Disaster Medicine and Public Health Preparedness

www.cambridge.org/dmp

Systematic Review

Cite this article: Aisyah DN, Rahman FM, Diva H, Putra BS, Rizki MH, Bisri MBF and Manikam L (2026). Mobile-Enabled Technologies in Disaster Management: A Systematic Literature Review. *Disaster Medicine and Public Health Preparedness*, **20**, e15, 1–12
https://doi.org/10.1017/dmp.2025.10252

Received: 21 November 2024
Revised: 22 August 2025
Accepted: 28 October 2025

Keywords:
disaster; preparedness; mobile application; technology

Corresponding author:
Logan Manikam;
Email: logan.manikam.10@ucl.ac.uk

‡This article has been updated since original publication. A notice detailing the change has also been published

© The Author(s), 2026. Published by Cambridge University Press on behalf of Society for Disaster Medicine and Public Health, Inc. This is an Open Access article, distributed under the terms of the Creative Commons Attribution licence (http://creativecommons.org/licenses/by/4.0), which permits unrestricted re-use, distribution and reproduction, provided the original article is properly cited.

CAMBRIDGE UNIVERSITY PRESS

Mobile-Enabled Technologies in Disaster Management: A Systematic Literature Review‡

Dewi Nur Aisyah[1,2,3,4], Fauziah Mauly Rahman[2,5], Haniena Diva[6], Bambang Surya Putra[7], Muhammad Halik Rizki[8], Mizan Bustanul Fuady Bisri[8,9] and Logan Manikam[1,3,10]

[1]Department of Epidemiology and Public Health Institute of Epidemiology and Health Care, University College London, United Kingdom; [2]Digital Transformation Office, Ministry of Health of the Republic of Indonesia, Jakarta, Indonesia; [3]Aceso Global Health Consultants Pte Limited, Singapore, Singapore; [4]Department of Public Health, Monash University Indonesia, Tangerang Regency, Banten, Indonesia; [5]School of Computer Science, The University of Sydney, Sydney, NSW, Australia; [6]Center for Immunopathobiology, Preventive and Diagnostic Medicine, Minomartani, Daerah Istimewa Yogyakarta, Indonesia; [7]Indonesian National Board for Disaster Management, Jakarta, Indonesia; [8]World Bank Indonesia Office, Jakarta, Indonesia; [9]Graduate School of International Cooperation Studies, Kobe University, Kobe, Hyogo, Japan and [10]Saw Swee Hock School of Public Health, National University of Singapore, Singapore, Singapore

Abstract

Objective: The growing frequency of global disasters highlighted the need to integrate technology into disaster management. This systematic review describes the global landscape of mobile phone technologies for natural hazard-induced disaster prevention, preparedness, response, and recovery.
Method: A systematic review was conducted by searching databases, including Embase and MEDLINE, for studies published in English between 2000 and March 2024 that examined mobile applications for disaster management.
Result: The review included 26 studies covering 77 mobile apps across 14 countries. Most apps were privately owned (78.26%), supported multiple disaster phases (41.56%), and favored the Android platform (46.67%), with GPS being the most common technology (15.58%). Apps primarily targeted the general public (63.64%) and focused on earthquakes (32.47%) and hurricanes (31.17%). Despite their potential, adoption remains low; only 11.33% (6 apps) exceeded 1 million downloads, while 33.96% failed to surpass 1,000 downloads.
Conclusion: This review highlights significant gaps in the development, adoption, and impact of disaster management apps, especially in high-risk regions. Future efforts must focus on enhancing accessibility, addressing user needs, expanding features, and fostering stakeholder collaboration to improve the effectiveness of mobile technologies in disaster preparedness, response, and recovery.

Introduction

Disasters are significant disturbances to communities that exceed their ability to manage with existing resources. They can arise from natural, human-induced, or technological hazards. This paper focuses on natural hazards-induced disasters like droughts, earthquakes, floods, tsunamis, landslides, volcanic eruptions, storms, cold waves, heat waves, and hailstorms.[1,2] These disasters cause economic loss, infrastructure collapse, food and logistic chain disruptions, population displacement, and deaths. Over the last 5 decades, disasters have resulted in 4.7 million deaths and a global economic loss of USD 5 trillion.[3,4]

