Comparison between TED Talks and scientific articles: global catastrophe risks

Comparação entre TED Talks e artigos científicos: riscos de catástrofe global

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ABSTRACT
The emergence of global catastrophic risks, such as the Covid-19 pandemic, highlights the need to popularize scientific knowledge, in order to disseminate the best practices for combating, preventing and mitigating ongoing environmental, social, economic, geopolitical and technological threats. From this perspective, this article seeks to validate the scientific knowledge publicly available through the online lecture platform TED Talks. The methodology applied was qualitative analysis through comparison between information from scientific databases, with a systematic review of the literature, and analysis of 32 video lectures. The results point to a convergence between the understanding published in scientific articles about global catastrophic risks and the knowledge popularized by the digital lecture platform analyzed.
RESUMO

A emergência de riscos de catástrofe global, tais como a pandemia de Covid-19, evidencia a necessidade de popularização do conhecimento científico, a fim de disseminar as melhores práticas de combate, prevenção e mitigação às ameaças ambientais, sociais, econômicas, geopolíticas e tecnológicas em curso. A partir de tal perspectiva, busca-se nesse artigo validar o conhecimento científico disponibilizado publicamente pela plataforma de palestras online TED Talks. A metodologia aplicada foi a análise qualitativa por meio de comparação entre informações oriundas de bases de dados científicos, com revisão sistemática da literatura, e análise de 32 palestras em vídeo. Os resultados apontam para uma convergência entre o entendimento publicado em artigos científicos sobre riscos de catástrofe global e os saberes popularizados pela plataforma de palestras digitais analisada.

Palavras-chave: TED Talks, riscos de catástrofe global, popularização do conhecimento.

1 INTRODUCTION

It seems to us that the current zeitgeist revolves around the collapse of society as we know it. Every day we are impacted by content and information about economic, environmental, geopolitical, social and technological aspects on a global scale, with great potential to cause serious damage to human well-being on a large scale. Global Catastrophic Risks (GCR) - risks of events that can significantly harm or even destroy human civilization on a global scale - have brought together researchers from different areas of knowledge in search of mapping the causes and understanding the future of humanity (BOSTROM, 2002; HARARI, 2018; MÜLLER; BOSTROM, 2016; UNICEF, 2020).

The challenges posed by the Covid-19 Pandemic, which is one of the biggest crisis ever faced by humanity (HARARI, 2020), have clearly exposed the global village to an avalanche of consequences caused by a single GCR, such as the collapse of health systems (VERELST; KUYLEN; BEUTELS, 2020); the disruption of production chains (RIZOU et al., 2020); the high increase in the unemployment rate; the growth of social inequality and the worsening of political
crisis (BLOFIELD; HOFFMANN; LLANOS, 2020). The magnitude and gravity of the issue have made GCRs part of the agenda of “smart cities” researchers and managers. Fair enough, since cities - even though they represent only 2% of the geographic area - are home to more than 55% of the world’s population, are responsible for 80% of greenhouse gas (GHG) emissions and consume 80% of the world’s resources (YIGITCANLAR, 2018).

In this context, concern with environmental issues brought back the initial conception of smart cities. The practice, unfortunately, demonstrates special attention focused on the technological core, leaving essential issues, such as sustainable development, on the sidelines of the main debates (YIGITCANLAR et al., 2018). However, the expectation arises that the demands intensified by the pandemic, the growing interest in studies of the risks of global catastrophes, together with the agendas defended by the United Nations (UN), will contribute significantly to the mapping and mitigation of GCR and their impacts in humanity and the planet (BOSTROM, 2016; HARARI, 2018).

The emerging concern, however, is that the worsening of GCR impacts will occur at a greater speed than humanity is prepared to face (LIU; LAUTA; MAAS, 2020). Global warming is proof of this. Its impacts are already felt in various parts of the planet. Kiribati, for example, a small island country in the Pacific, is already feeling the impacts and risk of extinction due to rising ocean levels, which makes it seek help from the United Nations (ALLGOOD; MCNAMARA, 2017; TONG, 2015). Thinking about the consequences of GCRs on people’s lives, it is correct to reflect and point out the urgent need for society to take ownership of the issue, and take responsibility individually and collectively for the search for solutions. From this perspective, sharing scientific knowledge is fundamental to consolidating democracy, access to quality information and the full exercise of citizenship (CAMARGO; BARBARÁ; BERTOLDO, 2008). However, the same technology that makes it possible to share knowledge on a large scale also strengthens the spread of fake news, synonymous with disinformation characterized by a lack of authenticity and its purpose to deceive, which is now
freely used by media outlets to indicate rumors and fake news that circulate mainly on social media (RECUERO; GRUZD, 2019).

Fake news, exponentially enhanced by the internet, has become a global phenomenon with negative effects on society. The anti-vaccine movement, flat earthism and global warming deniers are worrying results derived from fake news (LAZER et al., 2018). Therefore, mapping digital platforms committed to sharing scientific knowledge is necessary for direct opposition to fake news, aiming at the development of an intelligent society and, consequently, the mitigation of *Global Catastrophic Risks*.

