Degradation of the city and forests, changes in land use	(Javed et al., 2022), (J. Li et al., 2022), (Chen et al., 2022), (Jin et al., 2020), (Ahmed et al., 2020), (Martínez et al., 2020), (Vázquez-González et al., 2019), (Young, 2016), (Wamsler & Brink, 2016), (Waggonner et al., 2014), (Yu et al., 2006), (Y. Cui et al., 2019)
The accelerated urbanization process, associated with the effects of climate change, increases the risk of disasters.	(de Andrade Silva et al., 2022), (Cheek & Chmutina, 2022), (Shekhar et al., 2022), (Xu et al., 2022), (Joshi et al., 2022), (Cai & Xu, 2022), (Kabilijiang et al., 2021), (Yu et al., 2021), (C. F. Wu et al., 2021), (Rajput et al., 2021), (Zhou et al., 2021), (Acuña et al., 2021), (Zuo et al., 2021), (Z. Wu et al., 2021), (Imani et al., 2021), (K. Park et al., 2021), (Rivera et al., 2020), (Zhao et al.,

	2020), (Lai et al., 2020), (Pirlone et al., 2020), (Castigliano et al., 2020), (Ntokos & Ntokou, 2020), (Dulal, 2019), (Ahmed et al., 2018), (Hamma & Petrişor, 2018), (Lapenna, 2017), (Meerow, 2017), (Oteng-Ababio, 2016), (Su et al., 2016), (Orhan, 2016), (Sudmeier-Rieux et al., 2015), (Sonmez Saner, 2015), (Garschagen, 2015), (Parthasarathy, 2015), (Youssef et al., 2015), (Liu et al., 2015), (Caló et al., 2015), (Anhorn et al., 2015), (Manda, 2014), (Young, 2013), (Wamsler et al., 2013), (Khailani & Perera, 2013), (Brown et al., 2012), (Harwitasari & van Ast, 2011), (Fields, 2009), (Bahrainy, 2003), (Sanderson, 2000), (Oliver-Smith & Goldman, 1988), (Havlick, 1986), (Jairo Cardenas, 1990), (Ludwig et al., 2020), (Myers et al., 2020), (Asadzadeh et al., 2022)
Urbanization in risk areas increases population exposure to flood risks	(Duan et al., 2022), (J. Li et al., 2022), (Xu et al., 2022), (Qüense et al., 2022), (Yu et al., 2021), (Stamellou et al., 2021), (Echendu & Georgeou, 2021), (M. Wu et al., 2021), (Z. Wu et al., 2021), (K. Park et al., 2021), (Jouannic et al., 2020), (Lai et al., 2020), (Pirlone et al., 2020), (Salazar-Briones et al., 2020), (Rahmati et al., 2019), (Vázquez-González et al., 2019), (Bertilsson et al., 2019), (Vachaud et al., 2019), (Park & Lee, 2019), (Weinstein et al., 2019), (Su et al., 2018), (Duy, Chapman, Tight, Linh, et al., 2018), (Rojas et al.,

	2017), (March, 2016), (Ríos, 2015), (Khailani & Perera, 2013)

Table 7 - Categorization of urbanization studies.

Despite the fact that discussion about urbanization and disasters has grown significantly over time, the systematic literature review showed that this problem has been portrayed for a long time. The earthquake that occurred in Peru in 1970 had much of its damage attributed to the urbanization process that took place in the region without adequate planning (Oliver-Smith & Goldman, 1988). This historical fact adds value to the discussion as it emerges as a guiding reference on how urbanization planning has impacted different places over the years.

Some studies have indicated the need to create urban planning that deals with the operationalization of climatic events, whether managing floods (Park & Lee, 2019) or creating evacuation routes in case of disasters (Zuo et al., 2021). One way to reduce social vulnerability caused by urbanism is by following the UN sustainable development goals and Sendai Framework's (Oteng-Ababio, 2016).

4.5 Urban planning and climate (in)justice

Social vulnerability is measured through a society's ability to resist, recover and adapt in disaster situations arising from natural hazards (Jacobs, 2019). The consequences of climate change can be felt by all living beings, in every corner of the globe. Everyone is impacted, either directly or indirectly (Wallace-Wells, 2019), but the perception of these impacts occurs unequally (Milanez & Fonseca, 2011).

Commonly, social groups are one of the distinguishing factors, as poorer communities tend to be the most exposed to the impacts of climate change compared to other groups which occupy areas with better infrastructure, ensuring resilience and climate adaptation. The lowest social class is also the one that contributes the least to greenhouse gas emissions, evidencing climate injustice (Milanez & Fonseca, 2011).

Far beyond social issues, other factors are directly related to climate (in)justice. In 2005 Hurricane Katrina caused great devastation in Louisiana, Mississippi and Alabama, states on the Southern coast of the United States. Surveys carried out after the disaster indicated that the population that suffered the most from the devastating impacts of this disaster were women, Black people and low-income residents, exposing that climate (in)justice involves racism, classicism and sexism, creating a social hierarchy (Jacobs, 2019).

Climate injustice is not restricted to isolated regions or the Black population. A study developed in the metropolitan area of New York City (Bronx, Brooklyn, Manhattan, Queens, and Staten Island) pointed out a distinction in the level of vulnerability to disasters between the Hispanic, Black and Asian populations, with the second and third groups being the more exposed to the risk of floods (Maantay & Maroko, 2009).

Achieving climate justice requires climate planning and adaptation policies within urban planning, which must take place in a democratic manner, ensuring civil society participation (Chu et al., 2016). Although it is related to urban planning, conducting the systematic literature review showed that only 3% of the papers in the final sample mentioned the subject.

Adapting cities to face climate change requires attention to reducing climate injustice. One way to establish effective policies for climate adaptation is to see the city as a complex system with socioeconomic and geographic vulnerabilities. The model proposed by Ramyar et al. suggests the use of a framework that outlines planning for climate adaptation, serving as a support tool for urban planning considering climate justice (Ramyar et al., 2021).

Urban planning that aims to reduce climate injustices must also understand the relationship between disasters and local vulnerabilities (C. F. Wu et al., 2021). The Black Feminism and Radical Planning movement discusses how racism, classicism and sexism are driving factors of climate injustice (Jacobs, 2019). Data on vulnerabilities and previous disasters are extremely important to identify which places are the most impacted by climate change. This information is able to collaborate in creating urban planning with fair division of resources for infrastructure improvement (Hendricks et al., 2018).

The survey showed that 46% of the studies that addressed the issue of climate justice were associated with floods, 15% were related to hurricanes (specifically Hurricane Katrina), 31% did not refer to any specific type of disaster, and 8% (1 single paper) was associated with epidemics. It was also possible to identify that 38% of the studies that mentioned climate justice also cited urbanization. Therefore, it is possible to conclude that the sample size does not allow determining which are the phenomena responsible for driving the research on climate justice within the context of urban planning, despite relevant empirical notes on the impacts caused by climate injustice in climate disasters.

Year	Proposal	Reference
2022	"Reduce environmental injustice"	(Duan et al., 2022)
2022	"This equity of access is a form of distributional justice and is one of the pillars of environmental justice"	(Anderson et al., 2022)
2021	"Inequality, poverty, exploitation, violence and injustice are at the root of ill-health and the deaths of poor and marginalised people"	(Baum, 2021)
2020	"One of key changes and challenges of urban transitional regions important for planners and policy makers is adequate attention to social justice and inequality"	(Spencer et al., 2020)
2015	"From a disaster-management perspective the integration of low-status but knowledgeable informal sanitation workers into risk reduction and disaster mitigation strategies will simultaneously enhance the quality of disaster governance and address issues of equity and socio-environmental justice"	(Parthasarathy, 2015)
2014	"The environmental justice movement illustrates how race and class still play a crucial role in public decision making."	(Holt, 2014)
2014	"In addition, note that equity and environmental justice should be considered in such projects"	(Steiner, 2014)

Table 8 - Urban planning and climate (in)justice.

The sixth report of the IPCC (Intergovernmental Panel on Climate Changes) empirically evidenced climate injustice, pointing out that the peripheral population is 15 times more likely to die in climate disasters than the rest of the population. Although the discussion of climate injustice is part of urban planning, the sample showed a low concentration of studies that address the described theme, highlighting the need for participatory planning and more comprehensive research (Chu et al., 2016; IPCC, 2022).

5 CONCLUSION

Global warming is happening at such an accelerated pace that paleoclimatology has already declared it to be unprecedented in terms of speed. This warming is responsible for climate change, compromising ecosystems and altering the frequency and intensity of extreme weather events, a factor associated with the occurrence of increasingly devastating disasters, putting the lives of all beings on planet Earth at risk.

Climate science has been struggling for years to understand the factors causing this accelerated global warming, and the results of these researches are discussed at climate summits, government meetings, companies and several other places, in order to find a solution to reduce emissions and mitigate the effects of climate change, through international agreements and protocols with specific goals.

Greenhouse gas emissions derive from various activities, most of them linked to economic and production ventures. Achieving carbon neutrality is still a major challenge. The Kyoto Protocol was the first agreement to curb greenhouse gas emissions. In 2012 20% of the emissions of these gases were reduced in industrialized countries. However, contrary to this movement, global emissions increased by 38%.

This inefficiency in neutralizing greenhouse gas emissions allows global warming continue to grow, also raising the number and intensity of extreme weather events. The danger presented by these events becomes increasingly part of the population's routine. Unfortunately, most of the global population lives in risk areas.

It is not just weather events that cause disasters. Accelerated urbanization is a factor that alters the regional population density, often in an unplanned way, increasing the risk and proportion of disasters. In addition to urbanization, racism, classicism and sexism are factors that amplify the level of exposure of groups to disasters.

Analyzing the data from the studied period, it was possible to identify that 45% of the reported disasters referred to hydrological disasters. This was also the category with the most studies published in the sample, showing that research in urban planning considers the risk of hydrological disasters, attributing to urban planning the function of mapping risk areas, identifying social vulnerabilities and implementing land use policies capable of mitigating the risks of these disasters.

Geophysical disasters are not necessarily associated with extreme weather events, as seen in earthquakes and volcanic activity. However, the resilience of cities facing these disasters can be ensured by creating urban planning with risk reduction policies, mapping risk areas and developing mechanisms to minimize them. Accelerated urbanism emerges as one of the main factors for the risk of geophysical disasters, as it often results in increased population density and irregular land use. In this category, it was observed that academic research in urban planning usually does not research the impacts of volcanic activities.

It was also found that studies on meteorological disasters in the context of urban planning are mostly concentrated on studies about Hurricane Katrina, an event that occurred in 2005 in the United States and was addressed in 68.8% of the sample. Along with the need to map the risks of meteorological disasters, the discussion on climate justice and the importance of considering socioeconomic characteristics in the construction of urban planning also emerged, bringing the community to the center of this discussion.

The COVID-19 pandemic caused the death of over 6.6 million people worldwide, a number greater than the sum of deaths from hydrological and geophysical disasters during the period considered in this study. The sample showed that 77% of the papers on biological disasters were associated with the COVID-19 pandemic, attributing to urban planning and public managers the creation of policies to mitigate the spread of diseases and the development of contingency plans. Although diseases such as dengue and malaria affect several regions, they have not emerged as a research topic in the context of urban planning.

Returning to the context of climate change, the research also analyzed disasters caused by climatological reasons, which were divided into two categories: wild fires and drought. Despite the relevance of the topic for urban planning, only 1.6% of the works were directly related to climatological disasters. The large number of these events and the low amount of research on the subject highlights the need to create a research agenda to address the issue.

Urban planning must be prepared through the analysis of local infrastructure, bringing disaster risk reduction guidelines appropriate to local needs, also considering social issues of the population, ensuring social participation in the elaboration of policies as a way to reduce the inequalities. The academic participation of universities, researchers and research institutes is essential to guide the advancement of climate science and urban planning (Parsons & Thoms, 2018).

During the 27th Conference of the Parties (COP27), the last global event held before the completion of this work, the creation of a fund to compensate for damage caused by extreme weather events, called "loss and damage", was approved as way to repair damages left by inequality (Abnett 2022).

