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Review Article

Active participation of people with disabilities in disaster preparedness and contingency work: A systematic literature review on methods, outcomes, and challenges

Linda Stjernholm [a,*], Jonas Borell [a], Anna-Lisa Osvalder [b]

[a] Ergonomics and Aerosol Technology, Department of Design Sciences, Faculty of Engineering, Box 118, 221 00, Lund University, Sweden
[b] Division of Design and Human Factors, Department of Industrial and Materials Science, Chalmers University of Technology, 412 96 Gothenburg, Sweden

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ABSTRACT

Disaster risk reduction (DRR) strategies must actively include people with disabilities (PWD) to ensure equitable and effective preparedness. Although awareness of disability inclusion in DRR is growing, the literature remains fragmented, and no prior structured literature review has focused specifically on participatory methods involving PWD. This review addresses that gap by identifying and synthesizing evidence on how PWD have been engaged in disaster preparedness and contingency planning. Following a structured process inspired by PRISMA and using the PICO framework, searches in Scopus and Web of Science yielded 720 articles, of which 20 peer-reviewed studies from 12 countries were included. The studies employed diverse participatory methods such as interviews, focus groups, co-design workshops, photovoice, and multi-stakeholder consultations. These approaches led to increased preparedness, empowerment, and leadership among PWD, while also strengthening community networks and collaboration with DRR personnel. However, challenges such as communication barriers, limited resources, and exclusion of marginalized groups were common. To conclude, this review offers the first comprehensive synthesis of participatory methods for disability-inclusive DRR, highlighting both their transformative potential and the need for more inclusive, tailored strategies in future research and practice.

1. Introduction

People with disabilities (PWD) are disproportionately impacted by disasters. In addition to having a larger risk of injury or death in disasters, these individuals also have a higher risk of developing additional disabilities [1]. Another layer added to this is the presence of compounding elements including deprivation, stigma, prejudice, informational barriers, and exclusion from disaster risk reduction (DRR), and decision-making processes connected to DRR [2]. PWD makes up around 15 % of the global population, highlighting the importance of including this group in crisis planning and preparation initiatives [2].

The Sendai Framework, created in 2015, addresses this issue of exclusion and calls for the participation of individuals with disabilities in DRR initiatives [3]. The framework emphasizes the importance of addressing all aspects of disaster risk, including economic, structural, legal, social, health, cultural, educational, environmental, technological, political, and institutional measures to prevent and reduce hazard exposure and vulnerability to disasters. It also calls for DRR practices that are inclusive and accessible to better ensure their overall efficiency and effectiveness. Research has identified the intersectional vulnerabilities of disability and gender in the aftermath of a disaster [4]. The need for inclusion of marginalized groups, such as PWD and women in DRR planning is also recognized [4]. Their vulnerability is attributed to systematic socio-economic discrimination and structural barriers that limit access to necessary resources and information [5]. These studies [4,5] emphasize that DRR strategies should consider the needs and perspectives of PWD and other marginalized groups, such as children, refugees and the elderly, to ensure that they are not excluded or left behind.

With the Sendai Framework in place for nearly ten years, there has been a shift towards recognizing the role of PWD in disasters. The concept of agency, which is used in social change theories and practices [2], has been applied to disaster research to highlight the knowledge, skills, creativity, and experience that PWD can contribute to DRR [2,6].

In the context of disaster research, the interplay between individuals' capabilities, their needs, and the associated disability issues is critical

* Corresponding author.
E-mail addresses: linda.stjernholm@design.lth.se (L. Stjernholm), jonas.borell@design.lth.se (J. Borell), anna-lisa.osvalder@chalmers.se (A.-L. Osvalder).

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[7,8]. For example, emergency plans, recovery plans, and information and communication systems should be designed with the diverse needs and capabilities of PWD in mind. Until recently, universal design in emergency management was primarily a research field with a focus on the physical environment, buildings, and escape routes [9]. However, the design of, for example, information and communication technology (ICT) in emergency management and crisis communication can have a significant impact on the ability to save lives in a disaster situation [9]. Therefore, information and communication systems and different forms of warning systems should consider the diverse needs of PWD, such as those who use assistive technologies or require special accommodations [8].

Overall, incorporating universal design principles into disaster studies helps to ensure that all individuals have equal access to emergency services, and can respond to and recover from disasters effectively [8]. Taking the principles of universal design into account, user-centered methods have been found to be an effective strategy for enhancing crisis and contingency work for individuals with disabilities such as physical, visual or hearing impairments [9]. When focusing on function-based needs rather than specific impairments, it is possible to move away from deficit-based thinking and work towards strength-based tools. These mainly draw attention to the capabilities of PWD and chronic conditions to help them prepare for future emergencies [10].

Empowerment through participatory research goes beyond simply acknowledging local populations' wisdom in comparison to professional specialists [11]. Active community participation in knowledge building allows people to have a say in how their concerns are presented and the solutions pursued. They promote the notion that people might become actors capable of influencing not only the limits but also the fundamental concept of what is possible [12]. As a result, involvement should increase individuals' self-awareness of issues impacting them and thus empower them to undertake preparations on their own.

Participatory methods [11] have gained appeal among NGOs (non-governmental organizations), government agencies, and academia in disaster research and DRR. These methods are based on three basic principles: empowering marginalized groups, influencing legislative changes, and generating long-term solutions that are responsive to local needs [13]. Co-production, co-design, and co-creation are methods for inclusion and are used in studies in DRR [13]. These methods stress collaboration, but they differ in focus: co-production on joint knowledge, co-design on participatory solutions, and co-creation on collaborative outcomes. Agency, defined as an individual's ability to act independently and make independent decisions [14], is an essential component of active participation. High levels of agency in research and design processes are often considered valuable and desirable, especially in situations where results have a significant impact on the participants themselves.