Floods and wind-related hazards, including storms and cyclones, are the most frequent and economically damaging.[5] While fatalities and affected populations have decreased in high-middle and middle-income countries, they have increased in low-income countries, leading to a global rise in mortality and affected people.[6] For instance, tropical cyclones caused 97,430 excess deaths from 1980 to 2019 and were involved in 1,945 separate disasters including extreme winds, flooding, heavy rainfall, and massive lightning.[7,8] Earthquakes, equally frequent, have caused nearly 750,000 deaths from 1998 to 2017, affecting over 125 million people.[9]

The frequency and magnitude of natural hazard-induced disasters are increasing, with 436 recorded in 2021 compared to 376 recorded 30 years ago.[5] Asia is the most disaster-prone region, with countries like the Philippines, Indonesia, and India having the highest disaster risk scores.[10] Climate change has exacerbated the frequency and severity of disasters, tripling climate-induced events like floods, storms, and droughts over the last 3 decades.[11–13] Disasters also have significant short and long-term mental health impacts, including depression, PTSD, anxiety, and suicidal ideation.[14,15]

The use of mobile phone technologies can significantly enhance disaster management strategies, offering valuable opportunities for Disaster Risk Reduction (DRR) by promoting inclusivity and ensuring that local knowledge and risk information can become more relevant

and accessible as well as enhancing preparedness.[16,17] These technologies hold considerable promise in improving access to communication, fostering equitable resilience by engaging marginalized and vulnerable communities, such as individuals with disabilities, who are often overlooked by traditional knowledge generation methods.[18,19]

Current examples of mobile technologies used for disaster risk management include the use of mobile applications, photos and videos, sensing technology, global positioning system (GPS), short-message services (SMS), voice calls, and social media.[18] Technology offers numerous advantages for disaster management, especially in low- and middle-income countries. For instance, mobile applications can provide real-time alerts and updates about impending disasters, helping communities prepare and respond more effectively.[18] Features such as GPS and mapping services enable location tracking and coordination of rescue operations, which is crucial in densely populated or remote areas.[18,19] Additionally, SMS and social media platforms can disseminate critical information quickly and widely, ensuring that even those without internet access receive timely warnings and instructions.[18,20] These technologies not only enhance immediate response efforts but also contribute to long-term resilience by facilitating better planning and resource allocation.[21]

Although it remains difficult to measure the number of mobile applications developed and their features for disaster management at a global level, this systematic review seeks to describe the global evolution of mobile phone technologies in the context of natural hazard-induced disaster management, including disaster prevention, preparedness, response, and recovery. Through the careful analysis of existing knowledge and similar local initiatives, this information could be transformed into quantitative data to support the development of innovative applications that support future DRR.[17]

Material and methods

Search Strategy

This review was carried out in accordance with PRISMA guidelines.[22] A comprehensive search was performed using Embase (1974-2024) and MEDLINE (1946-2024) on March 26, 2024, via Ovid. The query used for the search strategy through Web of Science was "disaster" AND "mobile phone" or "smartphone" or "cell phone" or "phone app" or "mobile app" AND "2000-2024." The search query used for PubMed was "disaster" AND "mobile phone" or "smartphone" or "cell phone" or "phone app" or "mobile app" with filters from "2000-2024."

Several inclusion criteria were applied to determine the eligibility of studies for this review. The criteria included; (1) mobile applications used for disaster preparedness, response, and management; (2) studies published between January 2000 and March 26th 2024; (3) studies that include cross-sectional, cohort studies, case–control studies, case series, case reports, and meta-analysis; (4) studies written in English, and (5) studies reporting primary or secondary outcomes related to disaster mobile applications.

Exclusion criteria included dissertations, theses, conference abstracts, randomized controlled trials, background reviews, expert opinions, modelling studies; studies focusing on non-disaster mobile applications; studies addressing disaster technology but not mobile applications; and studies written in languages other than English.

Selection Process

To ensure that quality studies were included for review, all papers went through a screening process, and duplicate papers were removed. To reduce bias during the screening process, two authors were tasked to independently review the selected studies. Title and abstract screening, as well as full-text screening, were independently completed by two authors using a combination of Excel and Google Sheets. Inclusion and exclusion criteria were implemented during the title and abstract screening. During the full-text screening, a thorough review was conducted to ensure the studies provided sufficient information, and only those meeting the inclusion criteria were incorporated into the final review and data extraction phase. Studies identified by both authors for exclusion were removed from the final screening phase. When discrepancies emerged between the first and second reviewers, a third author participated to determine the final decision for study inclusion.