5.1 Study limitations

This study was conducted based on the methodological criteria described in the chapter “Methodological procedures”. The methodology used considered only articles in English, excluding all materials in other languages and in a different format, such as theses, books and news.

Sample construction was based on a search for keywords in the title, abstract and keywords, excluding materials that addressed the theme but did not mention the search words in those sections.

The present study is limited to providing an insight into academic research in urban planning and how it addresses disasters.

5.2 Recommendation for future studies

The author of this study suggests as a future study a comparison between the results obtained in this work and the urban planning carried out by some region, aiming to identify how scientific research converges in urban planning.

APPENDIX A - PRISMA checklist

Section and Topic	Item #	checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	Not used
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	Abstract
INTRODUCTION			
rationale	3	Describe the rationale for the review in the context of existing knowledge.	Existing knowledge
objectives	4	Provide an explicit statement of the objective(s) or question(s) of the review addresses.	Goals
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	Eligibility criteria
information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	Sources
search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Strategy
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	Methods
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	Methods
data items	10th	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (eg for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Methods
	10b	List and defines all other variables for which data were sought (eg participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Methods
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Risk of bias
Effect measures	12	Specify for each outcome the effect measure(s) (eg risk ratio, mean difference) used in the synthesis or presentation of results.	
Synthesis methods	13th	Describe the processes used to decide which studies were eligible for each synthesis (eg tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	Methods
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Methods
	13c	Describe any methods used to tabulate or visually display	Methods

Section and Topic	Item #	checklist item	Location where item is reported
		results of individual studies and syntheses.	
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	Methods
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (eg subgroup analysis, meta-regression).	-
	13f	Describe any sensitivity analyzes conducted to assess robustness of the synthesized results.	-
reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	Bias reduction
certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	-
RESULTS			
Study selection	16th	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Methods
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Methods
Study characteristics	17	Cite each included study and present its characteristics.	Included study
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	-
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (eg confidence/credible interval), ideally using structured tables or plots.	Results
Results of syntheses	20th	For each synthesis, briefly summarize the characteristics and risk of bias among contributing studies.	-
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (eg confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	Results
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	Results
	20d	Present results of all sensitivity analyzes conducted to assess the robustness of the synthesized results.	Results
reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	-
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	-
DISCUSSION			
discussion	23a	Provide a general interpretation of the results in the context of other evidence.	Conclusions
	23b	Discuss any limitations of the evidence included in the review.	Limitations
	23c	Discuss any limitations of the review processes used.	Limitations
	23d	Discuss implications of the results for practice, policy, and future research.	Future
OTHER INFORMATION			
registration and	24th	Provide registration information for the review, including the register name and registration number, or state that the	-

Section and Topic	Item #	checklist item	Location where item is reported
protocol		review was not registered.	
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	-
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	-
competing interests	26	Declare any competing interests of review authors.	-
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytics code; any other materials used in the review.	

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372:n 71. doi : 10.1136/ bmj.n 71

For more information, visit: http://www.prisma-statement.org/

APPENDIX B - Bibliometric analysis

Bibliometric analysis (Web of Science + Scopus)

Scopus data

- **Downloaded in:** 17 October, 22.
- **Source:** www.scopus.com
- **Documents:** 2,055 document results.
- **Aricles in english language:** 1.025
- **Query:** TITLE -ABS-KEY (("urban planning") AND ("disaster" OR "catastrophe" OR "calamity"))

Web of Science data

- **Downloaded in:** 17 October, 22.
- **Source:** https://access.clarivate.com/
- **Documents:** 589 document results.
- **Aricles in english language:** 377
- **Query:** TS =(("urban planning") AND ("disaster" OR "catastrophe" OR "calamity"))

Environment preparation, installation and data upload

```
library ( bibliometric )
library (reshape2)
library (ggplot2)
library ( writexl )



Scopus_file <- ( "~/Desktop/Master/OSF/DS-3/Scopus.csv" )
Wos_file <- c( "~/Desktop/Master/OSF/DS-3/Web of Science.bib " )


database_scopus <- convert2 df( Scopus_file , dbsource = " scopus " ,
format = "csv" )
database_wos <- convert2 df( Wos_file , dbsource = " wos " , format =
" bibtex " )
```

Duplicates remove and export dataframe to CSV

```
database= mergeDbSources ( database_scopus , database_wos , remove.dup
licated = TRUE )
# # 319 duplicated documents have been removed
write.csv( database, "~/Desktop/Master/OSF/DS-3/DS-4.csv" )
```

Data analysis

Bibliometric Analysis and Summary

“It performs a bibliometric analysis of a dataset imported from SCOPUS and Clarivate Analytics Web of Science databases. biblioAnalysis returns an object of class ' bibliometrix '” [1]

```
database_obj <- biblioAnalysis ( database, sep = ";" )

summary( database_obj )
```

```
## MAIN INFORMATION ABOUT DATA

# # Timespan 1975 : 2022
# # Sources (Journals, Books, etc ) 485
# # Documents 1083
# # Annual Growth Rate % 10.22
# # Document Average Age 7.34
# # Average citations per doc 17.77
# # Average citations per year per doc 2,567
# # References 44556

## DOCUMENT TYPES
# # article 1080
# # article ; proceedings paper 3

## DOCUMENT CONTENTS
# # Keywords Plus (ID) 5083
# # Author's Keywords (DE) 3006

## AUTHORS
# # Authors 2883
# # Author Appearances 3532
# # Authors of single-authored docs 212

## AUTHORS COLLABORATION
# # Single -authored docs 227
# # Documents per Author 0.376
# # Co -Authors per Doc 3.26
# # International co-authorships % 1,293


## Annual Scientific Production

# # Year Articles
## 1975 2
## 1977 2
## 1979 1
## 1980 1
## 1984 1
## 1986 3
## 1987 3
## 1988 6
## 1989 3
## 1990 3
## 1991 2
## 1992 2
## 1993 3
## 1994 3
## 1995 13
## 1996 2
## 1997 4
```

```
## 1998 6
## 1999 2
## 2000 10
## 2001 11
## 2002 6
## 2003 12
## 2004 3
## 2005 12
## 2006 25
## 2007 19
## 2008 10
## 2009 24
## 2010 28
## 2011 34
## 2012 29
## 2013 43
## 2014 56
## 2015 57
## 2016 67
## 2017 71
## 2018 64
## 2019 86
## 2020 104
## 2021 142
## 2022 108

## Annual Percentage Growth Rate 8.857772


## Most Productive Authors

## Authors Articles Authors Articles Fractionalized
## 1 ZHANG Y 17 WAMSLER C 6.17
## 2 LI Y 13 [ NO ANA 5.00
## 3 WANG Y 13 LI Y 3.28
## 4 WANG Z 12 ZHANG Y 3.25
## 5 LI X 11 GALDERISI A 3.00
## 6 WAMSLER C 10 WANG Y 2.90
## 7 WANG J 10 MARCH A 2.83
## 8 CHEN Y 9 WANG J 2.77
## 9 CHEN J 8 WANG Z 2.35
## 10 LIU Y 8 PARK K 2.17


## Top manuscripts per citations

## Paper DOI TC TCperYear NTC
## 1 OF SHERBININ A, 2007, ENVIRON URBAN 10.1177/0956247807076725 308 19.2 5.37
## 2 WENG Q, 2001, ENVIRON MANAGE 10.1007/s002670010258 287 13.0 6.12
## 3 HALLEGATTE S, 2011, CLIM CHANGE 10.1007/s10584-010-9978-3 263 21.9 9.06
## 4 DESOUZA KC, 2013, CITIES 10.1016/j.cities.2013.06.003 261 26.1 8.69
## 5 CAMPANELLA TJ, 2006, J AM PLANN ASSOC 10.1080/01944360608976734 256 15.1 4.77
## 6 THIEKEN AH, 2007, HYDROL SCI J 10.1623/hysj.52.5.1016 244 15.2 4.26
## 7 BATHRELLOS GD, 2012, ENVIRON EARTH SCI 10.1007/s12665-011-1263-x 232 21.1 7.99
## 8 BERKE PR, 2006, ANN AM ACAD POLIT SOC SCI 10.1177/0002716205285533 227 13.4 4.23
## 9 VALE LJ, 2014, BUILD RES INF 10.1080/09613218.2014.850602 225 25.0 8.98
## 10 REVI A, 2008, ENVIRON URBAN 10.1177/0956247808089157 221 14.7 4.23


## Corresponding Author's Countries

## Country Articles Freq SCP MCP MCP_Ratio
## 1 CHINA 192 0.2177 190 2 0.0104
## 2 USA 141 0.1599 136 5 0.0355
## 3 ITALY 51 0.0578 48 3 0.0588
## 4 UNITED KINGDOM 45 0.0510 42 3 0.0667
```

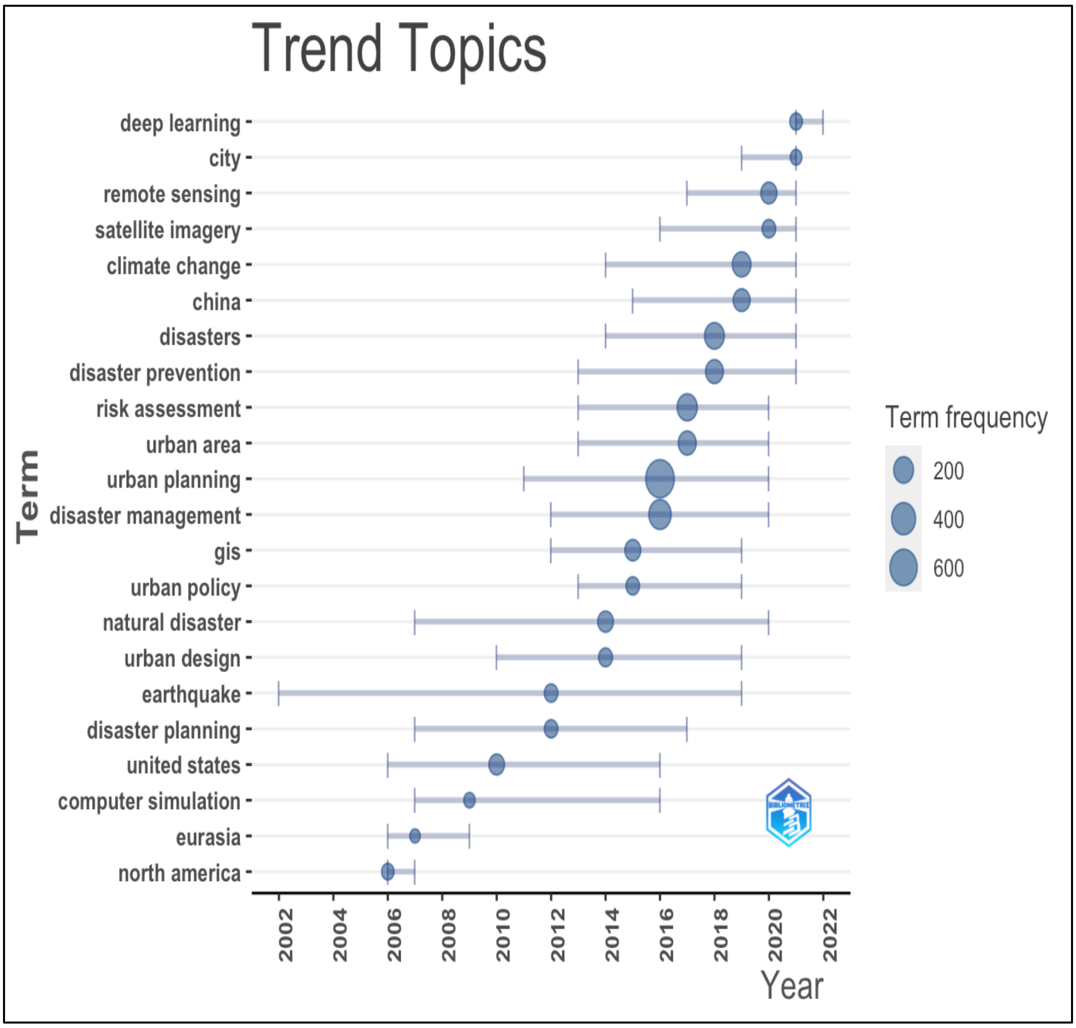
```
## 5 JAPAN 38 0.0431 36 2 0.0526
## 6 AUSTRALIA 37 0.0420 36 1 0.0270
## 7 INDIA 33 0.0374 33 0 0.0000
## 8 TURKEY 30 0.0340 30 0 0.0000
## 9 GERMANY 28 0.0317 25 3 0.1071
## 10 KOREA 27 0.0306 27 0 0.0000

## SCP: Single Country Publications

## MCP: Multiple Country Publications

## Total Citations per Country

## Country Total Citations Average Article Citations
## 1 USA 4763 33.78
## 2 CHINA 2409 12.55
## 3 UNITED KINGDOM 1114 24.76
## 4 GERMANY 817 29.18
## 5 AUSTRALIA 802 21.68
## 6 ITALY 774 15.18
## 7 INDIA 488 14.79
## 8 JAPAN 473 12.45
## 9 SWEDEN 470 47.00
## 10 CANADA 410 29.29

## Most Relevant Sources

## Sources Articles
## 1 SUSTAINABILITY (SWITZERLAND) 32
## 2 REMOTE SENSING 29
## 3 NATURAL HAZARDS 28
## 4 INTERNATIONAL JOURNAL OF DISASTER RISK REDUCTION 24
## 5 ENVIRONMENT AND URBANIZATION 20
## 6 CITIES 19
## 7 SUSTAINABLE CITIES AND SOCIETY 17
## 8 JOURNAL OF URBAN PLANNING AND DEVELOPMENT 16
## 9 INTERNATIONAL JOURNAL OF DISASTER RESILIENCE IN THE BUILT ENVIRONMENT 15
## 10 DISASTER ADVANCES 14

## Most Relevant Keywords

## Author Keywords ( DE) Articles Keywords-Plus (ID) Articles
## 1 URBAN PLANNING 134 URBAN PLANNING 692
## 2 RESILIENCE 72 DISASTER MANAGEMENT 311
## 3 CLIMATE CHANGE 54 RISK ASSESSMENT 216
## 4 GIS 49 DISASTERS 200
## 5 VULNERABILITY 44 CLIMATE CHANGE 161
## 6 DISASTERS 34 URBAN AREA 136
## 7 EARTHQUAKE 31 DISASTER PREVENTION 132
## 8 REMOTE SENSING 30 URBAN DEVELOPMENT 118
## 9 DISASTER MANAGEMENT 28 CHINA 107
## 10 RISK ASSESSMENT 27 VULNERABILITY 102
```