With this in mind, the object of this research is designed, TED Talks - audio and video podcasts of up to 18 minutes with more than 18 million subscribers on their YouTube channel - are perhaps, today, the main example of this new form of dissemination. Given its magnitude, due to the volume of access, TED has been arousing interest among researchers and academics in investigating and validating the platform as a tool for tackling language barriers and access to scientific knowledge (COMPAGNONE, 2015; MIRANDA, 2016).

Based on this new type of information support, this article seeks to evaluate whether the TED Talks platform can be used as a reliable tool for popularizing scientific knowledge about *Global Catastrophic Risks*, collaborating in the construction of a more humane, intelligent and sustainable society. To do this, it seeks to answer the following research question: how does scientific content about *Global Catastrophic Risks* existing on the TED platform reflect that published in the scientific databases Scopus and *Web of Science*?

The choice of such platforms was due to their relevance in global terms. Scopus is the world's largest abstract and citation database of peer-reviewed literature. It offers a comprehensive view of global research production in the areas of science, technology, medicine, social sciences, arts and humanities. *Web of Science* is the world's largest electronic indexer of scientific information. It facilitates access to a set of citations data from scientific journal articles, books and other types of materials that cover all fields of academic knowledge. In addition to the articles, the report *The Global Risks Report 2020*, prepared by
World Economic Forum, completes the scientific research sources used for the comparative analysis process of TED Talks.

The general objective of the work was to validate TED Talks as a platform for sharing scientific knowledge about Global Catastrophic Risks. The specific objectives are: to collect scientific knowledge about GCR available in the Scopus and Web of Science databases; investigate the knowledge about GCR available on the TED Talks Platform; compare the mapped knowledge. The article was structured into five sections: an introductory section; the second is the literature review; the third explains the methodology used. Next, the results of the discussions are analyzed and in the fifth section, final considerations are presented.

2 LITERATURE REVIEW

The systematic literature review followed the data collection steps that “include establishing the limits for the study, collecting information [...] as well as establishing the protocol for registration” (CRESWELL, 1998, p. 212). An adaptation of the method proposed by Whittemore and Knafl (2005) was used, respecting the following steps: problem identification, literature search, data evaluation, data analysis and writing the review. The strategy considers the objectives, materials and methods to be clearly explained with a clear and reproducible methodology. Systematic reviews present the state of science, contribute to the development of theories, and have direct applicability to practice (BOTELHO; CUNHA; MACEDO, 2011; WHITTEMORE; KNAFL, 2005). The selection of articles, based on relevance criteria when reading the title and summary, was based on the search keys set out in Table 1, with a view to highlighting the main risks of global catastrophe, enabling comparison with the information available in TED Talks.
Table 1 – Search keys.

<table>
<thead>
<tr>
<th>Data base</th>
<th>Key words</th>
<th>Articles</th>
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</thead>
<tbody>
<tr>
<td>Scopus</td>
<td>KEY (&quot;end of the world&quot;) AND PUBYEAR &gt; 2014</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>KEY (&quot;Global Catastrophic Risks&quot;) AND PUBYEAR &gt; 2014</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>KEY (&quot;society collapse&quot;) AND PUBYEAR &gt; 2014</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>(AK= (end AND of AND the AND world)) AND IDIOMA: (English) AND TIPOS DE DOCUMENTO: (Article)</td>
<td>11</td>
</tr>
<tr>
<td>Web of science*</td>
<td>(AK= (global AND catastrophic AND risks)) AND IDIOMA: (English) AND TIPOS DE DOCUMENTO: (Article)</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>(AK= (society AND collapse)) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article)</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>83</strong></td>
</tr>
</tbody>
</table>

Source: Author (searches carried out in April 2023).

After identifying the articles, there was a new selection, discarding 53 sources because they deviated from the study topic. The studies reviewed in full text are identified in Table 2:

Table 2 – Primary sources.

