

Innovative capacity building strategies for sustainable disaster risk management: a systematic review, conceptual framework, and future research directions

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Abstract. This systematic review examines innovative strategies for capacity building in sustainable disaster risk management (DRM). A review of 63 peer-reviewed articles, published between 2010 and 2024, was conducted using Scopus. The articles were analyzed to identify key themes related to technological innovations, community initiatives, and interdisciplinary approaches. Findings show that advancements in machine learning, Geographic Information Systems (GIS), and Information and Communication Technologies (ICT) significantly enhance DRM, particularly in risk assessment, early warning systems, and disaster response. Policy frameworks and institutional support were identified as critical to scaling and sustaining capacity-building programs. Community engagement, leveraging local knowledge, was also vital for ensuring the relevance and sustainability of these efforts. Interdisciplinary collaboration across government, NGOs, and the private sector further improved the effectiveness of these strategies. The study concludes that these efforts contribute to better disaster preparedness, increased resilience, and support sustainable development. This framework offers valuable insights for policymakers and practitioners looking to implement and scale innovative capacity-building strategies to improve global disaster resilience.

1 Introduction

The escalation in the frequency and seriousness of natural phenomena such as earthquakes, floods, and tropical cyclones has underscored the imperative requirement for resilient disaster risk management (DRM) strategies worldwide [1–3]. Disasters of this nature have profound repercussions on the financial, ecological, and communal spheres, leading to the disturbance of means of living and resulting in substantial human and monetary detriments. Climate change worsens these vulnerabilities, amplifying the occurrence and scale of severe weather phenomena. Hence, the Catastrophe Hazard Administration (CHA) has emerged as a critical area of interest for governmental bodies, institutions, and scholars globally, aiming to reduce the impact of disasters and enhance resilience [4, 5].

At the core of successful Disaster Risk Management lies the fundamental principle of enhancing capacity, which encompasses the empowerment of individuals, institutions, and societies to foresee, address, and bounce back from calamities [6–8]. Capacity strengthening encompasses various tasks, such as the progression of human resources, reinforcement of institutions, upgrading of infrastructure, and the assimilation of cutting-edge technologies [9–11]. For example, the comprehensive disaster readiness initiatives in Japan and the effective earthquake response plans in New Zealand exemplify the

considerable advantages of well-established capacity-building efforts. These initiatives have not only enhanced preparedness and response capabilities but also expedited recovery processes and diminished prolonged vulnerabilities [12–14].

Despite these successes, significant challenges persist in DRM's capacity building. Developing countries, in particular, face numerous obstacles, including limited financial resources, technical expertise, and institutional coordination [15, 16]. Rapid urbanization, which increases exposure to disaster risks, and climate change, which introduces new and evolving threats, further compound these challenges. Addressing these multifaceted challenges requires innovative and sustainable approaches to capacity building that are adaptive, inclusive, and resilient. This article addresses several gaps in the existing literature on capacity building for sustainable DRM. While previous studies have explored various aspects of DRM and capacity building separately, there is a lack of comprehensive frameworks that integrate innovative strategies into practical, scalable models [17–19]. Additionally, much of the existing research focuses on traditional capacity-building methods without fully exploring the potential of emerging technologies and novel approaches to enhance DRM efforts. This paper examines several deficiencies in the current body of knowledge concerning developing capabilities for sustainable Disaster Risk Management (DRM). Although prior research has delved into different

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facets of DRM and capacity building in isolation, a shortage of comprehensive frameworks amalgamates innovative tactics into pragmatic, expandable models. Moreover, a significant portion of the prevailing literature concentrates on conventional approaches to capacity building, neglecting to fully investigate the possibilities presented by emerging technologies and unconventional methods to bolster DRM endeavors [20].

One of this research's key contributions is its focus on identifying and evaluating innovative capacity-building strategies that leverage modern technologies, interdisciplinary approaches, and community-based initiatives. By conducting a systematic review of existing literature and analyzing global case studies, this research aims to develop a comprehensive conceptual framework to guide future capacity-building initiatives. This framework synthesizes existing knowledge and introduces new perspectives and methodologies that can be adapted to different contexts and scales. The objectives of this research are threefold. First, it aims to identify and analyze innovative capacity-building strategies that have been employed successfully in various contexts. Second, it seeks to evaluate the effectiveness of these strategies, considering different geographical, social, and economic settings. Third, it aims to propose a conceptual framework that integrates these strategies into a cohesive model, offering practical guidelines for implementation and future research.