Field Tag distribution by Year - TREND TOPICS

“It calculates the median year for each item of a field tag .”[1]

```
timespan= c( 1999 , 2021 )

res <- fieldByYear (
```

```
data base,
field = "ID" ,
timespan = timespan,
  min.freq = 20 ,
  n.items = 2 ,
graph = TRUE
🇧🇷
```

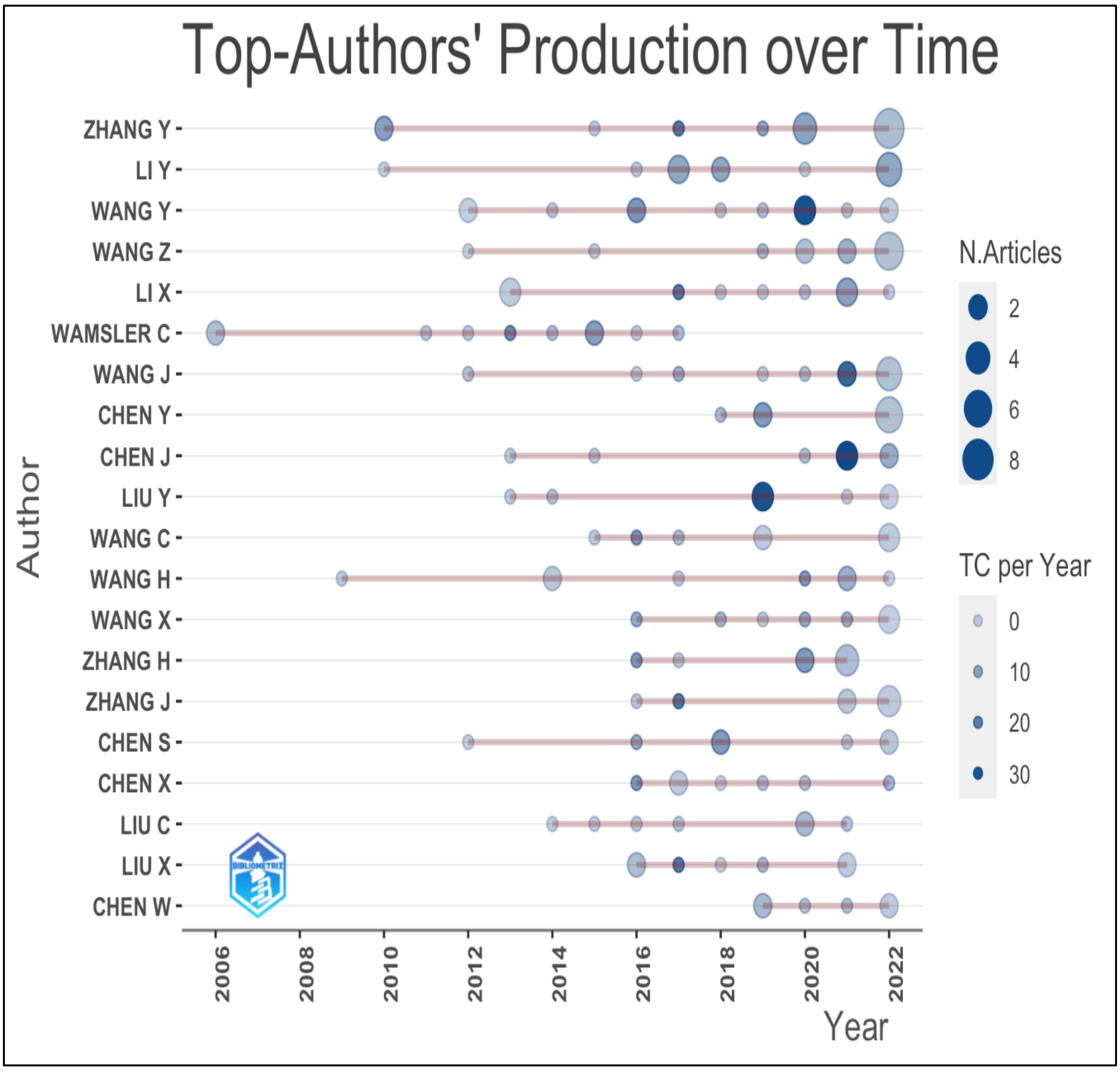


Top- Authors ' productivity over Time

“It calculates and plots the author production (in terms of number of publication) over the time .”[1]

The 30 most published authors:

```
authorProdOverTime ( database, k = 20 , graph = TRUE )
```

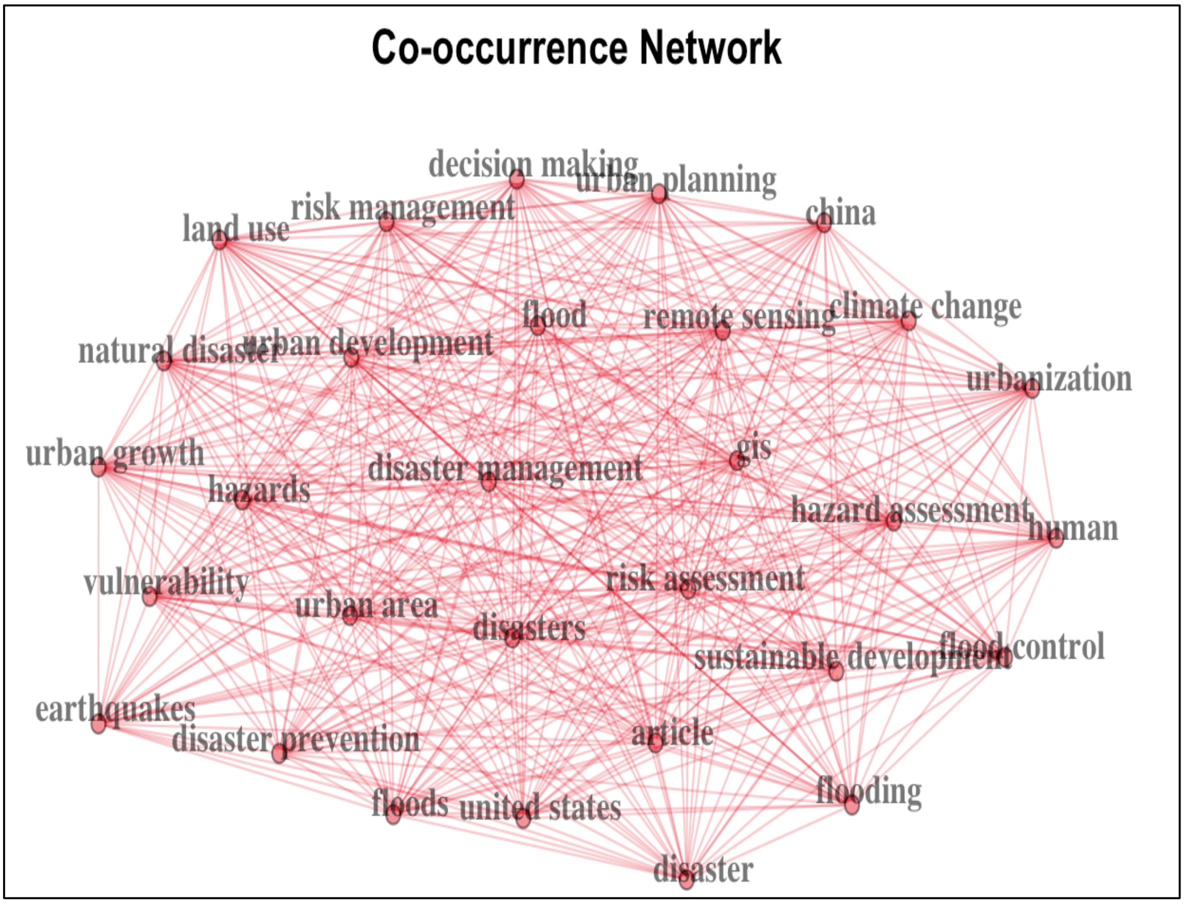


Plotting Co-occurrence networks

“The function networkPlot can plot a bibliographic network previously created by biblioNetwork .” [1]

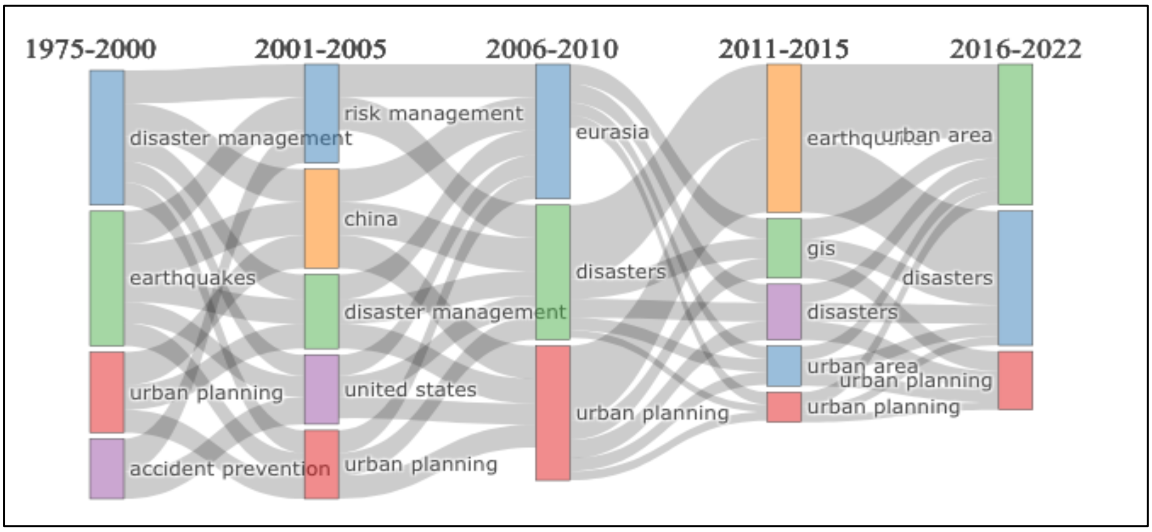
```
NetMatrix <- biblioNetwork (
data base,
analysis = "co-occurrences" ,
network = "keywords" ,
  sep = ";"
🇧🇷


net <- networkPlot (
  NetMatrix ,
n = 30 ,
type = "auto" ,
```

```
Title = "Co-occurrence Network" ,
  labelsize = 1
🇧🇷
```