Participation takes many forms and does not always grant real influence or a voice in decision-making [15]. There is no universal model for what participation should look like; instead, it is shaped by context, values, and the recognition of different kinds of knowledge [11,16,17]. Active participation refers to processes in which persons with disabilities have genuine influence over both planning and outcomes. Arnstein's [18] ladder of participation remains a useful framework for distinguishing between non-participation, tokenism, and actual power-sharing. In disaster risk reduction, participation is often described in inclusive terms yet commonly remains limited to consultation and information-sharing, steps Arnstein identifies as tokenistic [15]. A more substantive approach has been proposed through co-production, where services and strategies are developed in partnership with those affected [16] [19]. Within this framework, lived experience is treated as essential knowledge. As Gaillard and Mercer [17] argue, bridging the gap between knowledge and action in disaster planning depends on valuing and including diverse forms of expertise.

The contrast between passive and active participation is stark. Passive methods, such as traditional surveys or interviews, sometimes include participants merely as providers of information, with little or no control over the process or outcomes. In contrast, active approaches, such as co-design workshops or participatory action research, engage participants as partners, shaping both the direction and content of the research or design [14].

Active participation in design and research, particularly in the context of crises and disasters, is a multifaceted idea that includes various levels of participant involvement and agency. The level of involvement can be vital in determining the effectiveness and importance of the tactics used. Several key concepts and methods are frequently used when describing these levels of participation, including co-production, co-design, and co-creation. The level of collaboration and impact accessible for participants varies between these methods, ranging from passive to very active engagement. Active participation in crisis management can take various forms. Co-production, co-design, and co-creation represent a spectrum of collaborative methodologies with increasing levels of stakeholder agency. Co-production originated in public administration and referred to the collaborative process through which stakeholders, including researchers and participants, work together to generate knowledge or solutions [12]. Co-design extends cooperation into the design phase, making sure that participants have a significant influence on the outcomes [20]. Co-creation goes even further, incorporating participants not only during the design and production phases, but throughout the entire process, ensuring that their voices and agency are heard at all stages [15]. These collaborative approaches should be distinguished from broader concepts like public participation, which have roots in planning and environmental governance [18].

Some studies related to DDR [7,13] point out that academic research can be extractive, meaning there is little involvement from local communities in project design, aims, and outcome assessment. They argue for greater academic accountability to local communities, as well as improved participant engagement in both data collection and analytic procedures, to better accord with the essential principles of participatory research. External support should attempt to create not only advantageous conditions for participation, such as resources and enabling tools, but also to reform power relations in society to ensure a meaningful participation process.

Participatory research can generate knowledge that might not emerge through other methods. For example, in the seminal article on participatory research, Chambers [21] argues for a shift in perspective towards recognizing local knowledge, community empowerment, the use of various participatory tools, and the emphasis on holistic understanding and adaptability to unique contexts. In a similar way, the local knowledge in disability-inclusive DRR is centered in the disability community, local organizations, and PWD themselves [2].

There is a growing body of literature that recognizes the importance of including PWD in DRR efforts. However, the literature on disability-inclusive DRR methods is still fragmented, making it difficult to identify the most effective strategies and practices. Previous reviews in this area have focused on the role of theory in vulnerability and resilience research [22], children with disabilities in disasters [23], and methods and theories for community resilience [24]. However, to our knowledge, methods for the inclusion of PWD in DRR work have not yet been the focus of literature reviews. Therefore, this systematic literature review aimed to identify, synthesize, and present an overview of the existing evidence on the various active participation methods used to include PWD in DRR.

The research questions set were:

RQ1. What active participation methods for inclusion of people with disabilities were studied in the research literature on disaster preparation and contingency work?

RQ2. What were the reported positive and negative outcomes, as well as the challenges, of these methods?

2. Methods

2.1. Design

The systematic review examined methods used to actively involve PWD in crisis and contingency work. The review drew inspiration from PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) [25] by utilizing a structured, step-by-step process to ensure replicability. The steps included defining the study rationale, developing a search strategy, establishing eligibility criteria, and determining exclusion and inclusion criteria.

2.2. Search strategy

As a basis for defining and conducting a structured literature search, a preliminary search was conducted resulting in a set of 16 articles. The Population, Intervention, Comparison, Outcomes (PICO) framework [26] was used to structure the search. The preliminary search aimed to identify any existing literature reviews on the subject as well as to map the research field using relevant keywords and terminology. No previously published literature review on the subject was found.

Analysis of the set of preliminarily articles showed that common keywords or concepts across the whole set were lacking, indicating that a complex search string would be necessary to capture a broad range of relevant literature. A test search was then conducted using Web of Science and Scopus to calibrate the search strategy. This involved adjusting the strategy based on database indexation, candidate key words, terms, titles, filters, and abstracts, in comparison to a *'gold set'* of previously identified literature.

A gold set is a collection of highly relevant articles identified as important to the subject of a study, and which directly address the research question. These articles, identified through expert suggestions, initial scoping searches, or team findings, were essential for validating and improving the search strategy. Ensuring the inclusion of these gold set articles allowed the search terms and strategies to be tailored for a thorough literature review.

Iterative refinement of search strings helps to ensure that gold set articles are captured [27]. Through this iterative process, a PICO search string was developed. In this review, the "Comparison" component of the PICO framework was not applicable. The search was performed in the Scopus and Web of Science databases using the search strings presented in Table 1. This search yielded a total of 720 articles, which were imported into the reference manager Zotero and then into the systematic review software Covidence. Here, 205 references were removed as duplicates, resulting in 515 research articles of potential interest.