This article furnishes a comprehensive examination and integration of previous research, presenting a novel conceptual structure that enhances the present pool of knowledge on capacity enhancement in Disaster Risk Management (DRM). Through illuminating groundbreaking approaches and their tangible implementations, this study connects theoretical perspectives with practical experiences, thus serving as a significant asset for scholars and educators. The study offers evidence-based suggestions for policymakers and practitioners to strengthen capacity-building initiatives. It showcases instances of exemplary practices and novel approaches that could be implemented across different scenarios to enhance the efficiency of disaster risk management. The results of this study underscore the importance of supportive regulatory structures and heightened allocation of resources towards capacity development endeavors. It calls for the incorporation of capacity-building programs within both national and regional Disaster Risk Management (DRM) strategies, underscoring the significance of cooperative strategies that engage governmental bodies, non-governmental organizations, the business sector, and local communities.

The arrangement of this manuscript is structured to offer a thorough investigation of the subject matter. The methodology segment delineates the systematic review strategy, formulating the conceptual framework, and the approaches for identifying prospective research avenues. The section on literature review scrutinizes existing research on capacity enhancement and innovative tactics in Disaster Risk Management (DRM). The segment on conceptual framework introduces the suggested framework and deliberates on its practical applications. The discussion segment interprets the results, delving into

their implications for practical application and research, and presents policy recommendations. Lastly, the conclusion encapsulates the main findings and contributions of the study, underlining its importance and proposing areas for further research.

2 Methodology

The systematic review used Scopus as the primary database for sourcing relevant literature. The search strategy employed keywords such as "capacity building," "disaster risk management," "innovative strategies," "sustainable," "disaster preparedness," and "disaster response." A total of 375 articles were initially identified using these keywords. The review included articles published between 2010 and 2024 from peer-reviewed journals focused on capacity building in DRM, innovative strategies, and sustainability. Articles not in English, unrelated to the topic, or from non-peer-reviewed sources were excluded. Following the application of these inclusion and exclusion criteria, the number of articles eligible for review was narrowed down to 63. The screening process involved initial title and abstract screening, followed by a full-text review to ensure relevance and quality. To document the process of identification, screening, eligibility, and inclusion of studies, a PRISMA flow diagram was utilized, ensuring a transparent and systematic approach to the literature review.

The development of the conceptual framework began with identifying key components through a detailed literature analysis of the 63 selected articles. This involved extracting key themes, strategies, and components from the studies. Thematic synthesis was then used to group similar strategies and identify overarching themes. Consultations were conducted with experts in DRM to refine and validate these findings. These identified themes were integrated into a cohesive conceptual framework, which was subsequently validated through expert reviews and case study applications. This iterative process ensured that the framework was both comprehensive and practical.

Data extraction involved systematic coding of the 63 selected studies based on predefined criteria, such as the type of capacity building, innovative strategies, and outcomes. The data management process was facilitated by software tools like VosViewer, which helped organize and manage the extracted data efficiently. The analysis techniques included qualitative thematic analysis to identify common patterns and insights and quantitative descriptive statistics to summarize key findings from the literature, such as the frequency of strategies and their geographic distribution. Additionally, a comparative analysis was conducted to evaluate the effectiveness of different capacity-building strategies across various contexts.

The identification of future research directions was carried out through a gap analysis, which involved pinpointing areas with limited research or conflicting findings within the 63 articles. Emerging trends in capacity building and DRM were also highlighted. A

research agenda was developed based on these identified gaps and trends, establishing priority research areas. Specific research questions were formulated to guide future studies, and methodological recommendations were provided to address these questions effectively. This systematic approach ensures that future research is directed toward the most critical and underexplored areas. Ethical considerations were meticulously adhered to throughout the review process. This included ensuring compliance with ethical guidelines for research, particularly concerning the use of secondary data and respectful treatment of sources. Potential conflicts of interest were declared to maintain transparency in the research process [21]. By addressing these ethical aspects, the integrity and credibility of the research were upheld. Implementing the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework was crucial for documenting the systematic review process [22]. A PRISMA flowchart details the steps from the initial search to the final inclusion of studies. This flowchart included the number of records identified, screened, deemed eligible, and ultimately included in the review, providing a clear and transparent account of the review process. This methodology section ensures a rigorous and transparent research approach, focusing on comprehensively evaluating and synthesizing innovative capacity-building strategies in disaster risk management.