Plotting bibliometric analysis results

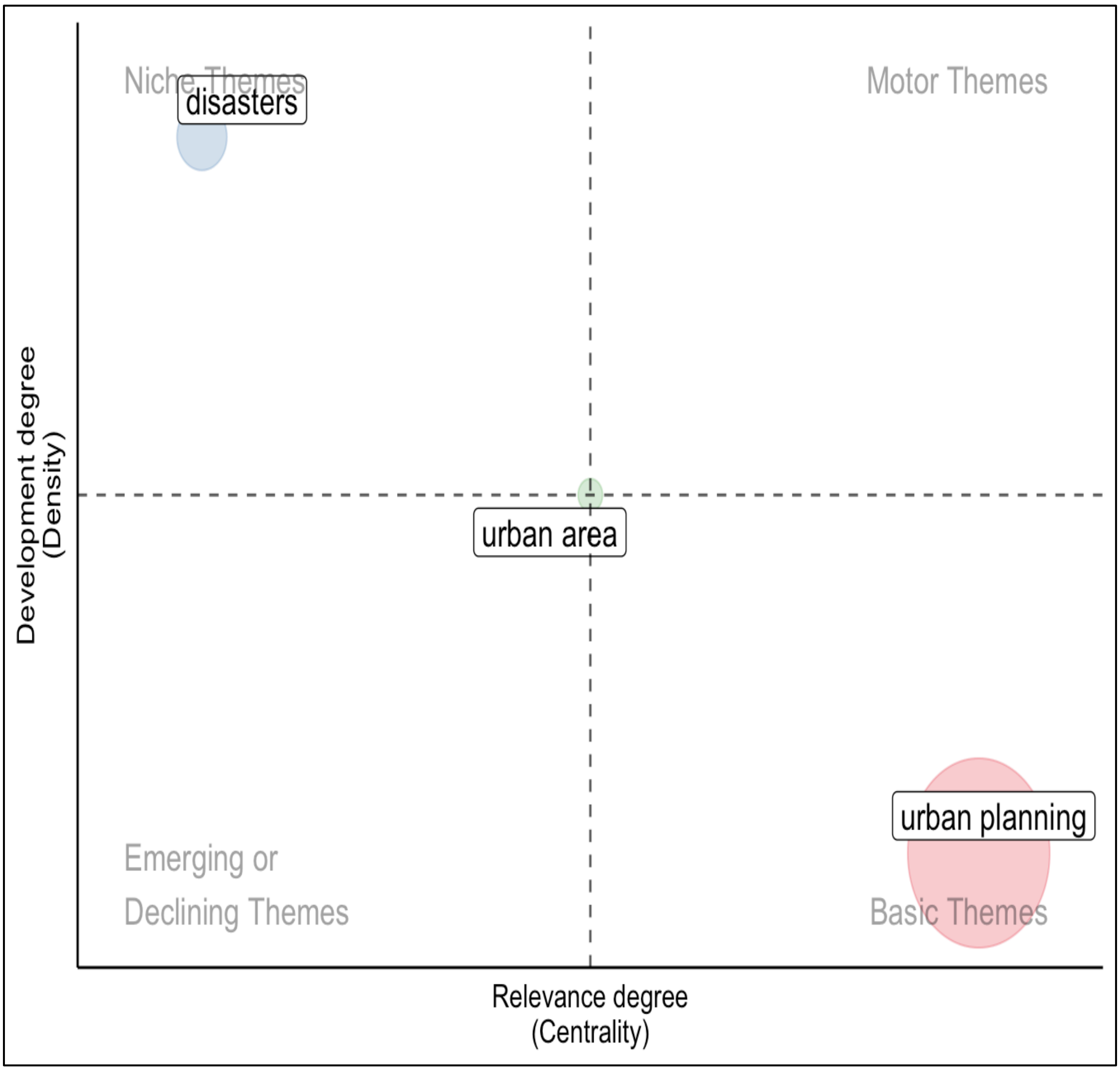
```
years= c( 2000 , 2005 , 2010 , 2015 )

nexus <- thematicEvolution (
  database, field = "ID" ,
years = years,
n = 100 ,
  minFreq = 2
🇧🇷

plotThematicEvolution ( nexus$Nodes , nexus$Edges )
```



Create a thematic map

" thematicMap starts from a co-occurrence keyword network to plot in a two -dimensional map the typological themes of a domain ."[1]

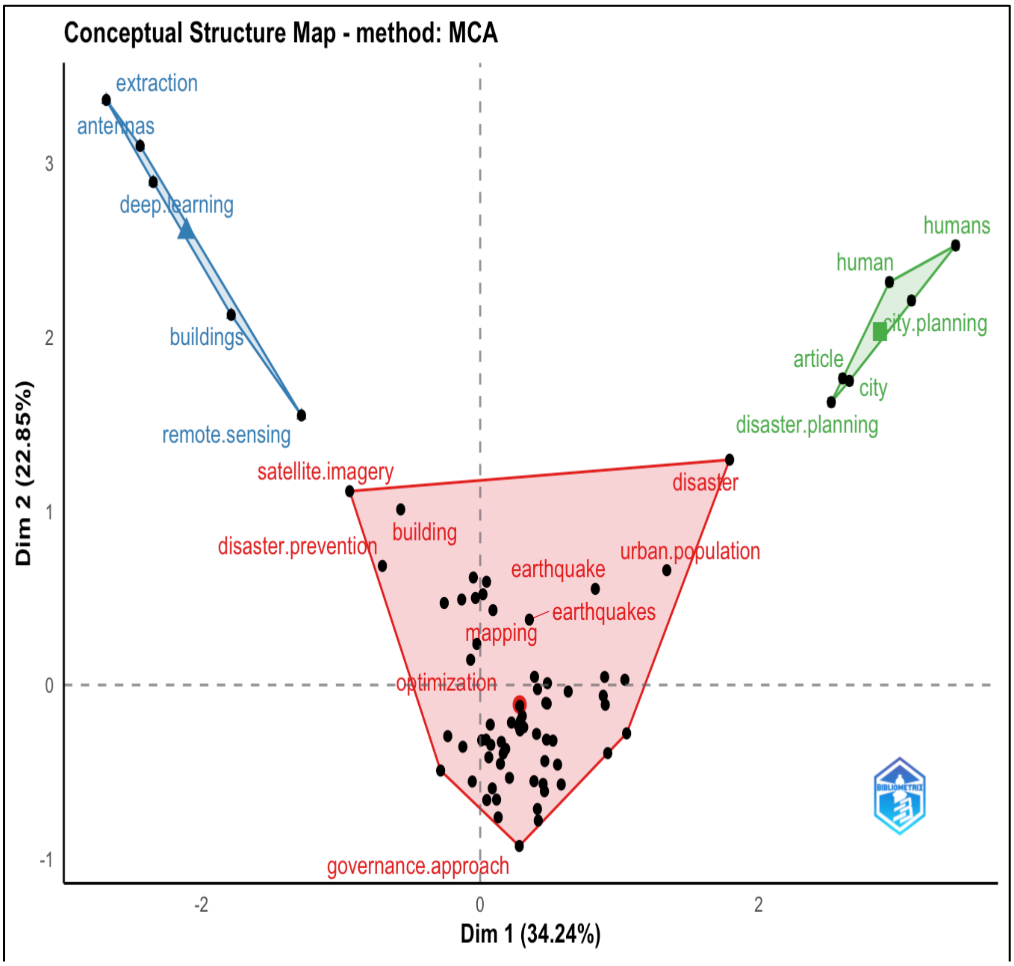
```
res <- thematicMap (
data base,
field = "ID" ,
n = 250 ,
  minfreq = 5 ,
size = 0.5 ,
repel = TRUE
🇧🇷


plot( res$map )
```



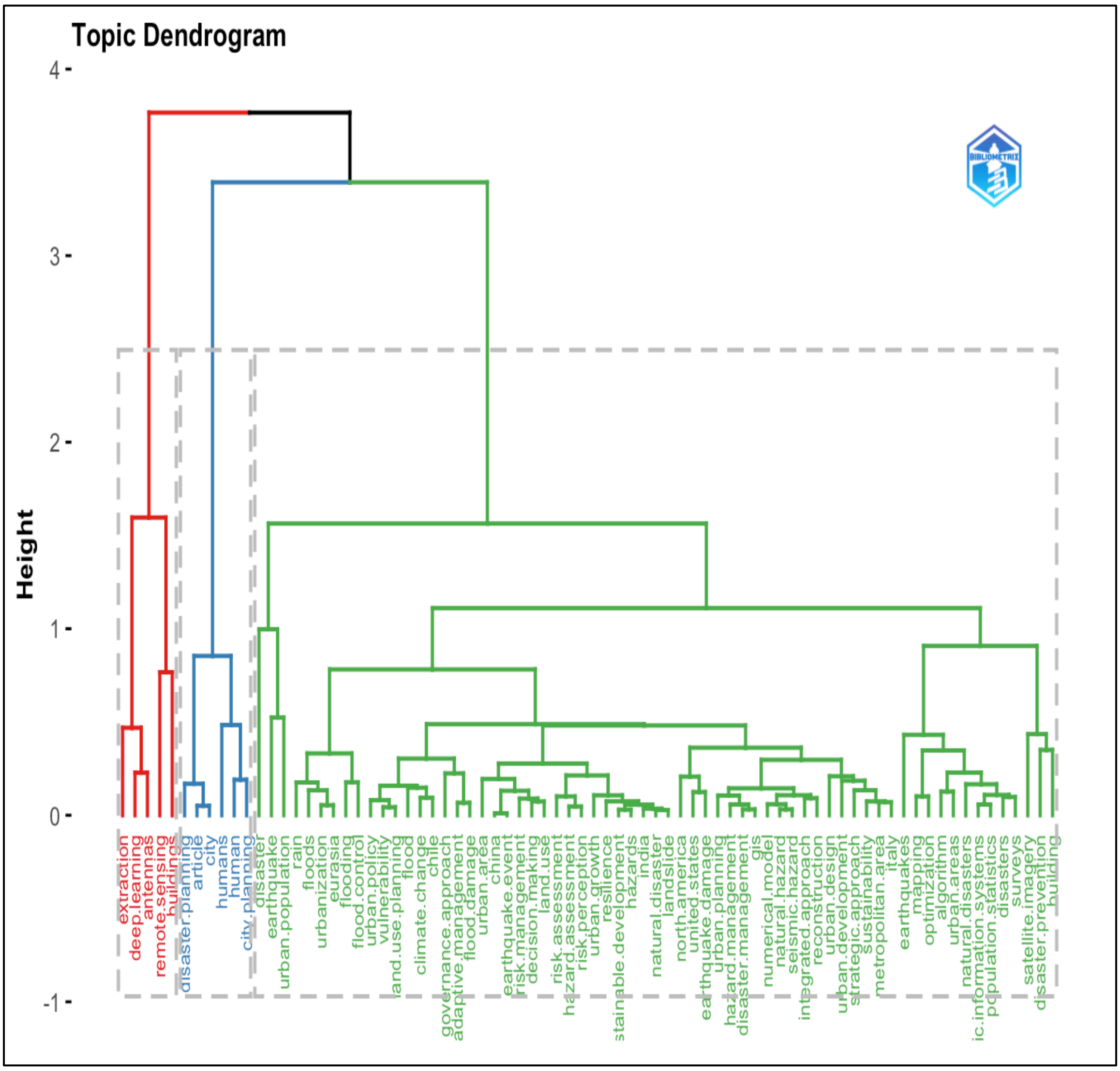
Creating and plotting conceptual structure map of a scientific field