Data Collection and Analysis

Data collection was carried out by the first reviewer by conducting a comprehensive review of 26 studies that passed the screening process. In order to harmonize the information needed to be extracted from the studies, a template was developed using Google Sheets. The aforementioned template was used to further examine each study by incorporating several categories, such as (1) mobile app name; (2) location; (3) year of release; (4) ownership; (5) operating system; (6) intended use; (7) targeted user; (8) number of downloads; (9) application rating; (10) available features; (11) type of hazard covered; (12) specific technology; and (13) other information. During data collection, not all information was reported in each category, and unavailable or missing data was reported as not available.

To assess the current availability and ongoing relevance of the reviewed applications, a manual search was conducted in June 2025 on the official Apple App Store and Google Play Store. To ensure an accurate assessment of inactivity, each of the 77 applications was first categorized based on its original operating system ("iOS", "Android", or "Android & iOS") as detailed in the study's appendix.

An application's status was then defined according to its availability on its intended platforms. Single-platform applications (i.e., "iOS only" or "Android only") were classified as inactive if they were no longer available on their single designated app store. Dual-platform applications (i.e., "Android & iOS") were classified as inactive only if they were missing from both the Google Play Store and the Apple App Store. If an app remained available on at least one of these platforms, it was considered active.

Results

Study Selection

The search across two databases, Medline and Embase, produced a total of 948 results, which were imported into EndNote20. Out of these results, 470 duplicates were identified and removed by EndNote20 and manual verification, leaving 478 records for eligibility screening. During the initial screening phase, based on title and abstract, 419 records were excluded for either meeting exclusion criteria or failing to meet inclusion requirements. In the second phase, the full text of the remaining studies was assessed, and an additional 33 studies were excluded for one of 6 reasons: disaster technology but not mobile apps, study not in English, mobile application not related to disaster, not digital technology, not related to disaster, or unsuitable study design. An additional study was excluded because the full text was inaccessible. The resulting number of studies passing eligibility screenings and available for extraction was 26.[23–48] From 26 studies,

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

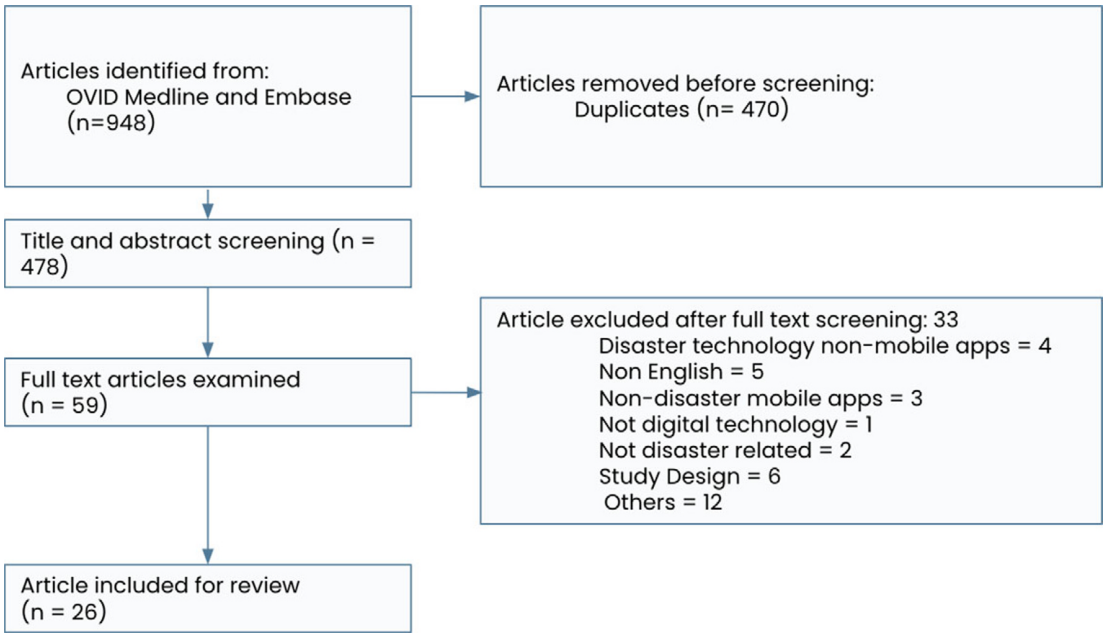


Figure 1. PRISMA flowchart with result for screening process.