Table 1
Search strings using PICO.

PICO component	Search strings using PICO
Population	("persons with disabilit*" OR "disabled people" OR "people with impairments" OR "deaf*" OR "d/Deaf" OR "people with intellectual disabilit*" OR "disabilit*" OR "impairment*" OR "visual impairment*" OR "hard of hearing" OR "blind") AND
Intervention	("inclusive disaster risk reduction*" OR"disaster risk management" OR "disaster management" OR"disaster risk reduction*" OR"disability-inclusive disaster risk reduction*" OR"DIDRR" OR"participatory method*" OR "disaster prep*" OR "disaster case management" OR "disaster plan*" OR "crisis management" OR "contingency" OR "DRR" OR "CBDRR") AND
Outcome	("inclusive community engagement*" OR"capacity development*" OR"reduced vulnerabilit*" OR "disability-inclusive" OR "inclusion" OR "responsibilit*" OR"participation" OR "empowerment" OR "disaster prep*" OR "emergency prep*" OR "co-creation" OR "co-production" OR "co-research*" OR "co-design")

2.3. Inclusion and exclusion criteria

Criteria for selecting studies for further examination were based on the research questions and focused on the participation of PWD in crisis or contingency work (Table 2). Articles included in the analysis only if they were peer-reviewed and written in English. Articles that did not involve PWD or were not related to crisis or contingency work were excluded. Interviews as an active participatory method were included only when there were elements of iteration or feedback.

2.4. Screening and selection process

The abstracts of the 515 articles were independently screened by two authors according to the inclusion and exclusion criteria. This initial screening resulted in 27 articles selected for full-text assessment. The two researchers conducted the screening independently using the software program Covidence. If any disagreements occurred, these were solved through discussions based on the criteria. Active collaboration was defined using the following signs, drawn from the abstracts: repeated interaction with PWD, clear examples of how they shaped research process or results, and specific descriptions of PWD's roles beyond just providing data. Seven articles were excluded due to being out of scope in terms of content focus or study design. Fig. 1 shows the PRISMA flow chart for the screening process. Ultimately, 20 articles were selected for review.

2.5. Data extraction and analysis

A full-text analysis of the selected articles was conducted using analytical questions relating to the research questions. A matrix framework was used to sort information into categories.

The specific questions based on the two main research questions were:

- Which types of active participation methods were used?
- What groups were involved in the active participatory research?
- In what way were PWD involved in the active participatory research?
- What kind of research methods were employed? (e.g., interventions and data collection)
- In what context (setting and geographical location) was the study conducted?
- What kind of hazards were used to frame the research?
- At what stage during the crisis was PWD involved (before the event, during, or in the recovery phase)?
- What pros and cons with the active participatory research in question were reported?
- What was the main outcome of the study?

2.6. Assessment, integration and compilation of findings

The process involved identifying both positive and negative outcomes. The evaluation of the participatory methods focused on limitations discussed in the articles and results highlighted in the results and discussion sections. Outcomes were categorized during the sorting and analysis phases, reflecting an inherent evaluation of the benefits of

Table 2
Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Peer-reviewed articles	Conference articles, books, and book chapters
English language	Non-English language
Related to crisis or disasters	Not related to crisis or disasters
Including people with disabilities as active collaborators	Not involving people with disabilities as active collaborators
Empirical study	

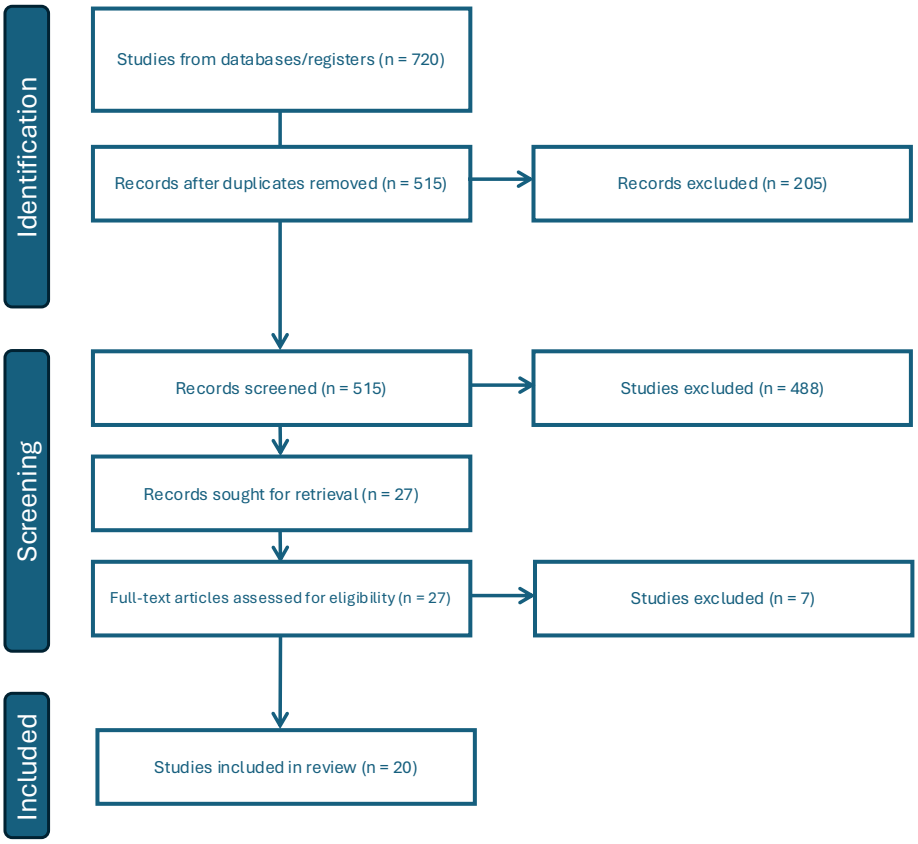

Fig. 1. PRISMA flow diagram of the literature search and selection of articles.

involving participants. In articles where no explicit pros and cons were reported, assessments were made based on indirect evidence, such as difficulties in participant recruitment or language barriers.