“The function conceptualStructure creates a conceptual structure map of a scientific field performing Correspondence Analysis (CA), Multiple Correspondence Analysis (MCA) or Metric Multidimensional Scaling (MDS) and Clustering of a bipartite network of terms extracted from keyword, title or abstract fields. ” [1]

```
CS <- conceptualStructure (
data base,
field = "ID" ,
method = "MCA" ,
stemming = FALSE ,
  minDegree = 20 ,
  k.max = 5
🇧🇷
```



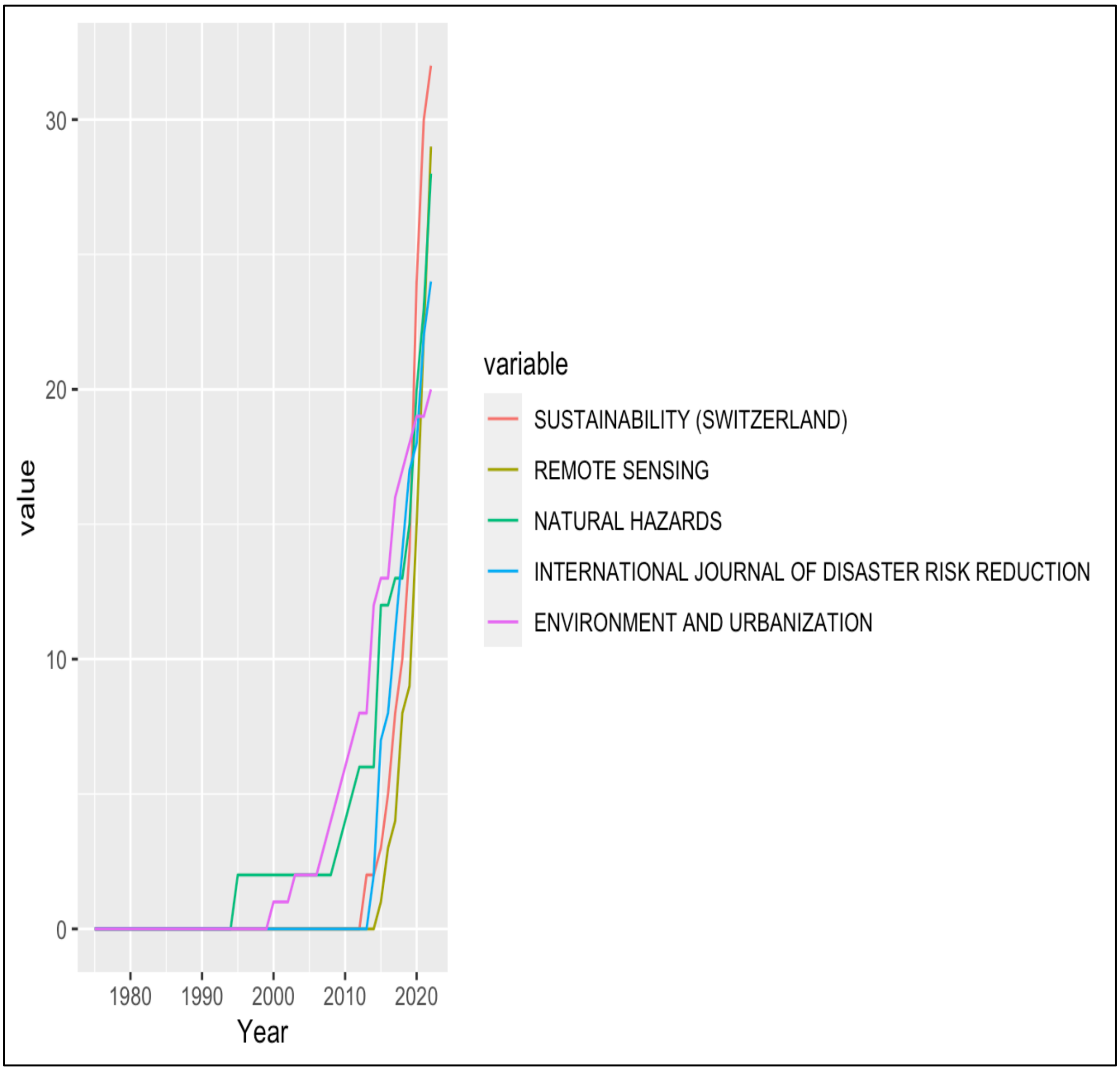
Conceptual Structure Map - method: MCA
extraction
antennas
deep.learning
buildings
remote.sensing
humans
human
city.planning
article
city
disaster.planning
satellite.imagery
disaster
building
disaster.prevention
urban.population
earthquake
earthquakes
mapping
optimization
governance.approach
Dim 2 (22.85%)
Dim 1 (34.24%)
3
2
1
0
-1
-2
0
2



Number of documents published annually by Top Sources

“It calculates yearly published documents of the top sources.” [1]

```
topSO <- sourceGrowth (
data base,
top = 5 ,
  cdf = TRUE
🇧🇷


DF <- melt( topSO , id= "Year" )
ggplot ( DF, aes (Year, value, group = variable, color = variable))+ g
eom_line ()
```



References

[1] Aria, M., Cuccurullo , C., Package ' bibliometrix '. Available on https://cran.r-project.org/web/packages/bibliometrix/bibliometrx.pdf

APPENDIX C - Classification of publications

Reference	Title	Disaster category	Disaster main-type	Disaster sub-type	Urbanization	Climate justice	Urban planning purpose: 1- Create policies; 2- Discuss policies; 3 - Change policies; 4 - The results can be used for urban planning	Study motivation: 1 - Past problems; 2 - Imminent problems; 3 - Prevention
(Eldesoky et al., 2022)	Combining environmental and social dimensions in the typomorphological study of urban resilience to heat stress	**Climatological**	**Extreme temperature**	**Heat wave**	**No**	**No**	**2**	**1**
(Amoako et al., 2022)	Fire risks management in emerging ghanaian cities land use planning responses for siting petrol and gas stations in the tamale metropolis	**Climatological**	**Wild fire**	**Landfires**	**No**	**No**	**2**	**2**
(Mudenda et al., 2022)	Government institutional emergent issues and gaps in disaster management mechanisms for wash a case study of zambias kanyama periurban area	**Hydrological disasters**	**Flood**	**Flash flood; storm surge**	**No**	**No**	**4**	**1**
(Duan et al., 2022)	Comprehensive risk assessment of urban waterlogging disaster based on mcdagis integration the case study of changchun china	**Hydrological disasters**	**Flood**	**Flash flood; storm surge**	**Yes**	**Yes**	**4**	**1**
(Zhou et al., 2022)	Risk assessment of debris flow in a mountainbasin area western china	**Geophysical disasters**	**Mass movement**	**Debris flow**	**No**	**No**	**1**	**2**
(J. Li et al., 2022)	Mapping basinscale supplydemand dynamics of flood regulation service a case study in the baiyangdian lake basin china	**Hydrological disasters**	**Flood**	**Flash flood; storm surge**	**Yes**	**No**	**4**	**1**
(Amri & Giyarsih, 2022)	Monitoring urban physical growth in tsunamiaffected areas a case study of banda aceh city indonesia	**Geophysical**	**Earthquake**	**Tsunami**	**No**	**No**	**4**	**2**

(Konig et al., 2022)	**Landslide risk management using the mathematical model trigrs gestão de risco a deslizamentos de terra utilizando o modelo matemático trigrs**	**Hydrological**	**Mass movement**	**Landslide**	**No**	**No**	**4**	**1**
(Zhao et al., 2022)	Rural postearthquake resettlement mode choices empirical case studies of sichuan china	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Munpa et al., 2022)	Climatic and hydrological factors affecting the assessment of flood hazards and resilience using modified undrr indicators ayutthaya thailand	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Barzaman et al., 2022)	Indicators of urban climate resilience case study varamin iran	**Geophysical; hydrological**	**Earthquake; flood**	**-**	**No**	**No**	**2**	**1**
(Modugno et al., 2022)	Analysis of human exposure to landslides with a gis multiscale approach	**Geophysical disasters**	**Mass movement**	**-**	**No**	**No**	**1**	**2**
(Keen et al., 2022)	Areabased approaches and urban recovery in the pacific lessons from fiji solomon islands and vanuatu	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Wang et al., 2022)	How community medical facilities can promote resilient community constructions under the background of pandemics	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**4**	**1**
(Johnson et al., 2022)	Knowledge graphs to support realtime flood impact evaluation	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Shekhar et al., 2022)	Are leading urban centers predisposed to global risks a analysis of the global south from covid19 perspective	(Shekhar et al., 2022)Biological disasters	**Pandemic**	**-**	**Yes**	**No**	**2**	**1**
(Yagoub & Al Yammahi, 2022)	Spatial distribution of natural hazards and their proximity to heritage sites case of the united arab emirates	**Geophysical disasters**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Xu et al., 2022)	Permeability control and flood risk assessment of urban underlying surface a case study of runcheng south area kunming	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Qüense et al., 2022)	Land cover and potential for tsunami evacuation in rapidly growing urban areas the case of boca sur san pedro de la paz chile	**Geophysical disasters**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Tao et al., 2022)	Study on deformation mechanism and control measures of tanziyan landslide	**Hydrological**	**Mass movement**	**-**	**No**	**No**	**4**	**1**
(Cremen et al., 2022)	A simulation based framework for earthquake riskinformed and peoplecentered decision making on future urban planning	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Cai & Xu, 2022)	Simulation and optimization strategy of storm flood safety pattern based on scscn model	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**2**
(Lei et al., 2022)	Application of highpower groundpenetrating radar antennas with different frequencies to quickly locate the upper breakpoint of active	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**

	buried faults in an urban area in the datong basin northern china							
(Golla et al., 2022)	Assessing the discrete and systemic response of the built environment to an earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**
(Y. Li et al., 2022)	Research on potential ground risk regions of aircraft crashes based on adsb flight tracking data and gis	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Vicuña et al., 2022)	Urban form planning and tsunami risk vulnerability analysis of 12 chilean coastal cities	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Kabilijiang et al., 2021)	Rural housing reconstruction and sustainable development post wenchuan earthquake a land unification perspective using dujiangyan city as an example	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**2**	**2**
(Yu et al., 2021)	Flood risk analysis by building use in urban planning for disaster risk reduction and climate change adaptation	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**2**
(Jayakody & Amaratunga, 2021)	Guiding factors for planning public open spaces to enhance coastal cities disaster resilience to tsunamis	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**
(Johnson et al., 2021)	High-resolution urban change modeling and flood exposure estimation at a national scale using open geospatial data a case study of the philippines	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Lara et al., 2021)	Development urban planning and political decisions a triad that built territories at risk	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Stamellou et al., 2021)	A giscellular automatabased model for coupling urban sprawl and flood susceptibility assessment	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Fang et al., 2021)	Compound flood potential from storm surge and heavy precipitation in coastal china dependence drivers and impacts	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Luo et al., 2021)	Integrating sponge city concept and neural network into land suitability assessment evidence from a satellite town of shenzhen metropolitan area	**Hydrological**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Echendu & Georgeou, 2021)	Not going to plan urban planning flooding and sustainability in port harcourt city nigeria	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**1**	**1**
(C. F. Wu et al., 2021)	Climate justice planning in global south applying a coupled naturehuman flood risk assessment framework in a case for ho chi minh city vietnam	**Hydrological disasters**	**Flood**	**-**	**Yes**	**Yes**	**3**	**1**
(Calderón & Silva, 2021)	Exposure forecasting for seismic risk estimation application to costa rica	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**

