



Transnational Dialogues on Interdisciplinary Approaches for Advancing People-Centered Warning Systems

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Abstract

The United Nations Office for Disaster Risk Reduction and the World Meteorological Organization launched in 2022 the executive plan of the world program “Early Warning Systems for All” to be implemented from 2023 to 2027. This program champions an investment of USD 3.1 billion into the four pillars of warning systems and calls for multi-hazard and people-centered warning systems (PCWS). However, there is a scientific gap concerning interdisciplinary approaches to promoting them. Motivated by the call for action of “Early Warning Systems for All” and warning research gaps on the lack of interdisciplinarity, a workshop series “Interdisciplinary Approaches for Advancing People-Centered Warning Systems” was held in early 2023. This short article shares the preliminary findings and recommendations of this research, which involved a transnational virtual dialogue between one scientific organization in Brazil and one from the United States. The findings and recommendations discussed in three virtual sessions and one collective working paper were centered on three aspects: promoting interdisciplinary integration in research; the need to discuss the characteristics of a PCWS; and promoting problem- and solution-based programs with people to integrate them at all phases of the warning system.

Keywords Capacity building · Cooperation · Interdisciplinary methods · Warning implementation · Warning research

1 Introduction

A warning system can be defined as an integrated structure of hazard monitoring, forecasting, and prediction, disaster risk assessment, communication, and preparedness activities, and processes that enable individuals, communities, governments, businesses, and others to take timely action to reduce disaster risks in advance of hazards (Mileti and Sorensen 1990; UNISDR 2015; UNDRR and WMO 2022a, 2022b). There is a growing scientific consensus that a warning system should address single or multiple hazards and vulnerabilities across its interrelated warning subsystems: risk knowledge, monitoring, risk communication, and response capability (Basher 2006; Garcia and Fearnley 2012; Kelman and Glantz 2014; Macherera and Chimbari

2016; Marchezini et al. 2017; Clegg et al. 2022; Marchezini et al. 2022).

These four interrelated subsystems have guided the investments for warning implementation. In November 2022, the United Nations Office for Disaster Risk Reduction (UNDRR) and the World Meteorological Organization (WMO) launched the executive plan of the world program “Early Warning Systems for All” to be implemented from 2023 to 2027. This program champions an investment of USD 3.1 billion into the four pillars of warning systems: (1) disaster risk knowledge (USD 374 million); (2) monitoring, observations, and forecasting (USD 1.18 billion); (3) dissemination and communication (USD 550 million); and (4) preparedness and response (USD 1 billion) (UNDRR and WMO 2022a). The executive plan calls for an interdisciplinary effort to promote multi-hazard and people-centered warning systems. However, there is a scientific gap concerning interdisciplinary approaches to promoting multi-hazard and people-centered warning systems.

While multidisciplinary refers to two or more disciplines focusing on a research question, each one using its own concepts and methods, the intent of interdisciplinarity is to overcome disciplinary limitations to analyze complex

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problems, sharing concepts, methods, and approaches to comprehend these complex problems together (Bammer 2013). Sometimes complex problems require transcending scientific knowledge, considering other forms of knowledge (traditional, local, and so on). When this happens, a transdisciplinary initiative can occur.

Motivated by the call for action of “Early Warning Systems for All” and warning research gaps on the lack of interdisciplinarity (Mileti and Sorensen 1990; Kelman and Glantz 2014; Marchezini 2020a), I decided to organize the workshop series “Interdisciplinary Approaches for Advancing People-Centered Warning Systems” as part of the activities of my postdoctoral scholarship. The aim of this short article is to share the preliminary findings of this research. The following section introduces the methods. Then the main findings and suggestions are discussed. Finally, I highlight some challenges ahead.

2 Methods: How Do We Engage Scientists in an Interdisciplinary Dialogue?

The workshop series gathered 27 to 30 researchers and practitioners from one scientific organization in Brazil and one from the United States. The three virtual 60-min sessions via a virtual Zoom conference also included pre-meeting preparation activities (three online trainings and six readings).