<table>
<thead>
<tr>
<th>Nº</th>
<th>Reference</th>
<th>Title</th>
<th>Base</th>
<th>Key words</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>(ALVARADO et al., 2020)</td>
<td>Scaling of greenhouse crop production in low sunlight scenarios.</td>
<td>scopus</td>
<td>Alternative foods; Existential risk; Global Catastrophic Risk; Greenhouses; Low sunlight; Nuclear winter</td>
</tr>
<tr>
<td>2</td>
<td>(LIVNI, 2019)</td>
<td>Investigation of collapse of complex socio-political systems using classical stability theory</td>
<td>web of science</td>
<td>Societal collapse; Social complexity; Equilibrium of complex society; Social stability; Social dynamics; Sustainability; Resilience</td>
</tr>
<tr>
<td>3</td>
<td>(BESLEY; DIXIT, 2019)</td>
<td>Environmental catastrophes and mitigation policies in a multiregion world</td>
<td>web of science</td>
<td>catastrophic climate risk; global stock externality; climate change mitigation</td>
</tr>
<tr>
<td>4</td>
<td>(PEARCE; KHAKSARI; DENKENBERGER, 2019)</td>
<td>Preliminary Automated Determination of Edibility of Alternative Foods: Non-Targeted Screening for Toxins in Red Maple Leaf Concentrate</td>
<td>web of science</td>
<td>alternative food; edible leaves; edible plants; existential risk; Global Catastrophic Risk; leaf; leaf concentrate; leaf protein; no screening; public health; sustainable food systems; toxins</td>
</tr>
<tr>
<td>5</td>
<td>(TORRES, 2019)</td>
<td>Existential risks: a philosophical analysis</td>
<td>scopus</td>
<td>analysis; existential risk studies; Existential risks; Global Catastrophic Risks</td>
</tr>
<tr>
<td>6</td>
<td>(KUHLEMANN, 2019)</td>
<td>Complexity, creeping normalcy and conceit: sexy and unsexy catastrophic risks</td>
<td>scopus</td>
<td>Cognitive biases; Environmental politics; Existential risk; Global Catastrophic Risks; Overpopulation; Risk assessment</td>
</tr>
<tr>
<td>7</td>
<td>(MANHEIM, 2018)</td>
<td>Questioning Estimates of Natural Pandemic Risk</td>
<td>web of science</td>
<td>Risk estimates; Pandemics; Existential risk; Global catastrophic biological risk</td>
</tr>
<tr>
<td>N°</td>
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<tr>
<td>8</td>
<td>(TORRES, 2018)</td>
<td>Agential risks and information hazards: An unavoidable but dangerous topic?</td>
<td>scopus</td>
<td>Agential risks; Existential risks; Global Catastrophic Risks; Omnicidal agents</td>
</tr>
<tr>
<td>9</td>
<td>(PEARCE; DENKENBERGER, 2018)</td>
<td>A National Pragmatic Safety Limit for Nuclear Weapon Quantities</td>
<td>scopus</td>
<td>Atomic bombs; Existential risk; Futures; Global Catastrophic Risk; National survival; Nuclear proliferation; Nuclear safety; Nuclear war; Nuclear weapons; Nuclear winter</td>
</tr>
<tr>
<td>10</td>
<td>(DENKENBERGER; PEARCE, 2018a)</td>
<td>Cost-effectiveness of interventions for alternate food in the United States to address agricultural catastrophes</td>
<td>scopus</td>
<td>Alternate food; Existential risk; Global Catastrophic Risk; Monte Carlo; Nuclear terrorism; United States</td>
</tr>
<tr>
<td>11</td>
<td>(TURCHIN; DENKENBERGER, 2018a)</td>
<td>Surviving global risks through the preservation of humanity's data on the Moon</td>
<td>scopus</td>
<td>Existential risks; Global Catastrophic Risks; METI; Moon; Time-capsule</td>
</tr>
<tr>
<td>12</td>
<td>(TURCHIN; DENKENBERGER, 2018b)</td>
<td>Global catastrophic and existential risks communication scale</td>
<td>scopus</td>
<td>Existential risks; Global Catastrophic Risks; Policy; Risk probability; Torino scale</td>
</tr>
<tr>
<td>13</td>
<td>(DENKENBERGER; BLAIR, 2018)</td>
<td>Interventions that may prevent or mollify supervolcanic eruptions</td>
<td>scopus</td>
<td>Existential risk; Geoengineering; Geothermal energy; Global Catastrophic Risk; Supervolcano; Yellowstone</td>
</tr>
<tr>
<td>14</td>
<td>(AVIN et al., 2018)</td>
<td>Classifying Global Catastrophic Risks</td>
<td>scopus</td>
<td>Anthropogenic risk; Classification; Existential risk; Foresight; Global Catastrophic Risk; Interdisciplinary; Planetary boundaries; Prevention and mitigation; Risk assessment</td>
</tr>
<tr>
<td>15</td>
<td>(DENKENBERGER; PEARCE, 2018b)</td>
<td>Micronutrient Availability in Alternative Foods During Agricultural Catastrophes</td>
<td>scopus</td>