(Sethi et al., 2021)	How to tackle complexity in urban climate resilience negotiating climate science adaptation and multilevel governance in india	**Geophysical; climatological ; hydrological**	Mass movement; heat wave; flood	**-**	**No**	**No**	**2**	**1**
(Saavedra et al., 2021)	Neoliberalism of disaster and longterm recovery the case of the 2010 earthquake in talcahuano chile	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**3**	**1**
(Chen et al., 2021)	What determines citys resilience against epidemic outbreak evidence from chinas covid19 experience	(Chen et al., 2021)Biological disasters	**Pandemic**	**-**	**No**	**No**	**2**	**1**
(Song et al., 2021)	The effects of spatial planning wellbeing and behavioural changes during and after the covid19 pandemic	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**2**	**1**
(M. Wu et al., 2021)	Identification of sensitivity indicators of urban rainstorm flood disasters a case study in china	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Liu et al., 2021)	Rainstorminduced landslides early warning system in mountainous cities based on groundwater level change fast prediction	**Hydrological**	**Mass movement**	**-**	**No**	**No**	**4**	**2**
(Echendu, 2021)	Relationship between urban planning and flooding in port harcourt city nigeria insights from planning professionals	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Tuitjer, 2021)	Exploring urban verticality during the 2011 flood in bangkok thailand	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Kondo & Lizarralde, 2021)	Maladaptation fragmentation and other secondary effects of centralized postdisaster urban planning the case of the 2011 cascading disaster in japan	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Rajput et al., 2021)	Urban policymaking for a developing city using a hybridized technique based on swot ahp and gis	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Contardo & Figueroa, 2021)	Who has benefited a socioecological chronology of urban resilience in the early reconstruction of talca after the 27f earthquake chile 20102012	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Kong et al., 2021)	Commentary understanding chinas urban rainstorm waterlogging and its potential governance	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Acuña et al., 2021)	The geosocial model a transdisciplinary approach to flowtype landslide analysis and prevention	**Hydrological**	**Mass movement**	**-**	**Yes**	**No**	**4**	**2**
(M. S. Park et al., 2021)	Media frames on urban greening in the democratic peoples republic of korea	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**2**	**2**
(Zuo et al., 2021)	Simulation and optimization of pedestrian evacuation in highdensity urban areas for effectiveness improvement	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**

(Z. Wu et al., 2021)	A case study of flood risk evaluation based on emergy theory and cloud model in anyang region china	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Gandini et al., 2021)	Climate change risk assessment a holistic multistakeholder methodology for the sustainable development of cities	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Scheuer et al., 2021)	A glimpse into the future of exposure and vulnerabilities in cities modelling of residential location choice of urban population with random forest	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Rosa et al., 2021)	Investigating the integration of cultural heritage disaster risk management into urban planning tools the ravenna case study	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Trajanovski, 2021)	Zbor imaat graǵanite the first sociological study the polish sociological expert aid to macedonia in the mid1960s and the postearthquake history of interethnic relations in skopje obywatele mają głos pierwsze studium socjologiczne polska socjologiczna pomoc ekspercka w macedonii w połowie lat 60 xx wieku i historia stosunków międzyetnicznych w skopje po trzęsieniu ziemi	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(K. Park et al., 2021)	Analysis of disaster resilience of urban planning facilities on urban flooding vulnerability	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Wyndham et al., 2021)	From disaster risk construction to disaster risk reduction exploring the agency of urban landuse planning in chile	**Geophysical; hydrological**	**Earthquake; flood**	**-**	**No**	**No**	**2**	**1**
(Wang, 2021)	Vision of chinas future urban construction reform in the perspective of comprehensive prevention and control for multi disasters	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**4**	**1**
(J. Z. Zhang et al., 2021)	Evaluating the effectiveness of drones in emergency situations a hybrid multicriteria approach	**Climatologica l**	**Wild fire**	**-**	**No**	**No**	**1**	**2**
(Ariyanti et al., 2020)	Towards liveable volcanic cities a look at the governance of lahars in yogyakarta indonesia and latacunga ecuador	**Geophysical**	**Volcano**	**-**	**No**	**No**	**1**	**2**
(Feofilovs & Romagnoli, 2020)	Assessment of urban resilience to natural disasters with a system dynamics tool case study of latvian municipality	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Abdrabo et al., 2020)	Integrated methodology for urban flood risk mapping at the microscale in ungauged regions a case study of hurghada egypt	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Sanna et al., 2020)	Policies and architectures for the unthinkable era new resilient landscapes in fragile areas of sardinia	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**

(Félix et al., 2020)	Estimating the needs for temporary accommodation units to improve predisaster urban planning in seismic risk cities	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Jouannic et al., 2020)	Recovery of the island of saint martin after hurricane irma an interdisciplinary perspective	**Meteorologic al**	**Hurricane**	**-**	**Yes**	**No**	**2**	**1**
(Allam & Jones, 2020)	Pandemic stricken cities on lockdown where are our planning and design professionals now then and into the future	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**4**	**1**
(Moscatelli et al., 2020)	The italian approach to seismic microzonation	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Jin et al., 2020)	Ecological risk resonance of urbanization and its effect on geohazard disaster the case of freetown sierra leone	**Hydrological**	**Flood, mass moviment**	**-**	**Yes**	**No**	**4**	**1**
(Rivera et al., 2020)	An interdisciplinary study of the seismic exposure dynamics of santiago de chile	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Jha & Afreen, 2020)	Flooding urban landscapes analysis using combined hydrodynamic and hydrologic modeling approaches	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Kheirizadeh Arouq et al., 2020)	Vulnerability assessment of cities to earthquake based on the catastrophe theory a case study of tabriz city iran	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Lai et al., 2020)	Flood risk assessment and regionalization from past and future perspectives at basin scale	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**1**	**1**
(Lu et al., 2020)	Cimpowered multihazard simulation framework covering both individual buildings and urban areas	**Geophysical; climatological**	**Earthquake; Wild fires**	**-**	**No**	**No**	**4**	**2**
(Lee et al., 2020)	Analysis of floodvulnerable areas for disaster planning considering demographic changes in south korea	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Fatemi et al., 2020)	Physical vulnerability and local responses to flood damage in periurban areas of dhaka bangladesh	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Rateb & Hermas, 2020)	The 2018 long rainy season in kenya hydrological changes and correlated land subsidence	**Hydrological**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Marta et al., 2020)	Past and future hydrogeological risk assessment under climate change conditions over urban settlements and infrastructure systems the case of a subregional area of piedmont italy	**Hydrological; geophysical**	**Flood; mass movement**	**-**	**No**	**No**	**1**	**1**
(Wu et al., 2020)	Analysis on the damage and recovery of typhoon disaster based on uav orthograph	**Meteorologic al**	**Typhoons**	**-**	**No**	**No**	**4**	**1**
(Pirlone et al., 2020)	More resilient cities to face higher risks the case of genoa	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**2**	**1**

(Bankoff, 2020)	Under the volcano mount mayon and covolcanic societies in the philippines	**Geophysical**	**Volcano**	**-**	**No**	**No**	**1**	**1**
(Martínez et al., 2020)	Worstcase tsunami scenario in cartagena bay central chile challenges for coastal risk management	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Borland, 2020)	Small parks big designs reconstructed tokyos new green spaces 1923-1931	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Asadi & Karami, 2020)	Modeling of the city evacuation plan in case of earthquake with particle swarm optimization pso and imperialist competition algorithm ica	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Shao et al., 2020)	Planning research on application of nanomaterial technology in disaster prevention and reconstruction	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Lak et al., 2020)	Resilient urban form to pandemics lessons from covid19	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**4**	**1**
(Salazar-Briones et al., 2020)	An integrated urban flood vulnerability index for sustainable planning in arid zones of developing countries	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Montejano-Castillo et al., 2020)	Mapping vertical urban growth in mexico city in a seismic risk context	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Pappalardo & Martinico, 2020)	Gibellina salaparuta poggioreale and montevago about built environment underutilization and possible urban future	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Fathollahi et al., 2020)	Prevalence of nonengineered buildings and population at risk for a probable earthquake a crosssectional study from an informal settlement in tehran iran	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Castigliano et al., 2020)	Places at risk called home rethinking the reconstruction in ischia	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Spencer et al., 2020)	Emerging infectious disease the household built environment characteristics and urban planning evidence on avian influenza in vietnam	**Biological disasters**	**Pandemic**	**-**	**Yes**	**Yes**	**4**	**1**
(Ntokos & Ntokou, 2020)	Defining a safe design distance from tectonic structures in urban and regional planning	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**2**	**2**
(Myers et al., 2020)	Trends in urban planning climate adaptation and resilience in zanzibar tanzania	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Helderop & Grubesic, 2019)	Flood evacuation and rescue the identification of critical road segments using wholelandscape features	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Karashima & Ohgai, 2019)	Implementation issues of the planning support tool in japan focusing on urban disaster mitigation	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**

(Wei et al., 2019)	The spatial characteristics of precipitation and waterlogging disaster during rainy season for urban planning in xian	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Smith, 2019)	The relational attributes of marketplaces in postearthquake portauprince haiti	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Inzulza-Contardo & Gatica-Araya, 2019)	Subsidiary displacement and empty plots dilemmas of original residents and newcomers in the reconstruction of talca chile 2010-2016	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Chang et al., 2019)	Effects of urban development on future multihazard risk the case of vancouver canada	**Hydrological; geophysical**	**Flood; earthquake**	**-**	**No**	**No**	**4**	**2**
(Ciccaglione, 2019)	Resilience and resisting resilience ethnographies in neoliberal laquila postearthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Song & Li, 2019)	Linkage between the environment and individual resilience to urban flooding a case study of shenzhen china	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Rahmati et al., 2019)	Urban flood hazard modeling using selforganizing map neural network	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Caprario & Finotti, 2019)	Socio technological tool for mapping susceptibility to urban flooding	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**2**
(Vázquez-González et al., 2019)	The value of coastal wetland flood prevention lost to urbanization on the coastal plain of the gulf of mexico an analysis of flood damage by hurricane impacts	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Yavuz Kumlu & Tüdeş, 2019)	Determination of earthquake risky areas in yalova city center marmara region turkey using gisbased multicriteria decisionmaking techniques analytical hierarchy process and technique for order preference by similarity to ideal solution	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Córdoba Azcárate, 2019)	Fueling ecological neglect in a manufactured tourist city planning disaster mapping and environmental art in cancun mexico	**Meteorologic al**	**Hurricane**	**-**	**No**	**No**	**2**	**2**
(Moghadas et al., 2019)	A multicriteria approach for assessing urban flood resilience in tehran iran	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Cian et al., 2019)	Sentinel1 for monitoring land subsidence of coastal cities in africa using psinsar a methodology based on the integration of snap and stamps	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Bertilsson et al., 2019)	Urban flood resilience a multicriteria index to integrate flood resilience into urban planning	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Vachaud et al., 2019)	Floodrelated risks in ho chi minh city and ways of mitigation	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**4**	**2**