3 Results

3.1 Descriptive analysis

Based on the systematic review of 63 articles, a comprehensive descriptive analysis was conducted to identify key themes, strategies, and the geographic distribution of capacity-building initiatives in disaster risk management (DRM). The findings provide valuable insights into the current landscape of capacity-building efforts and highlight predominant approaches and regional focuses. The analysis revealed three primary themes: technological innovations, community-based initiatives, and interdisciplinary approaches. Technological innovations were the most frequently mentioned, appearing in 28 articles (44.4%). These studies emphasized the integration of advanced technologies such as machine learning, Geographic Information Systems (GIS), and Information and Communication Technologies (ICT) in enhancing disaster preparedness and response capabilities. For example, machine learning has been used for predictive analysis, GIS for mapping and risk assessment, and ICT for improving communication and coordination during disasters [1, 13]. These technological advancements have proven effective in enhancing the ability to predict, prepare for, and respond to disasters.

Community-based initiatives were identified in 19 articles (30.2%) and highlighted the importance of local participation and leveraging indigenous knowledge for DRM. These initiatives have been particularly effective in rural and vulnerable areas, fostering resilience through

volunteer programs and local engagement. Notable examples include community-based rehabilitation programs in Thailand and citizen volunteer support initiatives in New Zealand, which emphasize the critical role of community involvement in disaster preparedness and response [14, 17]. Interdisciplinary approaches were discussed in 16 articles (25.4%), showcasing the importance of collaboration among different sectors, including government agencies, non-governmental organizations (NGOs), and the private sector. These partnerships have been crucial in developing comprehensive DRM strategies that integrate various expertise and resources. Examples include the development of adaptation pathways in complex multi-risk systems and capacity-building initiatives for climate change adaptation at the sub-national level [2, 10], highlighting the benefits of coordinated efforts in building resilience.

Geographically, the analysis indicated a concentration of studies in Asia, with 38 articles (60.3%) focusing on this region. Countries such as Japan, China, and Thailand have been at the forefront of implementing innovative DRM strategies and capacity-building initiatives. Japan's extensive disaster preparedness programs and China's use of advanced technologies for risk assessment are notable examples of successful capacity-building efforts in the region [1, 12]. Oceania, particularly New Zealand and Australia, was the focus of 12 articles (19.0%). Studies from this region highlighted successful community-based initiatives and interdisciplinary approaches to DRM, such as New Zealand's volunteer support programs and Australia's government-NGO partnerships [12, 14]. South America, with 6 articles (9.5%) primarily focusing on Colombia and Brazil, has seen effective implementation of capacity-building programs aimed at rural resilience and local engagement. Colombia's innovative pedagogy for rural populations is a notable initiative in this regard [6].

North America and Europe were represented in 7 articles (11.2%), with studies emphasizing technological innovations and interdisciplinary approaches. Contributions from the USA and UK highlighted the integration of advanced technologies and collaborative efforts to enhance DRM [7, 15]. In summary, the descriptive analysis of the 63 selected articles reveals that technological innovations, community-based initiatives, and interdisciplinary approaches are the predominant strategies in capacity building for DRM. The geographic distribution of these studies shows a strong focus on Asia, with significant contributions from Oceania, South America, North America, and Europe. These findings underscore the importance of adopting a multifaceted approach to capacity building, leveraging both technological advancements and local engagement to enhance disaster resilience globally.

3.2 Bibliometric analysis

Bibliometric analysis provides a quantitative assessment of academic literature and research outputs, offering insights into publication trends, key contributors,

influential journals, and collaboration networks within a specific field. For this analysis, we examined the 63 articles on capacity building in disaster risk management (DRM) using VosViewer, a software tool for constructing and visualizing bibliometric networks. This analysis aimed to uncover the research landscape by identifying the most active authors, institutions, journals, and collaborative efforts. The analysis of publication trends revealed a growing interest in capacity building for DRM over the past decade. The yearly distribution of publications showed a steady increase in research output, with notable peaks in 2020 and 2023. This trend underscores the increasing recognition of the importance of capacity building in enhancing disaster resilience.