<td>Alternate food; Alternative food; Essential nutrients; Existential risk; Global Catastrophic Risk; Micronutrients; Nuclear war; Nutrients; Public health; Vitamins</td>
</tr>
<tr>
<td>16</td>
<td>(DENKENBERGER et al., 2017)</td>
<td>Feeding everyone if the sun is obscured and industry is disabled</td>
<td>scopus</td>
<td>Cyber attack; Electromagnetic pulse; Existential risk; Global Catastrophic Risk; Nuclear war; Solar storm</td>
</tr>
<tr>
<td>17</td>
<td>(TURCHIN; PATRICK GREEN, 2017)</td>
<td>Aquatic refuges for surviving a global catastrophe</td>
<td>scopus</td>
<td>Disaster shelters; Existential risk; Global Catastrophic Risk; Human extinction; Refuges; Social collapse</td>
</tr>
<tr>
<td>18</td>
<td>(BARRETT, 2017)</td>
<td>Value of Global Catastrophic Risk (GCR) Information: Cost-Effectiveness-Based Approach for GCR Reduction</td>
<td>scopus</td>
<td>Cost-effectiveness analysis; Global Catastrophic Risk; Value of information</td>
</tr>
<tr>
<td>19</td>
<td>(ABDELKHALIQ et al., 2016)</td>
<td>Providing Non-food Needs if Industry is Disabled</td>
<td>scopus</td>
<td>Computer virus; Electricity; Existential risk; Global Catastrophic Risk; High-altitude electromagnetic pulse; Industry; Solar storm</td>
</tr>
<tr>
<td>Nº</td>
<td>Reference</td>
<td>Title</td>
<td>Base</td>
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<tr>
<td>20</td>
<td>(DENKENBERGER et al., 2017)</td>
<td>Feeding Everyone if Industry is Disabled</td>
<td>scopus</td>
<td>Computer virus; Electricity; Existential risk; Food; Global Catastrophic Risk; High-altitude electromagnetic pulse; Industry; Solar storm</td>
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<td>21</td>
<td>(GRISWOLD et al., 2016)</td>
<td>Vitamins in Agricultural Catastrophes</td>
<td>scopus</td>
<td>Alternate food; Existential risk; Global Catastrophic Risk; Nuclear war; Vitamins</td>
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<td>22</td>
<td>(DENKENBERGER; PEARCE, 2016)</td>
<td>Cost-Effectiveness of Interventions for Alternate Food to Address Agricultural Catastrophes Globally</td>
<td>scopus</td>
<td>Agricultural catastrophe; Alternate food; Global Catastrophic Risk; Intervention cost-effectiveness</td>
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<td>23</td>
<td>(ĆIRKOVIĆ; VUKOTIĆ, 2016)</td>
<td>Long-term prospects: Mitigation of supernova and gamma-ray burst threat to intelligent beings</td>
<td>scopus</td>
<td>Astroengineering; Catastrophism; Global Catastrophic Risks; SETI; Supernovae/gamma-ray bursts</td>
</tr>
<tr>
<td>24</td>
<td>(HAQQ-MISRA, 2015)</td>
<td>Should we geoengineer larger ice caps?</td>
<td>web of science</td>
<td>Global Catastrophic Risk; Geoengineering; Glacial cycles; Climate change</td>
</tr>
<tr>
<td>25</td>
<td>(BAUM; DENKENBERGER; HAQQ-MISRA, 2015)</td>
<td>Isolated refuges for surviving global catastrophes</td>
<td>web of science</td>
<td>Catastrophic threats; Global Catastrophic Risk; Refuges; Surface-independence</td>
</tr>
<tr>
<td>26</td>
<td>(MAJOT; YAMPOLSKIY, 2015)</td>
<td>Global Catastrophic Risk and security implications of quantum computers</td>
<td>web of science</td>
<td>Quantum computing; Cryptography; Global Catastrophic Risk; Post-quantum; RSA; ECC</td>
</tr>
<tr>
<td>27</td>
<td>(BECKSTEAD, 2015)</td>
<td>How much could refuges help us recover from a global catastrophe?</td>
<td>scopus</td>
<td>Bunkers; Disaster shelters; Existential risk; Global Catastrophic Risk; Refuges; Social collapse</td>
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<tr>
<td>28</td>
<td>(BAUM, 2015a)</td>
<td>Confronting the threat of nuclear winter</td>
<td>scopus</td>
<td>Catastrophic threats; Global Catastrophic Risk; Nuclear war; Nuclear winter; Risk reduction</td>
</tr>
<tr>
<td>29</td>
<td>(BAUM, 2015b)</td>
<td>The far future argument for confronting catastrophic threats to humanity: Practical significance and alternatives</td>
<td>scopus</td>
<td>Catastrophic threats; Co-benefits; Existential risk; Far future; Global Catastrophic Risk; Mainstreaming</td>
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<td>30</td>
<td>(Baum et al., 2015)</td>
<td>Resilience to global food supply catastrophes</td>
<td>scopus</td>
<td>Alternative foods; Food security; Global Catastrophic Risk; Nuclear winter; Resilience; Volcanic winter</td>
</tr>
</tbody>
</table>