3. Results

A total of 20 articles met the inclusion criteria. These are listed in Table 3, where the type of hazard, population, and location are presented. They were published between 2014 and 2024 in 15 different journals. The research was conducted in 12 countries and employed a variety of methods to include PWD as active participants in research on crisis management and contingency work. Table 4 presents more in-depth information about a selection of methods explored in this review, chosen for their diverse approaches to disability-inclusive disaster risk reduction. For each selected method, an article included in the review was chosen to illustrate how disability-inclusive DRR can be applied with that method. The set of methods presented in Table 4 showcase a range of techniques used to enhance inclusion in disaster preparedness and response, and also illustrate strategies suited to different local contexts and needs.

3.1. What active participatory methods for inclusion of PWD were used in disaster preparation and contingency work?

The articles reported findings from studies that used a range of active participation methods for inclusion, often combining different approaches. Three studies used semi-structured interviews with elements of iteration or feedback [36,41,42]. Two studies used focus groups [37,43], while another two used a combination of interviews and focus groups [34,38]. Photovoice was used in one study [29] and co-creation, or co-design workshops were used in three studies [28,31,46]. Six studies reported using two or more methods, such as role playing, writing learning diaries, group surveys, drawings, timeline tool, or questionnaires [30,33,35,39,44,45]. Two studies used learning workshops in a school setting [32,41] and one study used a live-action exercise [47].

Levels of participation.

Participation in the 20 selected articles varied from interview-based approaches [34,36,41,42,45] to more active participatory methods, including focus groups [33,41,42,44], live-action exercises [47] and workshops [28,31,32,40,46].

3.2. Positive outcomes and challenges

3.2.1. Capacity building at an individual level for PWD

A few of the articles [33,43], reported that increased knowledge about DRR and contingency work had been a positive outcome for the PWD who participated. Peer learning was identified as one way of building capacity and resilience in crisis [28,45]. For example, article [33] described how participants with disabilities developed practical strategies for personal preparedness after engaging in scenario-based exercises. In [43], participants reported feeling more confident in navigating emergency situations as a result of tailored training sessions. Peer learning emerged as a particularly effective approach in studies [28,45], where shared experiences among participants created a supportive environment that facilitated both knowledge exchange and emotional resilience. In [28], peer-led discussions were used to adapt risk communication materials, which not only increased participants' understanding but also gave them a sense of ownership over the content. Additionally, active participation in the studies led to greater empowerment and enhanced knowledge about DRR among PWD [28,31].

3.2.2. Collaborations between DRR personnel and PWD

The methods, for example workshops and interviews, employed in some studies [28,31,40,41,45], had facilitated the creation of closer community networks that included stakeholders from disability

Table 3
Summary of the 20 articles included in the literature review. The numbers in brackets [x], refer to the numbering used in the reference list.