3 were cross-sectional studies, 2 were cohort studies, 2 were case control studies, 12 were case series/case reports, and 7 were systematic review studies. Figure 1 shows a PRISMA flow chart of the selection process during each stage.

Disaster Preparedness and Mitigation Mobile Application Characteristics

From the 26 studies included, a total of 110 disaster mobile apps were identified. Following the selection based on specific application purpose (natural hazard-induced disaster or other types of crises) and usage status (released or prototype only), 77 mobile apps were deemed eligible for review. Among these 77 apps, 37 originated from North America (48.05%), 34 from Asia (44.16%), 3 from Europe (3.90%), 2 originated from Africa (2.60%), and 1 from Australia/Oceania (1.30%). Figure 2 illustrates the global distribution of disaster mobile apps by indicating the number of apps originating from each country.

This map reveals that the majority of disaster-related mobile applications were developed in countries such as the USA (36; 46.75%), India (24; 31.17%), and Indonesia (4; 5.19%). These are followed by China (2; 2.60%) and Japan (2; 2.60%). Additionally, countries like Bangladesh, Canada, Denmark, Italy, Kenya, South Africa, South Korea, Spain, and the Philippines each have only one application. A summary of key application characteristics is provided in Table 1. A complete breakdown of all 77 applications is available in Appendices A1-A3.

Among the 77 mobile applications reviewed, only 54 provide information on the year of release. The majority were released in 2016 (11; 20.37%). The following years of 2017 and 2018 each saw the release of 6 applications (6; 11.11%). Only one application was released in 2023, which is Relief Central from the USA. Following the platform-specific verification process, 43 of the 77 reviewed applications (55.8%) were found to be inactive as of June 2025. This indicates a significant rate of attrition among disaster-related mobile applications since their initial release. Upon examining the ownership of these applications, it was found that 36 (78.26%) were privately owned by IT companies, 24 (52.17%) were developed by government entities such as local government, 6 (13.04%) resulted from public-private collaboration, and 4 (8.70%) were owned by NGOs including the NFPA, OXFAM, and the American Red Cross.

In terms of operating system compatibility, the majority of applications were developed for Android only (35; 46.67%), followed by those compatible with both Android and iOS (28; 37.33%) and iOS only (12; 16.00%). The primary target users for these applications were the general public (49; 63.64%). Additionally, 11 (14.29%) applications targeted emergency responders, and 1 (1.30%) was designed for health workers. Several applications were intended for multiple user groups, such as medical personnel and emergency responders, general public and disaster volunteers, or general public and emergency responders, accounting for around 7 (9.09%) applications. Other specific target populations included mining personnel, university students and staff, civic administrators, individuals with special medical conditions, wildfire survivors, and children, comprising 7 (9.09%) applications. Two applications (2.60%) had unspecified target users.

The intended time of use for these applications was also examined. The majority (32; 41.56%) were designed for multiple disaster management stages, such as before and during, or before and after disaster. A total of 24 (31.17%) applications were designed solely for pre-disaster purposes, focusing on disaster preparedness and education. Additionally, 13 (16.88%) applications were intended for use during disasters, primarily for disaster alerts and evacuation, while 8 (10.39%) were designed for post-disaster use, including disaster reporting and teleconsultation. The types of hazards and disasters addressed by the applications were also reviewed. Earthquakes were the most frequently featured disaster, represented in 25 (32.47%) of the applications. This was followed by hurricanes/typhoons/tornadoes (24; 31.17%), fires (18; 23.38%), floods (17; 22.08%), tsunamis (13; 16.88%), volcanic eruptions (13; 16.88%), and landslides (10; 12.99%). Notably, approximately 28 (36.36%) applications did not specify a particular hazard or disaster focus.