Source: Author (searches carried out in April 2023).

This review allowed us to identify a series of threats that could lead to the collapse of human civilization. Among them, structural unemployment or underemployment, environmental destruction and man-made disasters, international conflicts with local consequences and epidemics, infectious diseases and large-scale cyber attacks stand out. According to the World
Economic Forum, these catastrophic risks fall into five categories: economic, environmental, geopolitical, social and technological. Environmental risks were the most cited, with emphasis on major natural disasters and extreme weather events. Wars with weapons of mass destruction (geopolitical) and food crises (social) also appear in many of the studies analyzed.

The scenario presented by the WEF is aligned with the research mapped by the systematic review, which also identified the environmental risk category as the most present in the articles, addressed in 25 of the thirty documents. According to the literature, there are several global catastrophic risks that can block the sun, severely damaging food production in the world, among which the following stand out: asteroid impact; comets; volcanic eruptions; and nuclear war, with the potential to cause nuclear winter, according to articles {6}{13}{15}{18}{28}. Another four articles focus their research exclusively on environmental causes {3}{13}{23}{24}.

The analysis of the other categories of Global Catastrophic Risks, also involves economic, geopolitical and social issues, presented by the WEF as GCR capable of causing the collapse of current society. The first category, although present in a smaller number of articles, highlights fiscal crises in the main economies; high structural unemployment or underemployment and failure and/or deficiency of critical infrastructure as triggers of global catastrophic risks {6}{16}. Considered as the answer to many of the GCR, technology may also be one of humanity's greatest challenges. Adverse consequences of technological advances; collapse of networks and critical information infrastructure, large-scale cyber attacks, major fraud incidents or data theft are the main catastrophic technological risks. Of the scientific articles analyzed, thirteen of them delve into the debate about the dangers that technology represents for the future of human society.

3 METHODOLOGY

Regarding the methodological definition, this study is characterized as basic qualitative research. For Creswell and Creswell (2021), qualitative research
is a means of exploring and understanding the meaning that individuals or groups attribute to a social or human problem. Along this path, attention turned to the problems presented by Global Catastrophic Risks: risks that could contribute to the end of the human species. Merriam (2009) argues that the qualitative method seeks to gather, understand and interpret phenomena in terms of the meanings that people bring to them. In this article we are interested in validating the TED Talks platform in relation to sharing scientific knowledge about Global Catastrophic Risks.

The precepts of basic qualitative research were observed, aligned with the pragmatic philosophical conception, the strategies and methodological path that best respond to the research problem were defined. The research design illustrating the strategies and methodological path adopted in this work can begin with the collection, analysis and interpretation of data and develops in three stages, consisting of consultation of databases; survey on the TED Talks platform; and integration between the knowledge highlighted. The second stage of the research, which uses the TED Talks platform as the object of study, was outlined based on the processes of analysis and selection of raw data, with subsequent analysis of the speeches present on the platform. In the third phase, the results are discussed and the knowledge mapped in the databases consulted are compared.

4 RESULTS AND DISCUSSION

In systematic reviews of the literature on smart cities, consulted for this research, two points of view are clearly presented: (i) those who defend smart cities by the prerogative of technology, especially focused on connectivity; and (ii) the perception of smart cities connected particularly to human and social capital (MEIJER; BOLÍVAR, 2016; YIGITCANLAR, 2018). The role of Information and Communication Technologies (ICTs) is the main characteristic of the smart city discussed in the literature (TRANOS; GERTNER, 2012). This involves the use of a wide range of infrastructure, including transport, commercial and housing
services. It is ICTs in particular that support all these networks and that are at the center of the idea of a smart city (MOZŪRIŪNAITĖ; SABAITYTĖ, 2021).

Even though it represents a significant part of the line of research into smart cities, the technological axis has lost or, at least, divided space with the understanding of a smart city designed for people. This point of view takes shape in the complex moment that humanity faces, particularly associated with the impacts of global warming and the challenges to sustainable development. The concepts derived from the studies by YIGITCANLAR et al. (2018) contribute to the systemic vision of smart cities, and the understanding of the need to think about urban centers in their entirety, especially focused on solving problems and presenting answers that improve the lives of people and the planet, including in relation to the perspective of prevention and mitigation of global catastrophic risks.

With the majority of the world's population residing in urban areas, cities are emerging as key sites of social experimentation and problem solving (SHELTON; ZOOK; WIIG, 2015). Cities provide a privileged space for people to meet and this is what urban life highlights most: the possibility of meeting many people from different cultures and different age groups. Diversity enriches cultural life and provides favorable spaces for sharing knowledge, promoting the collective development of intelligent solutions to urban problems (CARAGLIU; DEL BO; NIJKAMP, 2011; HARARI, 2018). Improving the living environment and increasing the quality of life are two important objectives of smart cities, since people are the main users of devices and services (ZUBIZARRETA; SERAVALLI; ARRIZABALAGA, 2016).

Since people are the true users of cities, it makes sense that smart cities consider the people axis, and prioritize it as the core of the debate. “A human smart city First and foremost, it meets people and their needs” (YIGITCANLAR et al., 2018, p. 04). Therefore, thinking about smart cities is, especially, thinking about people. But it is also about thinking about people capable of taking intelligent actions (MEIJER and BOLÍVAR, 2015; CARAGLIU et al. 2011; ZUBIZARRETA et al., 2015). The concept of a smart city in this aspect is mainly
based on the characteristics of intelligent inhabitants, in terms of educational level (formally educated people) and their level of education is seen as the main driver of urban growth (MEIJER and BOLÍVAR, 2015, p. 397).

The literature seems to emphasize the level of education and ease of interaction with technologies as main characteristics of "smart people" (CARAGLIU et al. 2011; TRANOS and GERTNER, 2012; MEIJER and BOLÍVAR, 2015). Zubizarreta et al. (2015) argue that the citizen is the protagonist of the city, and their active participation in public life is essential for the development of a smart city. To encourage intelligent citizen behavior and active participation in public life, creative and multicultural training and an ability to cooperate in the city’s daily issues are necessary.

In addition to these, the concept of sustainability has been a much discussed topic for decades, regarding the organization of urban and rural areas. Since the 1970s, the United Nations (UN) has been debating the subject, with the term “sustainable development” being introduced by Brundtland in 1987 with the preparation of the report known as “Our Common Future”. In essence, sustainable development is a process of change in which the exploitation of resources, the targeting of investments, the guidance of technological development and institutional change are in harmony and reinforce the current and future potential to satisfy human aspirations and needs. (OUR COMMON FUTURE, 1987, p. 43).