(Shi et al., 2019)	How can cities respond to flood disaster risks under multiscenario simulation a case study of xiamen china	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Shimpo et al., 2019)	How community gardens may contribute to community resilience following an earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Jacobs, 2019)	Black feminism and radical planning new directions for disaster planning research	**Meteorologic al**	**Hurricane**	**-**	**No**	**Yes**	**4**	**1**
(Park & Lee, 2019)	The development and application of the urban flood risk assessment model for reflecting upon urban planning elements	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**2**
(Weinstein et al., 2019)	Resilient growth fantasy plans and unplanned developments in indias floodprone coastal cities	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Dulal, 2019)	Cities in asia how are they adapting to climate change	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Y. Cui et al., 2019)	The cost of rapid and haphazard urbanization lessons learned from the freetown landslide disaster	**Hydrological**	**Mass movement**	**-**	**Yes**	**No**	**4**	**1**
(A. Fekete, 2019)	Critical infrastructure and flood resilience cascading effects beyond water	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Qi et al., 2019)	Urban observation integration of remote sensing and social media data	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Sandholz et al., 2018)	Governing green change ecosystembased measures for reducing landslide risk in rio de janeiro	**Hydrological**	**Mass movement**	**-**	**No**	**No**	**4**	**2**
(Bedini & Bronzini, 2018)	The postearthquake experience in italy difficulties and the possibility of planning the resurgence of the territories affected by earthquakes	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Karabulut, 2018)	A novel urban transformation criteria from a geosciences perspective as case study in bursa nw turkey	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Moisidi et al., 2018)	Assessing the main frequencies of modern and historical buildings using ambient noise recordings case studies in the historical cities of crete greece	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Martínez-Pagán et al., 2018)	Shearwave velocity structure from masw and spac methods the case of adra town se spain	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Van der Sommen et al., 2018)	Analysis of the interrelationship between houses trees and damage in a cyclone affected city can landscape design and planning utilising trees minimise cyclone impact	**Meteorologic al**	**Storm**	**-**	**No**	**No**	**2**	**1**
(Hendricks et al., 2018)	The development of a participatory assessment technique for infrastructure neighborhood level	**Hydrological**	**Flood**	**-**	**No**	**Yes**	**2**	**1**

	monitoring towards sustainable infrastructure systems							
(Maynard et al., 2018)	Urban planning following humanitarian crises supporting urban communities and local governments to take the lead	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Gonzalez-Mathiesen & March, 2018)	Establishing design principles for wildfire resilient urban planning	**Climatologica l**	**Wildfire**	**-**	**No**	**No**	**2**	**2**
(Duy, Chapman, Tight, Thuong, et al., 2018)	Urban resilience to floods in coastal cities challenges and opportunities for ho chi minh city and other emerging cities in southeast asia	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Wahab & Ojolowo, 2018)	Building contraventions and incidence of flood in the lagos metropolis nigeria	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Sritarapipat & Takeuchi, 2018)	Land cover change simulations in yangon under several scenarios of flood and earthquake vulnerabilities with master plan	**Hydrological; geophysical**	**Flood; earthquake**	**-**	**No**	**No**	**4**	**1**
(Torabi et al., 2018)	Adapting or maladapting building resilience to climaterelated disasters in coastal cities	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Aoki, 2018)	Sequencing and combining participation in urban planning the case of tsunamiravaged onagawa town japan	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Haruna et al., 2018)	Exploring ecoaesthetics for urban green infrastructure development and building resilient cities a theoretical overview	**Hydrological; climatological**	**Flood; drought**	**-**	**No**	**No**	**2**	**1**
(Ali & Kim, 2018)	Comparative analyses of seismic site conditions and microzonation of the major cities in gangwon province korea	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Su et al., 2018)	The influence of landscape pattern on the risk of urban waterlogging and flood disaster	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Ahmed et al., 2018)	Dhaka bangladesh unpacking challenges and reflecting on unjust transitions	**Hydrological; geophysical**	**Flood; earthquake**	**-**	**Yes**	**No**	**2**	**1**
(Hamma & Petrişor, 2018)	Urbanization and risks case of bejaia city in algeria	**Geophysical**	**Earthquake; Mass moviment**	**-**	**Yes**	**No**	**1**	**1**
(Duy, Chapman, Tight, Linh, et al., 2018)	Increasing vulnerability to floods in new development areas evidence from ho chi minh city	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Kumar et al., 2017)	Applicability of hecras gfms tool for 1d water surface elevationflood modeling of the river a case study of river yamuna at allahabad sangam india	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**

(Saunders et al., 2017)	The spatial distribution of rainfall extremes and the influence of el niño southern oscillation	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Zhao et al., 2017)	Planning emergency shelters for urban disaster resilience an integrated locationallocation modeling approach	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Orhan, 2017)	Factors affecting postdisaster location choices of businesses an analysis of the 1999 earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Platt & So, 2017)	Speed or deliberation a comparison of post-disaster recovery in japan turkey and chile	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**
(Bernal et al., 2017)	Integration of probabilistic and multihazard risk assessment within urban development planning and emergency preparedness and response application to manizales colombia	**Geophysical**	**Earthquake; mass moviment; volcano**	**-**	**No**	**No**	**1**	**1**
(Guillier, 2017)	French insurance and flood risk assessing the impact of prevention through the rating of action programs for flood prevention	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Kammerbauer & Wamsler, 2017)	Social inequality and marginalization in postdisaster recovery challenging the consensus	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Manda & Wanda, 2017)	Understanding the nature and scale of risks in karonga malawi	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Liu & Li, 2017)	Gisbased dynamic modelling and analysis of flash floods considering landuse planning	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**2**
(Li et al., 2017)	Simulating and analyzing engineering parameters of kyushu earthquake japan 1997 by empirical green function method	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Shinde, 2017)	Disruption resilience and vernacular heritage in an indian city pune after the 1961 floods	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Tumini et al., 2017)	Evaluating reconstruction effects on urban resilience a comparison between two chilean tsunamiprone cities	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Mojisola Olanrewaju et al., 2017)	Analysis of rain fall pattern and flood incidences in warri metropolis nigeria	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Clouse & Lamb, 2017)	**The batture effect**	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Kornakova & March, 2017)	The role of citizens in drr planning exercises when to inform or consult	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Kao et al., 2017)	An evaluation study of urban development strategy based on of extreme climate conditions	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Lapenna, 2017)	Resilient and sustainable cities of tomorrow the role of applied geophysics	**Geophysical**	**Earthquake; mass moviment**	**-**	**Yes**	**No**	**1**	**2**

(Mahmood et al., 2017)	Lessons learned from khartoum flash flood impacts an integrated assessment	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Meerow, 2017)	Double exposure infrastructure planning and urban climate resilience in coastal megacities a case study of manila	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Rojas et al., 2017)	Urban growth and flood disasters in the coastal river basin of southcentral chile 19432011	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Xu et al., 2016)	Multicriteria location model of earthquake evacuation shelters to aid in urban planning	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**2**
(Marulanda Aguirre et al., 2016)	Hydrological study of the potential effects of the melting of nevado del ruiz glacier on urban growth zones in manizales colombia	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Ubaura et al., 2016)	Building reconstruction after largescale disasters a case study of ishinomaki city after the great east japan earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(León & March, 2016)	An urban form response to disaster vulnerability improving tsunami evacuation in iquique chile	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Espínola et al., 2016)	Simulating rainfall water evaporation and groundwater flow in threedimensional satellite images with cellular automata	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Zhao & Liu, 2016)	Regional risk assessment for urban major hazards based on gis geoprocessing to improve public safety	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**2**
(Vona et al., 2016)	Thinking about resilient cities studying italian earthquakes	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Farías, 2016)	Devising hybrid forums technical democracy in a dangerous world	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Taheri Tafti & Tomlinson, 2016)	Longterm sociospatial transformation of earthquakeaffected neighbourhoods in bhuj who stayed who left and who moved in	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Mukherjee & Samuel, 2016)	Assessment of the temporal variations of surface water bodies in and around chennai using landsat imagery	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Parthasarathy, 2016)	Decentralization pluralization balkanization challenges for disaster mitigation and governance in mumbai	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Young, 2016)	Adaptation actions for integrated climate risk management into urban planning a new framework from urban typologies to build resilience capacity in santos sp	**Hydrological**	**Flood; Mass movement**	**-**	**Yes**	**No**	**2**	**2**
(Şenol Balaban, 2016)	An assessment of flood risk factors in riverine cities of turkey lessons for resilience and urban planning	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**

(Nguyen et al., 2016)	Disaster management in coastal tourism destinations the case for transactive planning and social learning	**Geophysical; hydrological**	**Earthquake; flood**	**-**	**No**	**No**	**3**	**2**
(Kobayashi et al., 2016)	Practical efforts for postdisaster reconstruction in the city of ishinomaki miyagi	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Su et al., 2016)	Modeling the optimal ecological security pattern for guiding the urban constructed land expansions	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Orhan, 2016)	Reading vulnerabilities through urban planning history an earthquakeprone city adapazari case from turkey	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Chu et al., 2016)	Inclusive approaches to urban climate adaptation planning and implementation in the global south	**Hydrological disasters**	**Flood**	**-**	**No**	**Yes**	**2**	**1**
(Athmani et al., 2015)	Seismic vulnerability assessment of historical masonry buildings located in annaba city algeria using non adhoc data survey	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Iizuka et al., 2015)	Impacts of disaster mitigationprevention urban structure models on future urban thermal environment	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Bostenaru Dan & Armas, 2015)	Earthquake impact on settlements the role of urban and structural morphology	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Wesener, 2015)	Temporary urbanism and urban sustainability after a natural disaster transitional community initiated open spaces in christchurch new zealand	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(de Andrade & Szlafsztein, 2015)	Community participation in flood mapping in the amazon through interdisciplinary methods	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Sudmeier-Rieux et al., 2015)	Opportunities incentives and challenges to risk sensitive land use planning lessons from nepal spain and vietnam	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**2**	**1**
(Ríos, 2015)	Present day capitalist urbanization and unequal disaster risk production the case of tigre buenos aires	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Zhang et al., 2015)	Planning and recovery following the great 1976 tangshan earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Herrmann Lunecke, 2015)	Urban planning and tsunami impact mitigation in chile after february 27 2010	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Sciulli et al., 2015)	Building a resilient local council evidence from flood disasters in italy	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Hellman, 2015)	Living with floods and coping with vulnerability	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Wang & Guldmann, 2015)	A landuse allocation optimization model to mitigate potential seismic damages	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**

(McDaniels et al., 2015)	Towards disasterresilient cities an approach for setting priorities in infrastructure mitigation efforts	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Wamsler, 2015)	Mainstreaming ecosystembased adaptation transformation toward sustainability in urban governance and planning	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**2**
(Sonmez Saner, 2015)	Seismic vulnerabilities and risks for urban mitigation planning in turkey	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**2**	**1**
(Garschagen, 2015)	Risky change vietnams urban flood risk governance between climate dynamics and transformation	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Parthasarathy, 2015)	Informality resilience and the political implications of disaster governance	**Hydrological**	**Flood**	**-**	**Yes**	**Yes**	**4**	**1**
(Chan et al., 2015)	Refuges of local resilience community gardens in postsandy new york city	**Meteorologic al**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Youssef et al., 2015)	Use of geological and geomorphological parameters in potential suitability assessment for urban planning development at wadi alasla basin jeddah kingdom of saudi arabia	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Liu et al., 2015)	Temporal changes in extreme high temperature heat waves and relevant disasters in nanjing metropolitan region china	**Climatologica l**	**Extreme temperature**	**-**	**Yes**	**No**	**2**	**1**
(Anhorn et al., 2015)	Rapid urban growth and earthquake risk in musikot midwestern hills nepal	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Tayfur et al., 2014)	Significance of rent attributes in prediction of earthquake damage in adapazari turkey	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Comerio, 2014)	Housing recovery lessons from chile	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Sunarharum et al., 2014)	Reframing planning decisionmaking increasing flood resilience in jakarta	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Hewitt et al., 2014)	Change and continuity in postkatrina new orleans	**Meteorologic al**	**Hurricane**	**-**	**No**	**No**	**2**	**1**
(Molinari et al., 2014)	Implementing tools to meet the floods directive requirements a procedure to collect store and manage damage data in the aftermath of flood events	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Syed & Routray, 2014)	Vulnerability assessment of earthquake prone communities in baluchistan	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Grinberger & Felsenstein, 2014)	Bouncing back or bouncing forward simulating urban resilience	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Balaban & Fu, 2014)	Politics of urban development and wildfires in california and turkey	**Climatologica l**	**Wildfire**	**-**	**No**	**No**	**4**	**1**
(Tai et al., 2014)	A study of evacuation behavior during earthquakes	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**