A total of 27 participants from different fields of knowledge and career stages attended the first meeting on 28 February 2023. To begin, each participant offered a self-introduction describing their work as disciplinary or multi-, inter-, and/or transdisciplinary based on definitions proposed by Peek and Guikema (2021). The interactive exercise helped to identify challenges in understanding the differences among these approaches and how to place ourselves in each of them based on an exercise of collective- and self-reflection. After the self-introductions, the director of each organization presented the main institutional projects and challenges related to warning systems.

The second session gathered 30 people on 21 March 2023, and focused on developing people-centered warning systems. The session was organized in two parts. First, participants focused on the case study of the MAP-Fire project in the tri-national frontier of southwestern Amazonia (Pismel et al. 2023), listening to its interdisciplinary challenges, such as the time spent interacting and building a team, the costs of time and money to build trust, and how to co-develop products with users. The second part of the meeting was an interactive session in six breakout rooms, each containing five participants. The conversation in small groups was guided by four questions that were analyzed in a collective working paper (Marchezini, Champeau, et al. 2023):

- How can social science be more deeply integrated into engineering and physical science?
- What methods and approaches can be used to promote interdisciplinary integration?
- What is a people-centered warning system?
- How can we build people-centered warning systems?

The third session gathered 28 participants on 25 April 2023, and focused on discussing potential ideas for future research collaboration between the two scientific organizations. The session was organized in two parts. First, a researcher talked about the convergence approach to hazards and disaster studies (Peek et al. 2020) and explained the importance of training and education resources developed through the CONVERGE initiative. The second part of the meeting was an interactive session guided by four questions in five breakout rooms, each containing 4–6 participants:

- What are the problem-focused and solution-based outputs that our organizations could potentially contribute to?
- What are the potential methods?
- What are the funding opportunities?
- What are the research priorities?

The five groups discussed the questions, drafted their proposals, and were asked to choose two research priorities to be presented in the general virtual room. After the brief presentation of 10 proposals, participants used the Zoom software poll to vote on one research priority. After the third session, I wrote a brief report describing these potential ideas for future research collaboration between the two scientific organizations, and the participants revised and made their suggestions to improve the brief report.

All the conversations in these three virtual sessions were recorded and then systematized using the support of NVivo software. The outcome of these three sessions was a collective working paper containing recommendations to improve interdisciplinarity toward people-centered warning systems (Marchezini, Champeau, et al. 2023) and a brief report on the potential for future research collaboration between the two scientific organizations (Marchezini, Villarreal, et al. 2023).

Due to language barriers and time availability, it was not possible to invite emergency managers and communities at risk in Brazil and the United States to engage in these virtual conversations. However, an in-person workshop was conducted in Brazil on 30 June 2023, to listen to other social groups’ perspectives on people-centered warning systems. A future short paper will address findings related to this in-person workshop and also the findings of the third virtual workshop that focused on the potential for future research collaboration.

3 Findings and Discussion: How Can We Promote Interdisciplinary Integration in Warning Systems?

Discussing interdisciplinary approaches for advancing people-centered warning systems (PCWS) led us to identify three cross-cutting take-away messages. Specifically, several groups discussed the need to foster respect for (1) fellow scientists and practitioners, regardless of their field of study; (2) the wisdom of people who are not scholars to share the roles and power of knowledge production; and (3) interdisciplinary solutions to the complex problems of our times, including adequate funding to conduct this time-demanding work.