The topic has been the focus of debates at several conferences organized by the UN, culminating in the Paris Agreement to reduce GHG emissions, and the compilation of the 17 Sustainable Development Goals (SDGs), published in the report entitled "Transforming Our World: The 2030 Agenda for Sustainable Development", later known only as "Agenda 2030". The document produced makes clear the characteristic of integration and indivisibility of objectives in the three dimensions of sustainable development: economic development, social development and environmental protection. (UNITED NATIONS, 2022).
4.1 GLOBAL CATASTROPHIC RISKS

Natural disasters, such as supervolcano eruptions and large asteroid collisions, as well as disasters caused by human activity, such as nuclear wars and global warming, are examples of Global Catastrophic Risks (GCRs). Despite being distinct, they have a common result: the collapse of human civilization as we know it or even its extinction (BAUM et al., 2015; BOSTROM, 2002; HARARI, 2018). The GCR theme was initially addressed by John Leslie in his book "The end of the world: the science and ethics of Human Extinction", published in 1996, but it was only after Nick Bostrom's publications in 2002 that the subject became an issue, motivating the founding of groups in universities and research organizations dedicated to the topic (TORRES, 2019). Initially termed “existential risks” by Nick Bostrom, they were defined as those in which an adverse outcome would annihilate intelligent life on Earth or permanently and drastically reduce its potential. This definition brings the apocalyptic notion of “end of the world” caused by an event or chain of events that would lead to the total collapse of society as we know it.

4.2 PLATAFORMA TED

The choice of the TED platform for analysis, over others, is due to its expressiveness, free nature and especially the curation to which it is submitted, being recognized as a powerful tool for sharing multiple and varied knowledge. All searches carried out to collect data used the language filters “english” and theme “global issues”. Only videos published from 2015 to 2020 were selected. The keywords and results are presented in Table 3.

<table>
<thead>
<tr>
<th>Key words</th>
<th>RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;end of the world&quot;</td>
<td>105</td>
</tr>
<tr>
<td>&quot;Global Catastrophic Risks&quot;</td>
<td>1</td>
</tr>
<tr>
<td>“society collapse”</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>112</strong></td>
</tr>
</tbody>
</table>

Source: Author (searches carried out in April 2023).
Once the database search phase was completed, the second stage was aimed at obtaining the study corpus. Eighty TED Talks were identified and excluded because they were listed twice, or were considered out of context (example: talks focused on solutions to global challenges, but which do not address the problem as an existential risk). The review and selection respected videos with the potential to contribute to the research question. As a form of selection, all descriptions and transcripts of TED Talks listed by the platform were read. The presentation of the 32 TED Talks selected for analysis and comparison can be seen in Table 4.

<table>
<thead>
<tr>
<th>N°</th>
<th>Speaker</th>
<th>Title</th>
<th>Key words</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>(RUSSELL, 2020)</td>
<td>A path to higher education and employment for refugees</td>
<td>Audacious Project, Education, Teaching, Africa, Refugees, Global Issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The link between climate change, health and poverty</td>
<td>Climate Change, Community, Health Care, Social Change, Human Rights, Activism, Global Issues, Humanity, Poverty, Health, TEDMED</td>
</tr>
<tr>
<td>II</td>
<td>(HOLDER, 2020)</td>
<td>A global pandemic calls for global solutions</td>
<td>Coronavirus, Pandemic, Epidemiology, Virus, Big Problems, Global Issues, Collaboration, Science</td>
</tr>
<tr>
<td>III</td>
<td>(BRILLIANT, 2020)</td>
<td>How to shift your mindset and choose your future</td>
<td>Climate Change, Choice, Leadership, Society, Global Issues, Environment, Fear, Humanity</td>
</tr>
<tr>
<td>IV</td>
<td>(RIVETT-CARNAC, 2020)</td>
<td>How we must respond to the coronavirus pandemic</td>
<td>Health Care, Disease, Virus, Medicine, Global Issues, Economics, Pandemic, TED Connects, Coronavirus</td>
</tr>
<tr>
<td>IN</td>
<td>(GATES, 2020)</td>
<td>What we do (and don’t know about the coronavirus)</td>
<td>Pandemic, Health, Public Health, Global Issues, Illness, Disease, Vaccines, Virus, Coronavirus</td>
</tr>
<tr>
<td>WE</td>
<td>(HEYMANN, 2020)</td>
<td>Climate change will displace millions. Here's how we prepare</td>
<td>Climate Change, Community, Social Change, Cities, Global Issues, Human Rights, Environment, Society, Activism, Humanity</td>
</tr>
<tr>
<td>VII</td>
<td>(BATTLE, 2020)</td>
<td>The urgent case for antibiotic-free animals</td>
<td>Health, Disease, Medicine, Microbes, Public Health, Global Issues, Epidemiology</td>
</tr>
<tr>
<td>VIII</td>
<td>(MARCHAL, 2020)</td>
<td>How we can protect truth in the age of misinformation</td>
<td>News, Internet, Social Media, Global Issues, Data, Society, TEDx</td>
</tr>
<tr>
<td>IX</td>
<td>(LESSON, 2019)</td>
<td>3 questions we should ask about nuclear weapons</td>
<td>Nuclear Weapons, Policy, Debate, Democracy, Humanity, Global Issues</td>
</tr>
</tbody>
</table>
XIII (HAYHOE, 2018) The most important thing you can do to fight climate change: talk about it