	Author(s)	Type of hazard	Population	Method(s)	Location
[28]	Black, K & Draper, P. (2019)	A variety of hazards	Mobility, developmental, deaf, and visual impairments.	Workshops and iterative codesigning of workshop tools	Kent State, USA
[29]	Chowdhury, S., Urme, S.A., Nyehn Jr., B.A., Mark Sr, H.R., Hassan, M. T., Rashid, S.F., Harris, N.B. and Dean, L., (2022)	Covid-lockdown	A variation of age, disability, and gender	Photovoice	Bangladesh and Liberia
[30]	Cooper, A. C., Bùi, H. T. T., Nguyễn, L. T., Nguyễn, P. K., Nguyễn, T. H. T., & Phan, D. P. N. (2021)	Flood	d/Deaf Communities	Interviews, group surveys, participant-generated disaster drawings and photographs and observations	Vietnam
[31]	Crawford, T., Villeneuve, M., Yen, I., Hinitt, J., Millington, M., Dignam, M., & Gardiner, E. (2021)	Flood	Culturally and linguistically diverse (CALD) With disabilities.	Co creation workshops, Participatory action research.	Australia
[32]	Dodd-Butera, T., Li, H., Beaman, M. L., Amaral, M., Eggleston, C. J., & Podolske, D. (2021)	A variety of hazards	Children with autism and their families	Workshops	USA
[33]	Eisenman, D. P., Bazzano, A., Koniak-Griffin, D., Tseng, C. H., Lewis, M. A., Lamb, K., & Lehrer, D. (2014)	A variety of hazards	Adults with learning disabilities	Collaboration and peer mentor learning, workshops, interviews, and group discussions	USA
[34]	Elisala, N., Turagabeci, A., Mohammadnezhad, M., & Mangum, T.E. (2022)	A variety of hazards	Sensory and physical disabilities Physical and visual impairments	Interviews and focus group discussions	Tuvalu, multiple islands in the pacific
[35]	Ewen, A., & Pelling, M., (2024)	Earthquake and flood		Interviews and co-production of a participatory timeline tool	Nepal
[36]	Good, G. A., Phibbs, S., & Williamson, K. (2016)	Earthquakes	People with visual impairments	Interviews in two stages, separated by the experience of an earthquake	Christchurch, New Zealand
[37]	Howard, A., Agllias, K., Bevis, M., & Blakemore, T. (2017)	A variety of hazards	Different disabilities	Focus group discussions	Australia
[38]	Kisira, Y., Ssennoga, M., Mugagga, F., & Nadhomi, D. (2023)	Landslides	Different disabilities	Focus groups and interviews	Mount Elgon region, Uganda
[39]	Kusumowardoyo, C. L., & Wulansari, H. Y. (2022)	A variety of hazards	Different types of disabilities. Vision, hearing, mobility, and physical impairments.	Role playing, pilot testing field work, post data collection, debriefing and reflective learning through writing learning diaries.	Indonesia
[40]	Nikolaraizi, M., Argyropoulos, V., Papazafiri, M., & Kofidou, C. (2021)	A variety of hazards	Children who are deaf or hard of hearing and children with visual impairments	Participatory learning workshops	Greece
[41]	Pertiwi, P., Llewellyn, G., & Villeneuve, M. (2019)	A variety of hazards	Disabled people's organizations	Interviews of PWDs to analyze disability-led collaborations in disaster risk reduction	Indonesia
[42]	Pyke, C., & Wilton, R. (2020)	A variety of hazards	Disability organizations and people with intellectual disabilities	Interviews to critique and discuss a government disaster plan to highlight important gaps	Ontario, Canada
[43]	Rofiah, N. H., Kawai, N., & Hayati, E. N. (2021)	A variety of hazards	Children with disabilities between the ages of 9 and 11 years	Focus group discussions	Yogyakarta, Indonesia
[44]	Ronoh, S., Gaillard, JC. & Marlowe J. (2015)	Earthquakes, tornadoes, volcanoes and floods	Children with autism, learning disabilities, hearing, seeing, mobility, and other disabilities. Ages 10–16 years old.	Case study with interviews, focus groups with participatory tools such as proportional piling and mapping. Participant observation of an earthquake safety drill.	Christchurch, New Zealand
[45]	Villeneuve, M., Abson, L., Pertiwi, P., & Moss, M. (2021)	Monsoon flooding, bushfire, earthquake, cyclone and severe storms.	People with intellectual, neurological, physical, learning and psychosocial disabilities as well as visual and hearing impairments.	Structured interviews and multi-stakeholder consultations.	Queensland, Australia
[46]	Villeneuve, M (2021)	A variety of hazards	People with disabilities and their organizations.	Co-designing workshops	Australia
[47]	Zod, R., Fick-Osborne, R., & Peters, E. B. (2014).	A public health emergency. For example, a bioterrorist attack involving mass-dispensing of medicine in a short period of time.	People with functional needs.	Live exercise	St Louis, USA

organizations, emergency personnel, and PWD. By working together, the emergency personnel and other stakeholders had gained new perspectives on disability and the capabilities of PWD, thereby reducing stereotypes [45]. High levels of collaboration led to greater involvement of PWD in DRR processes and decision-making [30,31,33,45,46]. Leadership roles for PWD and their organizations also emerged through their involvement in research activities [31,39].

3.3. Negative outcomes

3.3.1. Communication issues

Several articles reported challenges in communication, and translation arose from both local spoken languages and local sign languages [30,41]. Difficulties could for example stem from variations in fluency in English, as well as the nuances and differences among regional sign

Table 4
An overview of selected methods, with in-depth description of their key aspects as presented in the chosen articles.