It is necessary to **respect and destigmatize fields/disciplines** to promote integration and inter-/cross-disciplinary training and innovation. This recommendation is aligned with several publications that have discussed interdisciplinary challenges in disaster studies and methods and tools to overcome these challenges (Marchezini 2020a, 2020b; DeRouen and Smith 2021; Morss et al. 2021; Peek and Guikema 2021; Zobel et al. 2021; Marchezini et al. 2022). It is essential to recognize that methods, tools, and applications also have limitations, especially when dealing with international collaboration, as we faced during our international dialogues in the workshop series. Similar language challenges and power imbalances will likely confound international projects funded by the program “Early Warning Systems for All” (UNDRR and WMO 2022a, 2022b). The second limitation is time constraints. Time is needed to make meaningful progress, apply an interdisciplinary approach, and discuss concepts and ways of framing research problems. Time availability influences research and implementation processes, especially if projects on PCWS truly commit to listening to local people and practitioners; notably, this type of limitation has been discussed by scientific studies on PCWS (Aguirre-Ayerbe et al. 2020; Gumiran and Daag 2021; Clegg et al. 2022; Shah et al. 2022).

Recognizing and sharing knowledge and power with diverse social groups is necessary, tailoring research to fit communities’ unique needs for PCWS. Diverse cultural aspects of warning systems should be considered and diverse ways should be adopted to include people across warning processes. Considering cultural aspects and strategies for inclusion requires intense methods, such as participatory action research and citizen science. At its core, this recommendation aligns with several publications that have advocated for more participation and inclusion in warning systems (Mileti and Sorensen 1990; Garcia and Fearnley 2012; Kelman and Glantz 2014; Baudoin et al. 2016; Macherera and Chimbari 2016; Marchezini et al.

2017; Preuner et al. 2017; Marchezini et al. 2018; West et al. 2021; Scolobig et al. 2022; Sadiq et al. 2023). Calls for participation may discuss strategies to avoid the logic of scientific colonialism discussed in *Disaster Studies Manifesto: Power, Prestige, and Forgotten Values*.

Finally, funding agencies need a culture change to **promote problem- and solution-based programs** that support inter- and transdisciplinary long-term projects, specifically by funding long-term projects (more than two years). Oftentimes, funding agencies want co-development with local communities, but the funding usually does not finance local actors or pay for the time that communities spend exchanging their knowledge with researchers and practitioners. The program “Early Warning Systems for All” champions an investment of USD 3.1 billion into the four pillars of warning systems (UNDRR and WMO 2022a). However, it is unclear if this program will pay local actors or only external consultants, nor if interdisciplinarity will be essential for funding the projects on PCWS. The executive plan (UNDRR and WMO 2022a) does not provide the definition of PCWS adopted nor the criteria to consider a warning system as people-centered. The executive plan also lacks a long-term strategy to maintain the PCWS after the program. Hope that a collective working paper (Marchezini, Champeau, et al. 2023a), especially the strengths of interdisciplinarity and international collaboration, triggers a critical debate on how UNDRR and WMO are implementing their plans for people-centered warning systems (Fig. 1).

4 Next Steps and Challenges Ahead

This first article shares some recommendations for promoting interdisciplinary integration for advancing PCWS, but we still need to write about and discuss PCWS. Webinar participants realized that the distinction between multi-, inter-, and transdisciplinarity and the definition of PCWS are unclear. Our ongoing project is drafting a second article to address these gaps and to discuss methods and approaches for PCWS based on a literature review and findings from virtual webinars and in-person workshops in Brazil with municipal civil defenses, nongovernmental organizations (NGOs), scientists, and practitioners.

Finally, we will start a new project called “Capacities of Organizations to Cope with Extreme Events” (COPE), a five-year initiative that will bridge teaching, research, and extension projects with universities and communities in order to design and implement local PCWS. It seems a good opportunity to discuss warning systems before emergencies and disasters. More than ever, we need to promote research, dialogue, and debate, and to formulate policies on PCWS.