XIV (FRISCHMANN, 2018) 100 solutions to reverse global warming

United States, Asia, China, Politics, Global Issues, War, Economics, Future, Foreign Policy, History, Peace

XV (ALLISON, 2018) Is war between China and the US inevitable?


XVI (MANN, 2018) How will we survive when the population hits 10 billion?

Activism, Big Problems, Climate Change, Collaboration, Future, Communication, Inequality, Government, Global Issues, Society, Social Change, Politics

XVII (KLEIN, 2018) How shocking events can spark positive change


XVIII (ISHII, 2018) An economic case for protecting the planet


XX (HALSTEAD, 2017) A climate solution where all sides can win

Big Problems, Business, China, Economics, Climate Change, Global Issues, Goal-Setting, Policy, Politics, Government, Pollution, Society

XXI (HARARI, 2017) Nationalism vs. globalism: the new political divide


XXII (KURUP, 2017) A young scientist's quest for clean water


XXIII (GREGORY, 2017) The world doesn’t need more nuclear weapons


XXIV (LASSITER, 2016) We need nuclear power to solve climate change
In the same way as the Global Risks Report 2020 publication, environmental issues are highlighted in the study corpus, mentioned in 18 of the 32 TED Talks, they share the spotlight with the social category, which had 16 mentions. This result is not difficult to justify, since environmental issues directly enhance social GCR. In the TED Talk entitled "My country will be underwater soon — unless we work together" (TONG, 2015), the then president of Kiribati, Anote Tong, shares with the world his concern about the likelihood of Kiribati disappearing in the face of rising levels of the sea, a direct result of global warming. Geopolitical risks are covered in seven TED Talks. The focus of the speeches is on conflicts that could trigger wars using nuclear weapons.

Still in the field of imminent conflicts, a new context expands the perspectives of a global war: technology. The use of robots and artificial intelligence as weapons of war adds new challenges to scholars and strategists responsible for State defense policies [X]. Not surprisingly, technology alone
represents a category, along with WEF, and was directly addressed in 4 TED Talks [IX][X][XXI][XXXI].

Cyber attacks [X][XXI]; bioengineering [XXI], and the main enemy of current democracy fake news [IX] are addressed as global risks capable of triggering financial crises, political conflicts and negative impacts on elections for heads of state across the planet. "A recent study from Oxford University showed that in the recent Swedish elections, a third of all news shared on social media about the election was false or incorrect" ([IX], 02:17”). The effects are most worrying with the evolution of new tools such as "deepfake" (very realistic video and/or audio montages), associated with generative adversarial networks and artificial intelligence.

4.3 TED TALKS AND THE POPULARIZATION OF SCIENTIFIC KNOWLEDGE

Human beings owe their survival and evolution entirely to the production and transmission of knowledge between generations. The domain of fire, agriculture, commerce, health and quantum physics are all accumulations of knowledge passed from generation to generation, at first orally, then with paintings and, with the advent of writing by the Sumerians, formalized in texts increasingly technical throughout history (HARARI, 2017). With the Renaissance, between the 15th and 16th centuries, ancient knowledge was gradually reappropriated and expanded. The so-called Scientific Revolution had important figures such as Nicolaus Copernicus, Galileo Galilei and René Descartes who published important thoughts and discoveries, quickly disseminated among other scholars through the newly invented press (SILVA; NETO, 2015). However, knowledge was still far from the general population.

It was in the 18th century, with the Enlightenment and the appreciation of reason for human development, that the creation of the press and the emergence of universities took advantage, expanding the importance of knowledge and gradually bringing it into the public domain. The Industrial Revolution accelerated this process and, as humanity became increasingly efficient and technologically developed, the more science advanced, knowledge became specialized and its
dissemination began to be restricted once again to specialists in their journals (GERMANO; KULESZA, 2007).

Directly facing language and access barriers, new forms of disseminating scientific knowledge have emerged on public internet networks: the digital talks on the TED platform and the *podcasts* with interviews and discussions between scientists, both available free of charge, are two examples of an important movement to popularize knowledge. We live in a knowledge society, where technoscience is increasingly necessary for ordinary citizens, an input to obtain guidance in daily decisions (BENSAUDE-VINCENT, 2009; KNIGHT, 1995). As a layman, the average citizen is not prepared to read original texts written by researchers and aimed at other researchers. Without mastering the necessary technique, they need help to decode and understand scientific studies (CAMARGO; BARBARÁ; BERTOLDO, 2008).