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

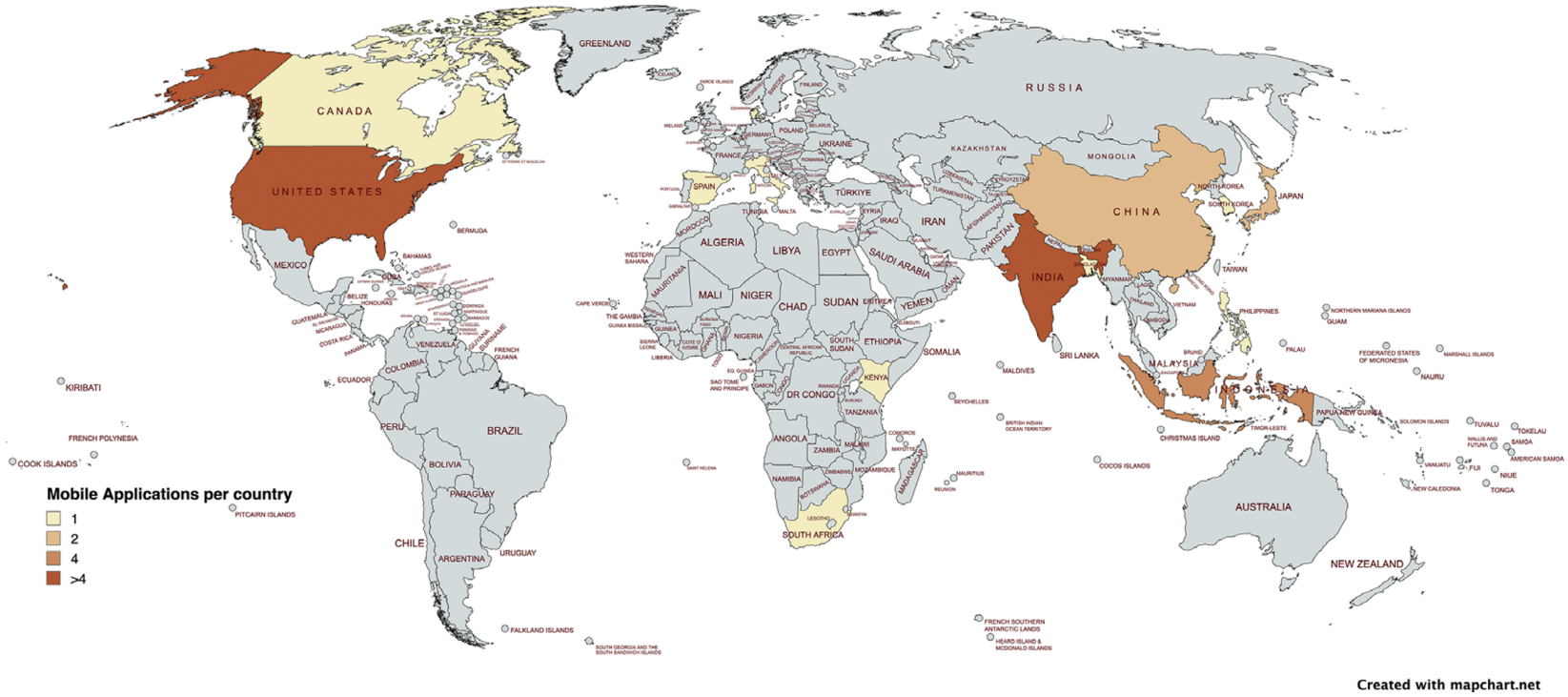


Figure 2. Number of mobile apps developed and used per country.

Table 1. Characteristics of disaster mobile applications

Characteristic	Category	Number of apps (n)	Percentage
Application Profile			
Year of release (n = 54)			
	2008–2012	7	12.96%
	2013–2015	15	27.78%
	2016	11	20.37%
	2017–2018	12	22.22%
	2020–2023	8	14.81%
Ownership (n = 46)			
	Private	36	78.26%
	Government	24	52.17%
	Combination	6	13.04%
	NGO	4	8.70%
Operating system (n = 75)			
	Android	35	46.67%
	Android & iOS	28	37.33%
	iOS	12	16.00%
Target Audience and Adoption			
Primary target user (n = 77)			
	General Public	49	63.64%
	Emergency Responders	11	14.29%
	Other Specific Users[a]	15	19.48%
	Unspecified	2	2.60%
Number of downloads (n = 53)			
	<1,000	18	33.96%
	1,000 to <100,000	24	45.28%
	100,000 to <1,000,000	5	9.43%
	≥1,000,000	6	11.32%
Disaster Functionality			
Utilization in disaster cycle (n = 77)			
	Pre-disaster	24	31.17%
	During disaster	13	16.88%
	Post-disaster	8	10.39%
	Multistage	32	41.56%
Hazards covered (n = 77)[b]			
	Earthquake	25	32.47%
	Hurricane/Typhoon/ Tornado	24	31.17%
	Fire	18	23.38%
	Flood	17	22.08%
	Tsunami	13	16.88%
	Volcano Eruption	13	16.88%
	Landslide	10	12.99%
	Unspecified	28	36.36%
Technical Specification			
Technology used (n = 77)[b]			
	GPS	12	15.58%
	Other Specified[c]	13	16.88%
	Unspecified	52	67.53%

Notes.
[a]Includes apps targeting health workers/providers, mixed users (e.g., general public and volunteers), and other specific populations (e.g., mining personnel, university students).
[b]Categories are not mutually exclusive; apps may cover multiple hazards or use multiple technologies.
[c]Includes GIS, QR codes, smartphone movement sensor, wireless ad hoc network, Bluetooth, augmented reality, and OCR.