Method	Description	Pros	Cons	Type(s) of disabilities
Co-production	The study [31] employed a co-production approach, engaging PWD to co-develop sustainable disaster preparedness resources through Person-Centred Emergency Preparedness (P-CEP) workshops. The method included interactive discussions, presentations, and feedback loops to ensure culturally relevant and accessible materials, with participants recruited via convenience sampling from flood-prone areas.	The co-production approach facilitated collaboration between researchers, policymakers, and service users, enabling the exchange, synthesis, and dissemination of disaster preparedness knowledge. This approach empowered participants, particularly PWD, by involving them in the decision-making process and generated shared knowledge to promote more inclusive and disability-sensitive disaster risk reduction initiatives.	Convenience sampling for recruitment may have limited participant diversity, and there was a lack of participation from PWD despite a focus on disability-inclusive disaster risk reduction. Challenges included language barriers and accessibility issues for those with limited English proficiency, and the potential impact of the workshop timing on attendance.	People with a variety of disabilities and their family/carers from culturally and linguistically diverse (CALD) backgrounds.
Combination of methods	The study [38] used a design with face-to-face household interviews, a 6-point Likert scale to assess disaster resilience coping mechanisms, and included 55 household interviews, 7 key informant interviews, and 2 focus group discussions. Local research assistants with community knowledge were recruited to improve access, build trust, and help with effective communication.	The sampling method promoted appropriate representation of the target population, while snowball and purposive sampling techniques allowed access to households in challenging areas. Additionally, the study emphasized meaningful participation, particularly for marginalized groups and individuals with disabilities, resulting in localized insights and comprehensive understanding of disaster resilience strategies.	Snowball sampling, though effective for accessing hard-to-reach populations, may result in a lack of diversity if initial participants share similar characteristics or perspectives.	The participants included people with a variety of disabilities.
Photovoice	Photovoice [29] was used as a participatory method, with participants capturing photographs to document their COVID-19 experiences, which were then discussed in WhatsApp groups to provide context. Intersectional analysis was applied to understand how identity-based characteristics, such as disability and caregiving roles, shaped these experiences.	Photovoice provided an inclusive platform for recognizing lived experiences and knowledge, offering PWD an opportunity to be heard in research and decision-making processes.	The use of WhatsApp groups created a virtual space for building connections and sharing discussions and photos collectively. However, this approach also excluded individuals without smartphone access and those living in rural areas.	People with physical and psychosocial disabilities as well as caregivers as co-researchers.
Live exercise	The live exercise [47] tested the ability to efficiently dispense medication to individuals with functional needs during a public health emergency. Measures to ensure access for these individuals were evaluated through a countywide exercise, where 40 volunteers with functional needs collected medication from an open dispensing site as if in a real emergency.	Engaging PWD in the exercise provided valuable insights into successes and areas for improvement, emphasizing the need for comprehensive staff training.	The system for gathering feedback from, in particular, people with developmental and physical disabilities was lacking, highlighting the need for a more standardized way of collecting feedback from participants.	The types of disabilities were low vision, low hearing, mobility, and developmental needs.
Interviews	The study [36] recruited participants through the Association of Blind Citizens, focusing on the experiences of visually impaired individuals. Semi-structured interviews were conducted with 12 adults in their homes, allowing for an in-depth exploration of their earthquake experiences. After the February 22, 2011, earthquake in Christchurch, follow-up interviews with seven participants examined the long-term effects. The data was analyzed using thematic analysis, while experts from the Blind Foundation contributed insights on disaster preparedness.	The study's semi-structured interviews offered in-depth insights, allowing participants to share detailed personal experiences and revealing the challenges they faced during the earthquakes. By conducting interviews in the comfort of participants' homes, the study encouraged an open and honest dialogue. The follow-up interviews after the second earthquake provided a unique opportunity to capture evolving experiences and perspectives over time. Additionally, the involvement of Blind Foundation staff brought expert knowledge on disaster preparedness, adding depth and professional insight to the research findings.	The small sample size of 12 participants could limit the generalizability of the findings, making it difficult to apply the results to the wider visually impaired population. The loss of five participants for follow-up interviews, due to reasons such as death or trauma, could have impacted the depth of the second round of data collection.	All participants in the study had visual impairments, ranging from blindness to low vision, which was the primary factor shaping their earthquake experiences. Three participants also reported having multiple significant impairments, further complicating their ability to manage daily tasks and access essential medications during the disaster.

languages [31]. Although there had been an increase in understanding between emergency and government staff and PWD [30,45], some participants still perceived negative stereotypes regarding the participation of PWD in DRR and decision making [42].

3.3.2. Need for resources

A few articles [34,47] highlighted that the methods used, such as focus groups, interviews and live exercises, had been time-consuming and costly. Specifically, the collaborations between DRR personnel and PWD and their organizations had been reported as particularly expensive and arduous to arrange. Costs associated with sign language translators and other accessibility measures were also noted as factors to consider.

3.3.3. Some groups or individuals excluded

Despite the emphasis on involving PWD in all studies, some articles indicated that not all intended participants could be included. For example, people with sensory sensitivities or chronic illness declined to participate [45]. Selection bias was another issue, as the people who signed up for a specific study were likely to have participated in previous studies, which narrowed the population variety [33]. In one study, certain groups, like people not connected to their local community, were considered difficult to include or reach using the chosen methods [46]. Another study found some groups, such as people with severe mental illness or intellectual disabilities too vulnerable to include [42]. Additionally, group dynamics sometimes prevented issues from being raised, or members speaking and sharing their experiences. An example was in focus groups, where community members could not participate on an equal basis, due to power structures related to gender and social status [37].

4. Discussion

This study systematically reviewed 20 articles involving PWD as active collaborators in DRR and contingency work. The research addressed which active participation methods were used, the positive and negative outcomes of these methods, and the challenges that were encountered. The overall results revealed that there was a limited body of research on these issues, with most studies being conducted in countries frequently affected by disasters. The most commonly used active participation methods were co-creation, co-designing, co-creating and collaborative workshops, but also interviews and focus groups were used. However, often only a limited number of PWD were included in the studies due to difficulties in finding and attracting relevant people. Participants who had physical disabilities, such as mobility impairments, visual or hearing impairments, were more frequently involved, whereas individuals with cognitive disabilities seemed to be less included. Additionally, methods with a lower degree of user involvement, such as individual interviews, were also employed in inclusive DRR research and were therefore included in this review. The inclusion of interviews reflects the spectrum of participatory potential within interview-based methods. Traditional one-time interviews with limited participant influence were excluded. In contrast, interviews incorporating iterative elements such as feedback loops or participant involvement in interpreting findings, were considered to meet the criteria for active participation and were therefore included. The diverse methods presented in Table 4 highlight the importance of adaptability and flexibility in disability inclusive disaster risk reduction. These methods demonstrate that effective disaster risk reduction can extend beyond the one-size-fits-all approach, emphasizing the need to tailor strategies to the local context. This customization allows for the incorporation of a variation of cultural, environmental, and socio-economic factors that influence how communities prepare for and respond to a crisis. By adopting methods that are context-specific, disaster risk reduction initiatives can better meet the needs of PWD, thereby enhancing the effectiveness of DRR efforts.