(Holt, 2014)	Do you know what it means to rebuild new orleans cultural sustainability after disaster	**Meteorological**	**Storm**	**-**	**No**	**Yes**	**4**	**1**
(Chen et al., 2014)	Combining tsunami hazard and vulnerability on the assessment of tsunami inundation probability in taiwan	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Cavallaro et al., 2014)	Assessment of urban ecosystem resilience through hybrid socialphysical complex networks	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Tennekes et al., 2014)	Out of the comfort zone institutional context and the scope for legitimate climate adaptation policy	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Sambah & Miura, 2014)	Remote sensing and spatial multicriteria analysis for tsunami vulnerability assessment	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Hardoy & Velásquez Barrero, 2014)	Rethinking biomanizales addressing climate change adaptation in manizales colombia	**Hydrological**	**Flood; Mass movement**	**-**	**No**	**No**	**3**	**1**
(Chan et al., 2014)	Establishing disaster resilience indicators for tansui river basin in taiwan	**Hydrological; metereological**	**Flood; typhoons**	**-**	**No**	**No**	**4**	**1**
(Manda, 2014)	Where there is no local government addressing disaster risk reduction in a small town in malawi	**Geophysical; hydrological; climatological**	**Earthquake; flood; drought**	**-**	**Yes**	**No**	**2**	**1**
(Waggonner et al., 2014)	New orleans after katrina building americas water city	**Meteorological**	**Storm**	**-**	**Yes**	**No**	**2**	**1**
(Hayward, 2013)	Rethinking resilience reflections on the earthquakes in christchurch new zealand 2010 and 2011	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Gibson et al., 2013)	Landslide management in the ukthe problem of managing hazards in a lowrisk environment	**Hydrological**	**Mass movement**	**-**	**No**	**No**	**4**	**2**
(Luque et al., 2013)	The local governance of climate change new tools to respond to old limitations in esmeraldas ecuador	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Gilbuena et al., 2013)	Environmental impact assessment of structural flood mitigation measures by a rapid impact assessment matrix riam technique a case study in metro manila philippines	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Jacobi et al., 2013)	Water governance and natural disasters in the metropolitan region of são paulo brazil	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Johar et al., 2013)	Seismic microzonation for banda aceh city planning	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Parrinello, 2013)	The cityterritory largescale planning and development policies in the aftermath of the belice valley earthquake sicily 1968	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Young, 2013)	Urban expansion and environmental risk in the são paulo metropolitan area	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**4**	**1**

(Khailani & Perera, 2013)	Mainstreaming disaster resilience attributes in local development plans for the adaptation to climate change induced flooding a study based on the local plan of shah alam city malaysia	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**3**	**1**
(Hashemi & Alesheikh, 2012)	Development and implementation of a gisbased tool for spatial modeling of seismic vulnerability of tehran	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Del Ventisette et al., 2012)	An integrated approach to the study of catastrophic debrisflows geological hazard and human influence	**Geophysical**	**Mass movement**	**-**	**No**	**No**	**1**	**1**
(Bathrellos et al., 2012)	Potential suitability for urban planning and industry development using natural hazard maps and geologicalgeomorphological parameters	**Hydrological**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Ye et al., 2012)	Methodology and its application for communityscale evacuation planning against earthquake disaster	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Viganò, 2012)	Extreme cities and bad places	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Wamsler & Lawson, 2012)	Complementing institutional with localised strategies for climate change adaptation a southnorth comparison	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Sdao et al., 2011)	Systemic vulnerability in urbanized areas exposed to combined risk of landslide and flood la vulnerabilità sistemica in aree urbanizzate esposte al rischio combinato di frane ed inondazioni	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Omidvar et al., 2011)	Evaluation of public participation in reconstruction of bam iran after the 2003 earthquake	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Rahm & Reddick, 2011)	Us city managers perceptions of disaster risks consequences for urban emergency management	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Barrios, 2011)	If you did not grow up here you cannot appreciate living here neoliberalism spacetime and affect in postkatrina recovery planning	**Meteorologic al**	**Hurricane**	**-**	**No**	**No**	**2**	**1**
(Poretti & De Amicis, 2011)	An approach for flood hazard modelling and mapping in the medium valtellina	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Ozcep & Ozcep, 2011)	Geophysical analysis of the soils for civil geotechnical engineering and urban planning purposes some case histories from turkey	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Indirli et al., 2011)	Hazard evaluation in valparaíso the mar vasto project	**Geophysical; hydrological**	**Earthquake; mass moviment**	**-**	**No**	**No**	**1**	**1**

(Hochrainer & Mechler, 2011)	Natural disaster risk in asian megacities a case for risk pooling	**Geophysical; meteorological**	**Earthquake; hurricane**	**-**	**No**	**No**	**4**	**1**
(Harwitasari & van Ast, 2011)	Climate change adaptation in practice peoples responses to tidal flooding in semarang indonesia	**Hydrological disasters**	**Flood**	**-**	**Yes**	**No**	**4**	**1**
(Nielsen, 2010)	Mimesis of the state from natural disaster to urban citizenship on the outskirts of maputo mozambique	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Barrios, 2010)	You found us doing this this is our way criminalizing second lines super sunday and habitus in postkatrina new orleans	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**2**	**1**
(Adikari et al., 2010)	Floodrelated disaster vulnerability an impending crisis of megacities in asia	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Stevens et al., 2010)	New urbanist developments in floodprone areas safe development or safe development paradox	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Von Einsiedel et al., 2010)	The challenge of urban redevelopment in disasteraffected communities	**Geophysical; hydrological**	**Eathquake; flood**	**-**	**No**	**No**	**4**	**1**
(Tai et al., 2010)	Urban disaster prevention shelter location and evacuation behavior analysis	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Islam et al., 2009)	Origin distribution and timing of texas hurricanes 18512006	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Hosseini et al., 2009)	Development of urban planning guidelines for improving emergency response capacities in seismic areas of iran	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Ozcevik et al., 2009)	Flagship regeneration project as a tool for postdisaster recovery planning the zeytinburnu case	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Tüdeş & Yilmaz, 2009)	Evaluation of relationship of spatial planninggeorisks and urban risk analysis the case study of bartin	**Hydrological; geophysical**	**Flood; earthquake**	**-**	**No**	**No**	**2**	**1**
(Kang et al., 2009)	A study on the implementation of nonstructural measures to reduce urban flood damage focused on the survey results of the experts	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Tanaka et al., 2009)	Using gis in community design charrettes lessons from a japanus collaboration in earthquake recovery and mitigation planning for kobe	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Reardon et al., 2009)	Overcoming the challenges of postdisaster planning in new orleans lessons from the acorn housinguniversity collaborative	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Maantay & Maroko, 2009)	Mapping urban risk flood hazards race environmental justice in new york	**Hydrological disasters**	**Flood**	**-**	**No**	**Yes**	**4**	**1**

(Fields, 2009)	From green dots to greenways planning in the age of climate change in postkatrina new orleans	**Meteorological**	**Hurricane**	**-**	**Yes**	**No**	**4**	**1**
(Price & Vojinovic, 2008)	**Urban food disaster management**	**Hydrological**	**Flood**	**-**	**No**	**No**	**3**	**1**
(Surjan & Shaw, 2008)	Ecocity to disasterresilient ecocommunity a concerted approach in the coastal city of puri india	**Meteorological; hydrological; geophysical**	**Storm; flood; earthquake**	**-**	**No**	**No**	**4**	**1**
(Revi, 2008)	Climate change risk an adaptation and mitigation agenda for indian cities	**Hydrological; climatological**	**Flood; drought**	**-**	**No**	**No**	**3**	**1**
(Parnell et al., 2007)	Global environmental change conceptualising the growing challenge for cities in poor countries	**Hydrological**	**Flood**	**-**	**No**	**No**	**4**	**1**
(Caruso & Downs, 2007)	Rehabilitation and flood management planning in a steep boulderbedded stream	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**4**	**2**
(Wiener, 2007)	Epilogue after katrina lessons not only to be learned but to be used	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Wiener, 2007)	Integrating disaster risk management into construction a uk perspective	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**2**
(Wolshon & Marchive, 2007)	Emergency planning in the urbanwildland interface subdivisionlevel analysis of wildfire evacuations	**Climatological**	**Wild fire**	**-**	**No**	**No**	**4**	**1**
(Williams et al., 2007)	Simulation and analysis of freeway lane reversal for coastal hurricane evacuation	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**2**
(Olshansky et al., 2006)	Rebuilding communites following disaster lessons from kobe and los angeles	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Bhagat et al., 2006)	Mumbai after 26/7 deluge issues and concerns in urban planning	**Hydrological**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Olshansky, 2006)	**Planning after hurricane katrina**	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Dreier, 2006)	Katrina and power in america	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Berke & Campanella, 2006)	Planning for post-disaster resiliency	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**2**	**1**
(Campanella, 2006)	Urban resilience and the recovery of new orleans	**Meteorological**	**Hurricane**	**-**	**No**	**No**	**4**	**1**
(Shibata, 2006)	Estimation of earthquake damage to urban systems	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Yu et al., 2006)	The evolution of greenways in china	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**3**	**2**
(Matthew & McDonald, 2006)	Cities under siege urban planning and the threat of infectious disease	**Biological**	**Epidemic**	**-**	**Yes**	**No**	**1**	**1**
(Nichols, 2005)	A major urban earthquake planning for armageddon	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**

(Sengezer & Koç, 2005)	A critical analysis of earthquakes and urban planning in turkey	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Burby, 2005)	Have state comprehensive planning mandates reduced insured losses from natural disasters	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Montoya & Masser, 2005)	Management of natural hazard risk in cartago costa rica	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Chang, 2003)	Evaluating disaster mitigations methodology for urban infrastructure systems	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Esnard, 2003)	Beyond semantics and the immediate postdisaster period community quality of life as an overarching theme for sustaining collective action	**Hydrological**	**Flood**	**-**	**No**	**No**	**2**	**1**
(Flüchter, 2003)	Tokyo before the next earthquake agglomerationrelated risks town planning and disaster prevention	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**2**
(Bahrainy, 2003)	Natural disaster management in iran during the 1990s need for a new structure	**Geophysical; hydrological; climatological ; biological**	**Earthquake; flood; drought; epidemic**	**-**	**Yes**	**No**	**2**	**1**
(Menoni, 2001)	Chains of damages and failures in a metropolitan environment some observations on the kobe earthquake in 1995	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Sharma & Priya, 2001)	Development strategies for flood prone areas case study patna india	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Tsujie, 2001)	Osaka citys earthquake preparedness improvement measures	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Sinha, 2000)	Plague a challenge for urban crisis management	**Biological disasters**	**Pandemic**	**-**	**No**	**No**	**3**	**1**
(Özerdem & Barakat, 2000)	After the marmara earthquake lessons for avoiding short cuts to disasters	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Sanderson, 2000)	**Cities disasters and livelihoods**	**Hydrological**	**Flood**	**-**	**Yes**	**No**	**1**	**1**
(Bahrainy, 1998)	Urban planning and design in a seismicprone region the case of rasht in northern iran	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**
(Cardona & Yamín, 1997)	Seismic microzonation and estimation of earthquake loss scenarios integrated risk mitigation project of bogotá colombia	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Davidson, 1997)	Eeri annual student paper award a multidisciplinary urban earthquake disaster risk index	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Castaños & Lomnitz, 1995)	Unplanned and unforeseen effects of instabilities	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Masri & Moore, 1995)	Integrated planning information systems disaster planning analysis	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**2**	**1**

(Steedman, 1995)	Megacities the unacceptable risk of natural disaster	**Geophysical**	**Earthquake**	**-**	**No**	**No**	**4**	**1**
(Thouret & Laforge, 1994)	Hazard appraisal and hazardzone mapping of flooding and debris flowage in the rio combeima valley and ibague city tolima department colombia	**Hydrological disasters**	**Flood**	**-**	**No**	**No**	**1**	**1**
(Tanguy, 1994)	The 1902 1905 eruptions of montagne pelée martinique anatomy and retrospection	**Geophysical**	**Earthquake; Volcano**	**-**	**No**	**No**	**4**	**2**
(Jairo Cardenas, 1990)	Natural disasters and urban struggle for housing	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**4**	**1**
(Oliver-Smith & Goldman, 1988)	Planning goals and urban realities postdisaster reconstruction in a third world city	**Geophysical**	**Earthquake**	**-**	**Yes**	**No**	**2**	**1**
(Havlick, 1986)	Third world cities at risk building for calamity	**Geophysical; hydrological**	**Earthquake; flood**	**-**	**Yes**	**No**	**1**	**1**

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