Regarding the types of technology utilized and supported within the applications, GPS was predominant, featuring in 12 (15.58%) applications. This was followed by GIS, QR codes, smartphone movement sensors, and wireless ad-hoc networks, each present in 2 (2.60%) applications. Additionally, there were applications supporting Bluetooth (1; 1.30%), augmented reality (1; 1.30%), and OCR (1; 1.30%). However, 52 (67.53%) applications did not specify the types of technology they supported. The usage of each application was also assessed. The majority of the applications (18; 33.96%) had fewer than 1,000 downloads. Only 11 applications exceeded 100,000 downloads, and just 1 application, HERE WeGo, achieved 10 million downloads (1.89%).

A deep dive into existing features within each application was conducted. Educational features were present in 50 (64.94%) applications, primarily including content such as guidebooks and preparedness checklists. Approximately 30 (38.96%) applications featured alert or early warning systems, typically delivered through in-app and pop-up notifications. Disaster-related information, such as news, articles, or summaries of recent events, was available in 23 (29.87%) applications. Chat services or call centers providing crucial contact points for firefighters, nearby police stations, and ambulances were developed in 21 (27.27%) applications. Fourteen (18.18%) applications included a disaster reporting feature, allowing users to report disaster impacts. Only 12 (15.59%) applications provided information on evacuation routes during disasters. Additionally, 7 (9.09%) applications incorporated features such as offline functionality and search and rescue capabilities. Teleconsultation was available in 5 (6.49%) applications, and a panic button feature was found in 3 (3.90%) applications. Figure 3 summarizes the distribution of each feature across all examined applications.

An analysis of download numbers and their representation by continent was conducted. As shown in Figure 4, data were available for 4 continents: Africa, Asia, North America, and Oceania. In Africa, the reported number of downloads was around 10,000. In Oceania, this number reached approximately 1,000,000. Conversely, in continents such as Asia and North America, the download numbers were wider and more varied. Applications originating from Asia reported download numbers ranging from 100 to 10,000, while those from North America had a broader range, from fewer than 100 to 10,000,000. For this analysis, data from Europe was not available.

The focus of applications varies by continent as presented in Figure 5. Data indicate that applications from Europe concentrate on hazards such as earthquakes, fires, and floods. Applications from Asia and Oceania address all examined hazards but in varying numbers. For instance, in Asia, there are 12 applications focused