4.1. What active participation methods for PWD were used in disaster preparation and contingency work?

4.1.1. Levels of participation

Active participation of PWD produced a distinct set of knowledge compared to studies without their involvement [21]. This review indicated that in DRR, active participation served both as a method and an outcome. A recurring theme across many of the reviewed articles was the understanding that participation was a crucial element in inclusive DRR efforts. The importance of involving PWD in decision-making processes related to disaster preparedness, response, and recovery was emphasized [31,45]. Moreover, the active participation of PWD was highlighted throughout these studies, establishing it as a fundamental principle in achieving inclusivity in DRR [40–42]. A critical aspect emphasized in the reviewed articles was the need for meaningful participation, where PWD actively engaged, and their perspectives were heard [40–42]. Collaborating with PWD encouraged active participation, inclusion, and empowerment in the overall DRR process. Collaborating with PWD supported active participation, inclusion, and empowerment throughout the disaster risk reduction process. This contributed to research findings that more accurately reflected their needs, experiences, and goals, resulting in outcomes with potential to inform and improve accessible DRR practices. However, barriers hindering participation, such as inaccessible communication, lack of awareness, and discriminatory attitudes, had been identified [41,45]. These barriers highlighted challenges that had to be addressed to ensure meaningful involvement of PWD in DRR processes. The findings also highlight the importance of moving beyond consultation, as outlined by Arnstein [18] towards meaningful participation, defined here as PWD being actively involved in shaping both the process and the outcomes of disaster risk reduction efforts. As described in the Sendai Framework [3], participation is considered meaningful when it enables real influence over decisions rather than serving as symbolic inclusion. Strategies to promote participation included the importance of assistive technologies, accessible information, and inclusive communication methods [41,46]. Incorporating these strategies aligned with the goal of fostering active engagement and overcoming barriers. Collaboration emerged as a recurrent theme in these articles [41,45], which emphasized the importance of coordinated efforts between various stakeholders. Collaboration between government agencies, NGOs, and disability organizations was also pointed out as essential to ensure meaningful participation of PWD.

4.2. What were the reported positive outcomes of the active participatory methods?

4.2.1. Capacity building at an individual level for PWD

Active participation of PWD was shown to increase their empowerment and knowledge about DRR. Two studies [33,43] supported this idea that when PWD actively participate, their empowerment and understanding of DRR significantly arose. However, other studies showed that the participants learned about crisis management and gained a greater understanding of the hazards unique to their situation [34,44,45]. One study [33] observed a noticeable increase in readiness behaviors, such as planning and preparing for emergencies. As a result, the increased level of readiness reduced vulnerability, demonstrating the potential of participatory tools that enabled empowerment and participation in decision-making and risk management.

Participatory research was a collaborative approach that actively engaged local actors and individuals with firsthand experience. One article [31] highlighted how the participants, with diverse disabilities, took proactive measures such as assembling emergency kits, creating escape plans, designating meeting places, identifying danger zones, and preparing their friends and families for potential emergencies. This dimension of proactive behaviors was exemplified in the results of capacity building efforts. Essentially, this interaction made use of people's

own creativity, abilities, and knowledge while integrating the concept of agency [2]. Thereby, increased empowerment and knowledge acquisition were sparked by the active participation of PWD in DRR, which led to increased preparedness and a corresponding decrease in vulnerability. The incorporation of participatory techniques emphasized the agency of PWD, reaffirming the crucial role that they played in developing resilience and decision-making in environments that are vulnerable to disasters [31].

The importance of peer learning in disaster resilience was highlighted in [28]. This study investigated a training programme within a county structure that not only provided community members with crucial preparedness information but also created a collaborative learning environment. After finishing the programme, the participants became mentors for new participants, facilitating a continuous cycle of knowledge transfer. The larger disability community, through disability organizations, was included in this approach, and its members' essential feedback was considered. Peer-based knowledge sharing was also presented in [45], that addressed various dimensions of power dynamics. The increase in awareness among PWD about their rights and responsibilities in DRR led to the creation of collectives, such as a group of trained peer leaders. It also facilitated connections with emergency managers. These examples in [28,45] suggested that participatory methods that involve peer-to-peer learning could positively impact collaboration and relationship-building within the community. Thus, peer-to-peer learning was a useful method for building resilience and enhancing disaster preparedness knowledge among individuals with disabilities, and the capabilities of the individual could be effectively supported and strengthened by a network of peers.

4.2.2. Collaborations between DRR personnel and PWD

Some articles reported that new, closer networks within the community were created. Collaborative methods such as co-designing and co-creating [28,31] promoted new ways of connecting stakeholders that made progress possible for future work together. Another example of a collaborative approach between emergency personnel and PWD revealed how a previously unused network was established during the study [40]. Collaborative workshops involving professionals from various backgrounds, such as teachers, students, museum personnel, and emergency personnel, had the potential to instigate a transformative shift in mindset and created thereby a cross-organizational culture in which group dynamics were fostered and team members worked cohesively.

Collaborative workshops encouraged collaboration among, for example, schools and organizations that were actively involved in, or could play, a key role in educating children about DRR [40]. Teachers played an important role, and they were supported by a variety of professionals and practitioners who worked together to produce more accessible and inclusive DRR programmes. Collaborative efforts encouraged the participants to actively share information and experiences, leading to a multi-perspective understanding of the preparedness, capabilities, and support needs of PWD during emergency situations [45]. In other studies, it was reported that involving disability organizations led to establishing a disability service section within the disaster management agency, ensuring that future planning and preparation included disability concerns [41] and promote local relevance [35]. The longevity of these networks was difficult to ascertain, but their introduction seemed to be linked to the methods and studies taking place.

Collaborations provided a new perspective on the capabilities of PWD from the viewpoint of emergency personnel and crisis planners [45]. These collaborations led to agreed understandings that reshaped discussions and influenced stakeholders' attitudes and actions. This shifted the focus from ensuring the safety of PWD in emergencies to a shared commitment to identifying and removing barriers to DRR participation. Such shifts from individual behavior modification to group agency were thereby identified as a key aspect [45].