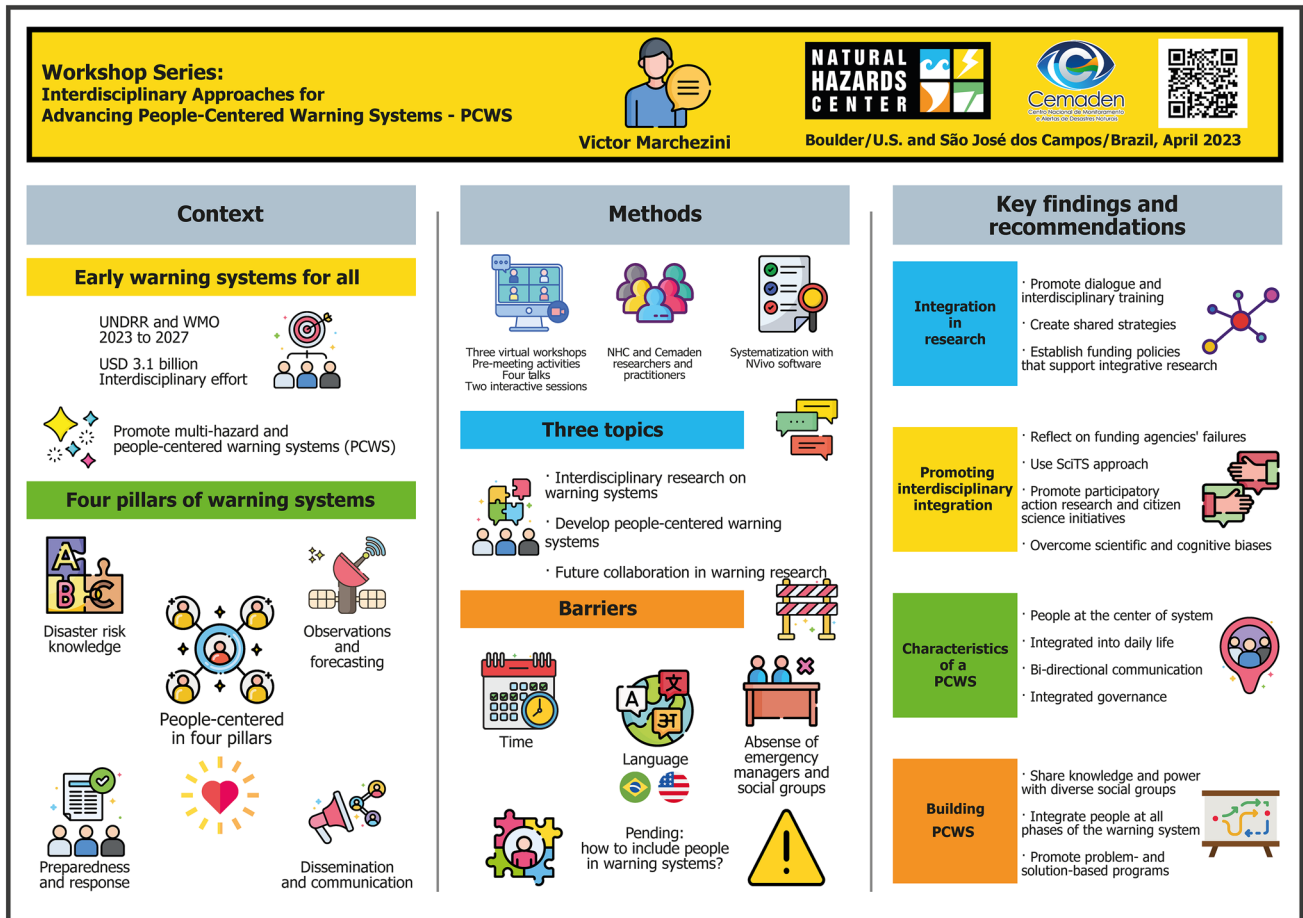


Fig. 1 Visual abstract of the workshop series “Interdisciplinary Approaches for Advancing People-Centered Warning Systems” (elaborated by Angelina Trinidad and Victor Marchezini). *Source* Marchezini, Champeau, et al. (2023)

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