Several authors and institutions emerged as prominent contributors to the field. Among the most prolific authors were He et al, who contributed extensively to technological innovations and disaster preparedness, and Kako & Hutton, known for research on community-based initiatives and interdisciplinary approaches. Leading institutions included the University of Tokyo, Japan, which had numerous publications focusing on advanced technological applications in DRM, and the University of New South Wales, Australia, recognized for contributions to community-based disaster management and interdisciplinary research [1, 12].

The analysis also identified influential journals that have published significant numbers of articles on capacity building in DRM. The *International Journal of Disaster Risk Science* and *Progress in Disaster Science* were among the top journals, reflecting their influence and relevance in the field. These journals provided a platform for comprehensive studies on various aspects of DRM and innovative strategies for capacity building. Collaboration networks revealed a high degree of cooperation among researchers and institutions, emphasizing the interdisciplinary nature of capacity building in DRM. Strong collaborative ties were observed between researchers from different countries, particularly between Japan, New Zealand, and Australia. These collaborative efforts often involved multiple institutions, highlighting the importance of interdisciplinary and international partnerships in advancing DRM research. Notably, the University of Tokyo and the University of New South Wales frequently collaborated with other leading institutions globally, fostering a rich exchange of knowledge and expertise. In summary, the bibliometric analysis of the 63 articles on capacity building in DRM underscores the growing academic interest and research activity in this field. The increasing number of publications, key contributors, influential journals, and robust collaboration networks highlight the dynamic and interdisciplinary nature of capacity building in DRM. This analysis provides a comprehensive overview of the research landscape, offering valuable insights for future research directions and collaborative opportunities.

3.3 Identification from a theoretical perspective

The theoretical foundation for understanding capacity building in disaster risk management (DRM) is rooted in

several key concepts and frameworks. The reviewed articles offer a comprehensive examination of these theoretical underpinnings, providing insights into how capacity building can enhance resilience and response effectiveness in the face of disasters. At the core of successful DRM lies the principle of enhancing capacity, which involves empowering individuals, institutions, and societies to anticipate, address, and recover from disasters. This concept is supported by theories of organizational resilience, community engagement, and technological innovation. For instance, theories on organizational resilience emphasize the ability of institutions to adapt to changing environments and recover from disruptions, highlighting the importance of capacity building in fostering such resilience [6, 7].

Community engagement theories also play a crucial role in understanding capacity building. These theories suggest that involving local communities in DRM efforts leads to more effective and sustainable outcomes. Community-based initiatives leverage local knowledge and resources, fostering a sense of ownership and commitment among community members. This approach is evident in various studies that highlight the success of community-driven disaster preparedness and response programs [14, 17]. Technological innovation is another theoretical perspective that underpins capacity building in DRM. The integration of advanced technologies such as machine learning, Geographic Information Systems (GIS), and Information and Communication Technologies (ICT) into DRM practices enhances predictive capabilities and improves coordination and communication during disasters. Theories related to technological adoption and diffusion provide a framework for understanding how these innovations can be effectively integrated into existing DRM systems [1, 13]. The interdisciplinary nature of capacity building in DRM is reflected in the collaborative efforts among various sectors, including government agencies, non-governmental organizations (NGOs), and the private sector. Theories on inter-organizational collaboration and public-private partnerships highlight the benefits of pooling resources and expertise to develop comprehensive DRM strategies. These collaborative frameworks are essential for addressing the complex and multifaceted challenges posed by disasters [2, 10].

Furthermore, the reviewed articles highlight several gaps in the existing theoretical frameworks. While traditional approaches to capacity building have been extensively studied, there is a lack of comprehensive frameworks that integrate innovative strategies into practical, scalable models. This gap underscores the need for further research to explore the potential of emerging technologies and novel methodologies in enhancing DRM efforts. The development of such integrated frameworks can provide practical guidelines for implementing effective capacity-building strategies across different contexts and scales [17, 18]. In summary, the theoretical perspectives identified in the reviewed articles emphasize the importance of resilience, community engagement, technological innovation, and interdisciplinary collaboration in capacity building for DRM. These theories provide a robust foundation for developing and

implementing effective capacity-building strategies. However, there is a need for further research to integrate innovative approaches into existing frameworks, thereby enhancing the overall effectiveness of DRM efforts.