Increased involvement in crisis planning and preparation created more opportunities for leadership roles for both PWD and their organizations. A positive correlation was highlighted between the involvement of PWD in crisis planning and the subsequent increase in leadership roles for both individuals and organizations [39]. Similarly, the Kent County Inclusive preparedness program demonstrated a paradigm shift where PWD actively contributed to crisis planning and subsequently found ways to assume leadership roles [31]. This initiative not only strengthened community relationships but also aligned with the Sendai framework for disaster risk reduction.

4.3. What were the reported negative outcomes of the active participatory methods?

4.3.1. Communication issues

Different languages and modes of communication could significantly hinder understanding and collaboration in DRR. This issue was highlighted, where both local languages and local sign languages required translation before analysis could begin [30]. These translations introduced layers of filtering, affecting how concepts related to disasters and disabilities were understood. Additionally, the research process itself was slowed down by these translation requirements, which could potentially impact the reliability of the findings.

4.3.2. Need for resources

Cost and time were significant factors affecting the active participatory methods that aimed for a disability-inclusive approach. One key finding related to cost was the need to secure financial resources to ensure that communication systems, infrastructure and assistance services were available and accessible to participating PWD. This highlighted the need for training and capacity building for both PWD, and other stakeholders involved, although this could also be costly. It was also shown that extensive planning, developing and implementing an inclusive DRR can be time-consuming [34]. One study, however, nuanced this aspect by showing that involving co-researchers and hosting sessions in participants' homes not only supported inclusion but also helped reduce travel time and costs, illustrating how participatory methods can align with practical and economic considerations [35]. The question of time and cost was also reflected in the need for an investment of resources to enable participation [47]. This included providing the necessary provisions for the participants, such as braille materials, interpreters and accessible facilities, as well as staff training and the allocation of resources to ensure equal access to the disaster preparation and planning. Another challenge noted in instances was the need for specialized equipment, such as a 3D printer, to carry out certain sessions, which could pose logistical or financial constraints [35].

4.3.3. Some groups and individuals were excluded

Exclusion was also a significant issue reported in some of the articles. While several studies approached the recruitment of participants with an inclusive mindset, some groups and individuals were ultimately not represented. Some studies reported this to be a consequence of people declining due to concerns that the sessions would be overwhelming [45], while others excluded certain groups already in the study design itself [29,42] [35]. Government officials often failed to recognize the relevance of people with intellectual disabilities' perspectives, perpetuating a pattern in which these people were mistakenly neglected due to a perception of limited value [42]. Addressing ableist attitudes and fighting stereotypes were critical to ensure that people with intellectual disabilities could contribute effectively to planning and policy discussions.

However, the use of Photovoice enabled the possibility of co-researching by distance [29]. While WhatsApp groups allowed for virtual relationships, chats, and group photo sharing, one disadvantage of using this technology was its inherent constraints. Individuals without smartphone access and those living in rural areas with barriers to using the technology were excluded. It is important to recognize that while

Photovoice can be a valuable method for many, it has accessibility challenges for people with visual impairments. Other alternatives, such as audio-based narratives or tactile mapping, could provide inclusive options. On the other hand, it was pointed out that positive results could be skewed due to selection bias, as those who were motivated to participate also might have been more inclined to adopt disaster preparedness [33]. Additionally, limitations of focus groups were identified, where dominant participants or agendas could overshadow and limit the diversity of outputs [37].

5. Conclusions

This systematic literature review examined active participation methods including PWD in DRR and assessed the outcomes of participatory practices within these methods. The review systematized knowledge about disability-inclusive DRR and highlighted the value of participatory approaches for building resilience, fostering collaboration, and promoting inclusivity across all aspects of DRR initiatives.

The review pointed out a significant shortage of studies on disability-inclusive DRR, stressing the need for further exploration.

The methods identified in the review were workshops, interviews, photovoice, co-design, group surveys, participant generated drawings and photographs, co-creation, peer mentor learning workshops, focus groups, role playing, learning diaries, participatory learning workshops, proportional piling and mapping, multi-stakeholder consultations and live exercise.

Positive outcomes identified included significant capacity building at the individual level through peer-to-peer learning, active participation, and collaborative efforts between DRR personnel and PWD. These outcomes contributed to reducing vulnerabilities in the face of disasters by increasing preparedness, empowerment, and knowledge acquisition.

Active participatory methods, such as co-designing, co-creating and collaborative workshops, were shown to lead to new networks within communities and helped facilitate a shift in mindset while fostering cross-organizational culture. This in turn resulted in a shared commitment to identify and remove barriers to participation in DRR, as well as emphasizing group agency over individual behavior modification.

The involvement of PWD in the crisis planning and preparation process paved the way for leadership roles within their organizations, thereby promoting a more diverse and inclusive approach to DRR.

Challenges with participatory approaches were communication problems, such as language barriers and the need for translation, which hampered effective understanding and collaboration. Time and cost were also found to be constraints, in addition to the exclusion of specific individuals or groups. To effectively include groups that were harder to reach, the research methods have to address barriers, such as selection bias, participant vulnerability, and power imbalances to ensure diverse representation in DRR.

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CRediT authorship contribution statement

Linda Stjernholm: Writing – review & editing, Formal analysis, Writing – original draft. **Jonas Borell:** Writing – review & editing, Supervision, Writing – original draft, Formal analysis. **Anna-Lisa Osvalder:** Writing – original draft, Writing – review & editing, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

No data was used for the research described in the article.

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