Despite technological facilities, the spread of disinformation is accelerated by the internet, artificial intelligence and network dynamics. In a report carried out by BBC News Brasil, it is revealed that the anti-vaccine network in Brazil imports conspiracy theories from the USA and grows with YouTube's recommendation system, contributing to the validation that mass digital platforms are powerful tools for disseminating information - whether they are false or not (GRAGNANI, 2019). This denialist front regarding scientific knowledge finds strength in one of the most critical moments faced by humanity, perhaps the greatest of our generation, the pandemic scenario caused by Covid-19. Facts and information like these reinforce the importance of popularizing scientific knowledge, contributing to the advancement of society, mitigating the distance between the strands of knowledge and bringing people together through the collective understanding of knowledge, which is so necessary in a polarized world (HARARI, 2017).

The spread of fake news, which directly impacted the presidential elections in many countries, has encouraged ordinary citizens to believe and support false information - such as the anti-vaccine movement - and has strength in digital media, especially the Internet (LAZER, 2018). The popularization of scientific
knowledge needs to use this same valuable tool. Positive results can already be seen on many digital platforms, with emphasis on TED Talks, the largest and most widespread lecture platform that for over 35 years has been popularizing speeches by experts in different areas, covering a variety of topics, and aiming at multiple and varied audiences.

TED is an acronym in English for Technology, Entertainment, Design. The initiative began in 1984, by Richard Saul Wurman - owner of a publishing house - as an event that brought together some guests to attend lectures, and with no intention of occurring again (MIRANDA, 2016). Only in 1990, in the city of Monterey, California, Richard and his partner Harry Marks resumed the movement. The TED Conference became an annual event, attracting a growing, influential, multidisciplinary audience that shared the sense of curiosity. Still, the events were held exclusively for guests (ted.com). In 2001, TED was acquired by Sapling Foundation, a non-profit organization founded by new media entrepreneur Chris Anderson, who became the official curator.

In June 2006 the first six TED Talks - audio and video podcasts of up to 18 minutes - were posted online. In September it had already surpassed more than one million views. TED Talks proved so popular that in 2007, the TED website was relaunched around them, giving a global audience free access to some of the world's greatest thinkers, leaders, and teachers. According to data from the platform, in 2009, TED Talk had grown to 100 million views. In 2012, TED Talks celebrated its billionth video viewing. With his short talks being watched around the world, sustaining an average of 17 views per second, and over three billion hits per year.

Today, with a mission to spread ideas, TED covers nearly every topic — from science to business to global issues — in more than 100 languages. Meanwhile, independently run TEDx events help share ideas in communities around the world. Because of this, TED has been attracting interest, albeit recently, from researchers and academics interested in investigating and understanding this powerful platform as a tool for popularizing knowledge, especially scientific knowledge. In a quick search on the Scopus platform, using
the keyword “TED Talk”, more than 250 works are presented in 23 areas of knowledge in more than 50 countries around the world.

5 FINAL CONSIDERATIONS

The Pandemic caused by the Coronavirus, which continues to impact people's lives and the economy of all countries, began during the process of creating this research and intensified the need for debates on the topic and the search for answers. In the process of overcoming the pandemic, sharing knowledge about the risks of an event with catastrophic potential among the largest number of people became the only way to prevent and mitigate even more tragic outcomes. With easy access via the internet, anyone can join the debate about the future of humanity. But the same internet that informs us also confuses us through an avalanche of fake news. The impacts of this dissemination of untruths are already causing real harm to society. The anti-vaccine movement and global warming denialism gain strength at one of the most critical moments in our history, precisely when science should be a protagonist in responding to the problems of the Covid-19 Pandemic and the challenges of climate change.

By deepening the investigation on the topic, as researchers, we sought to find allies in the dissemination of scientific knowledge about Global Catastrophic Risks, hence the interest in validating the TED Talks Platform. In parallel, as citizen, we tried to understand what the catalyst for this imminent collapse would be. The World Economic Forum points out that there are countless possibilities and categorizes them into five types: economic; environmental; geopolitical; social and technological. This perception is shared by the researchers and speakers who form the corpus of this study, who portray both in the scientific articles consulted and in the lectures presented through TED Talks, their thoughts guided by science. In this way, it was possible to answer the research question: How does scientific content about Global Catastrophic Risks existing on the TED platform reflect that published in the scientific databases Scopus and Web of Science? - Through the popularization of knowledge.
Throughout the analysis process, it was possible to validate the TED Talks platform in sharing scientific knowledge. All five categories mapped by WEF were included in the registry of selected TED Talks, as well as in the scientific articles made available by the reviewed databases. The online lecture platform is a powerful and important tool that allows scientists to disseminate their findings to a diverse and expanded audience, facilitating the democratization of knowledge and the full exercise of citizenship.

RESEARCH LIMITATIONS AND FUTURE STUDIES

The topic of Global Catastrophic Risks is very broad and multidisciplinary. For this reason, a more detailed approach to each topic or all aspects of each GCR is not possible, which is a limitation of this study. Therefore, it is proposed as a theme for future research to deepen each of the points raised by the World Economic Forum. Regarding the TED Talks platform, as a tool for sharing scientific knowledge, this study only examined research topics. The same replications in other regions are needed for future studies.
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