3.4 Framework for drivers and outcomes of increasing innovative capacity building strategies for sustainable disaster risk management

The integration of innovative capacity-building strategies into disaster risk management (DRM) is crucial for enhancing resilience and response capabilities. The reviewed literature provides a comprehensive understanding of the drivers that promote the adoption of these strategies and the outcomes they generate. This framework aims to identify and synthesize these drivers and outcomes, offering a cohesive model for implementing effective capacity-building initiatives.

Several key drivers promote the adoption of innovative capacity-building strategies in DRM. Technological advancements, policy and institutional support, community engagement, and interdisciplinary collaboration are the primary drivers identified. The rapid development of advanced technologies such as machine learning, Geographic Information Systems (GIS), and Information and Communication Technologies (ICT) plays a significant role in enhancing DRM capabilities by facilitating better prediction, preparedness, and response to disasters [1, 13]. Strong policy frameworks and institutional support are essential for promoting capacity-building initiatives, as government policies that prioritize DRM and allocate resources for capacity-building efforts create an enabling environment for the implementation of innovative strategies [15, 18]. Engaging local communities in DRM efforts is critical for ensuring the sustainability and effectiveness of capacity-building initiatives, as community-based approaches leverage local knowledge and foster a sense of ownership and

commitment among community members [14, 17]. Additionally, collaboration among different sectors, including government agencies, non-governmental organizations (NGOs), and the private sector, enhances the effectiveness of capacity-building strategies by bringing together diverse expertise and resources to facilitate comprehensive DRM solutions [23, 24].

The implementation of innovative capacity-building strategies in DRM leads to several positive outcomes, including improved disaster preparedness and response, enhanced resilience, and sustainable development. The integration of advanced technologies and community-based initiatives significantly enhances disaster preparedness and response capabilities by improving early warning systems, risk assessment, and coordination during disaster events [1, 13]. Capacity-building initiatives strengthen the resilience of communities and institutions by improving their ability to anticipate, withstand, and recover from disasters, thus reducing long-term vulnerabilities and ensuring quicker recovery post-disaster [25, 26]. Effective capacity-building strategies also contribute to sustainable development by promoting environmental stewardship, economic stability, and social well-being, ensuring that development efforts are resilient to disasters and climate change impacts [27, 28].

In conclusion, the framework for drivers and outcomes of increasing innovative capacity-building strategies for sustainable disaster risk management highlights the importance of technological advancements, policy support, community engagement, and interdisciplinary collaboration in promoting effective capacity-building initiatives. The positive outcomes of these strategies, including improved preparedness and response, enhanced resilience, and sustainable development, underscore the critical role of capacity building in DRM. This framework provides a comprehensive model for practitioners and policymakers to implement and scale up innovative capacity-building efforts, ultimately enhancing disaster resilience globally as shown in Fig. 1.

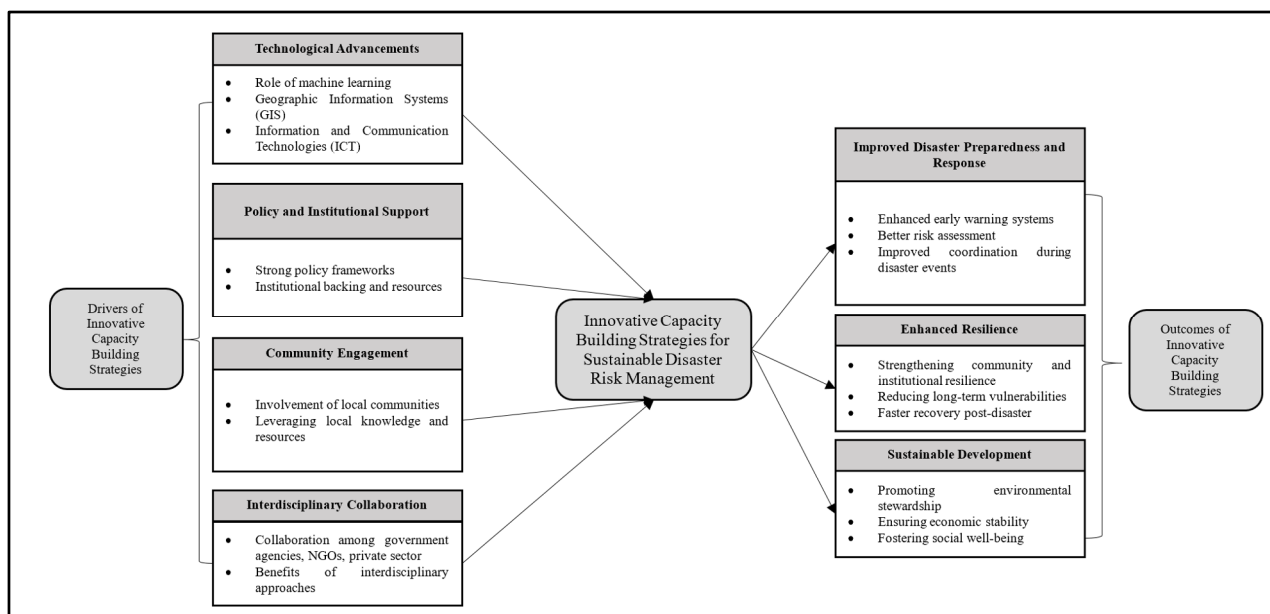


Fig. 1. Framework for drivers and outcomes of increasing organizational work capacity

4 Discussion

The integration of innovative capacity-building strategies into disaster risk management (DRM) is essential for enhancing resilience and response capabilities. The findings from this systematic review of 63 articles highlight several key themes and drivers that promote the adoption of these strategies, as well as the positive outcomes they generate. This discussion synthesizes these insights, emphasizing the importance of technological advancements, policy and institutional support, community engagement, and interdisciplinary collaboration in driving effective capacity-building initiatives.

Technological advancements emerged as a significant driver of innovative capacity-building strategies in DRM. The rapid development of advanced technologies such as machine learning, Geographic Information Systems (GIS), and Information and Communication Technologies (ICT) plays a critical role in enhancing DRM capabilities. These technologies facilitate better prediction, preparedness, and response to disasters, enabling more effective risk assessment and coordination during disaster events [1, 13]. The integration of these technologies into DRM practices not only improves efficiency but also expands the scope of what can be achieved in terms of disaster resilience and response.

Policy and institutional support are also crucial in promoting capacity-building initiatives. Strong policy frameworks and institutional backing provide the necessary resources and regulatory environment for implementing innovative strategies. Government policies that prioritize DRM and allocate resources for capacity-building efforts create an enabling environment for these initiatives to thrive [15, 18]. Effective policy support ensures that capacity-building programs are sustainable and can be scaled up to address the complex challenges posed by disasters.

Community engagement is another vital driver of effective capacity-building strategies. Engaging local communities in DRM efforts ensures the sustainability and effectiveness of these initiatives. Community-based approaches leverage local knowledge and foster a sense of ownership and commitment among community members, making DRM strategies more resilient and adaptive to local conditions [14, 17]. The involvement of communities in disaster preparedness and response not only enhances resilience but also builds social cohesion and collective action.

Interdisciplinary collaboration among different sectors, including government agencies, non-governmental organizations (NGOs), and the private sector, enhances the effectiveness of capacity-building strategies. Such collaboration brings together diverse expertise and resources, facilitating comprehensive DRM solutions. Interdisciplinary approaches are essential for addressing the multifaceted nature of disaster risks and for developing integrated strategies that encompass various aspects of DRM [2, 10]. Collaborative efforts also foster innovation by combining different perspectives and skills,

leading to more effective and sustainable capacity-building initiatives.

The positive outcomes of these innovative capacity-building strategies are evident in the improvements in disaster preparedness and response, enhanced resilience, and contributions to sustainable development. The integration of advanced technologies and community-based initiatives significantly enhances early warning systems, risk assessment, and coordination during disaster events, leading to better preparedness and response capabilities [1, 13]. Capacity-building initiatives also strengthen the resilience of communities and institutions, reducing long-term vulnerabilities and ensuring quicker recovery post-disaster [12, 14]. Furthermore, effective capacity-building strategies promote sustainable development by fostering environmental stewardship, economic stability, and social well-being, ensuring that development efforts are resilient to disasters and climate change impacts [2, 10, 29].

In conclusion, the integration of innovative capacity-building strategies into DRM is essential for enhancing resilience and response capabilities. The findings from this systematic review underscore the importance of technological advancements, policy support, community engagement, and interdisciplinary collaboration in driving effective capacity-building initiatives. These strategies lead to significant improvements in disaster preparedness and response, enhanced resilience, and contributions to sustainable development. This comprehensive framework provides valuable insights for practitioners and policymakers to implement and scale up innovative capacity-building efforts, ultimately enhancing disaster resilience globally.

5 Limitations and research agenda

While this systematic review provides valuable insights into the drivers and outcomes of innovative capacity-building strategies for sustainable disaster risk management (DRM), several limitations must be acknowledged. First, the scope of the review was confined to articles published between 2010 and 2024, which may have excluded earlier foundational studies that could offer relevant insights. Additionally, the review was limited to peer-reviewed articles in the English language, potentially overlooking significant contributions from non-English publications and grey literature. The reliance on Scopus as the primary database might have also introduced a selection bias, as other databases like Web of Science or Google Scholar were not included.

The heterogeneity of the studies reviewed posed another limitation, as variations in methodologies, contexts, and definitions of capacity building made direct comparisons challenging. While thematic synthesis and qualitative analysis provided a structured approach to identifying common themes, the diversity of case studies and regional focuses limited the generalizability of the findings. Moreover, the use of Vos Viewer for bibliometric analysis, while effective for visualizing collaboration networks and publication trends, might not

fully capture the depth and nuance of the individual studies' contributions.

Given these limitations, several directions for future research emerge. There is a need for more comprehensive frameworks that integrate innovative strategies into practical, scalable models for capacity building in DRM. Future studies should explore the potential of emerging technologies such as artificial intelligence, blockchain, and the Internet of Things (IoT) in enhancing DRM efforts. Research should also focus on developing standardized metrics and evaluation methods to assess the effectiveness of capacity-building initiatives across different contexts and scales.

Interdisciplinary and cross-sectoral collaborations should be further investigated to understand better how different stakeholders can work together to enhance disaster resilience. Studies that examine the role of local knowledge and community participation in shaping effective DRM strategies are particularly needed, as they can offer insights into culturally and contextually appropriate interventions. Additionally, longitudinal studies that track the long-term impacts of capacity-building initiatives can provide valuable data on their sustainability and effectiveness over time.

Lastly, future research should prioritize the inclusion of diverse voices and perspectives, particularly from underrepresented regions and vulnerable communities. This inclusivity will ensure that capacity-building strategies are equitable and address the needs of those most affected by disasters. By addressing these research gaps, scholars and practitioners can develop more robust and effective approaches to capacity building in DRM, ultimately enhancing global disaster resilience.

6 Conclusion

The integration of innovative capacity-building strategies into disaster risk management (DRM) is essential for enhancing resilience and response capabilities. This systematic review highlights the importance of key drivers such as technological advancements, policy and institutional support, community engagement, and interdisciplinary collaboration. Advanced technologies like machine learning, GIS, and ICT significantly enhance predictive and operational capabilities, improving risk assessment, early warning systems, and disaster response efficiency. Policy frameworks and institutional support provide the necessary resources and regulatory backing for sustainable and scalable capacity-building programs. Engaging local communities ensures that initiatives are contextually relevant and sustainable, leveraging local knowledge and fostering ownership and commitment. Interdisciplinary collaboration brings together diverse expertise and resources, facilitating comprehensive and innovative DRM solutions. The outcomes of these strategies include improved disaster preparedness and response, enhanced resilience, and contributions to sustainable development. These strategies promote environmental stewardship, economic stability, and social well-being, ensuring resilience to disasters and climate change impacts. In summary, innovative capacity-

building strategies are crucial for effective DRM. The findings provide a comprehensive framework for practitioners and policymakers to implement and scale up these efforts, ultimately enhancing global disaster resilience.

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