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

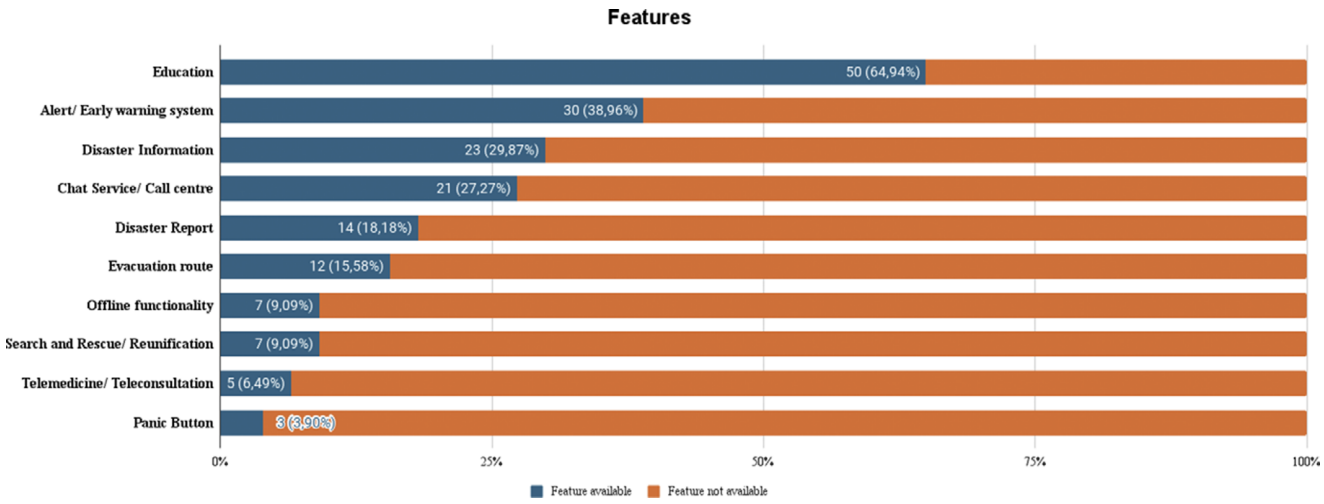


Figure 3. Feature provided in disaster mobile applications.

on earthquakes, whereas Oceania has just one. North America also developed applications covering all hazards, with the majority (13 applications) concentrating on hurricanes, typhoons, and tornadoes. For this analysis, data for Africa was not available.

In addition to application focus, the availability of features related to specific hazards was also assessed as presented in Figure 6. Educational features, prevalent across all hazards, were most common in applications focusing on earthquakes (15) and hurricanes (14). Similarly, alert/early warning features were prominent in applications targeting earthquakes (12) and hurricanes (13). While evacuation routes were available for all hazards, the highest frequency was observed in applications focusing on hurricanes, with 6 instances. Offline functionality was present in applications addressing earthquakes (2) and fires (1). Disaster information features were widespread, particularly in applications related to hurricanes (12) and earthquakes (10). The disaster report feature was also available across all hazards, with the highest occurrence in applications focusing on earthquakes (5). Search and rescue features were included in applications targeting almost all hazards, except for volcanic eruptions. Chat services or call center features were incorporated in applications addressing nearly all hazards, except for landslides and volcanic eruptions. Telemedicine features were found in applications focusing on fires (2) and floods (1). Additionally, the panic button feature was limited, appearing only in applications addressing fires (1), floods (1), hurricanes (2), and tsunamis (1).

Discussion

The review assessed 26 studies, identifying 110 disaster-related mobile applications, with 77 deemed eligible based on specific criteria. Geographically, these applications originated from Africa (2.60%), Asia (44.16%), Europe (3.90%), North America (48.05%), and Australia/Oceania (1.30%). The distribution highlighted that the USA, India, and Indonesia were leading developers. Out of 7 hazards, the most frequently addressed hazards were earthquakes (32.47%), hurricanes/typhoons/tornadoes (31.17%), fires (23.38%), and floods (22.08%). Feature analysis indicated that educational content was the most prevalent (64.94%), followed by alert/early warning systems (38.96%), disaster information (29.87%), and chat services/call centers (27.27%). Additionally, the majority of the applications were released in 2016 (20.37%).

The distribution of disaster mobile applications varied significantly by country. In this study, we found that the USA, India, and Indonesia led in the number of applications developed for disaster management. Applications from North America, particularly the US, dominate due to its well-developed technological infrastructure and frequent disaster events.[49,50] In the past 5 years, between 2020 and 2024, there have been 17 tropical cyclones, 69 severe storms, 5 wildfires, 5 winter storms, 7 flooding, and 4 drought billion-dollar disaster events affecting the USA.[51] This number is also reflected in our findings, in which the most prominent features developed within mobile applications originated from the USA are related to hurricane/tornado, amounting to 13 mobile applications out of 36 mobile applications. The limited number of mobile applications developed in Oceania and Europe could be linked to the lower number of studies focusing on mobile apps in these regions. This may be due to different disaster management strategies and capacities, as well as varying levels of technological infrastructure and research priorities.[52]

Countries with rich and diverse technological options, like Japan, may place less importance on mobile solutions due to differing disaster management strategies. For example, due to a high number of earthquakes experienced per year, Japan's approach to disaster risk reduction emphasizes better regional planning, constructing earthquake-resistant buildings, and increasing public awareness through campaigns and education.[52,53] While Japan has its own Early Warning System (EWS) called J-ALERT for nationwide emergency warnings and L-ALERT as the common platform by which local municipalities send critical information to local residents through various media. The dissemination of information to the public does not depend heavily on mobile apps. Instead, it utilizes a combination of radio station broadcasts, media, and cell broadcast mobile phone notifications, thus residents will receive the notifications even though they do not install a dedicated mobile app and as long as they are located in the areas within the hazard's threshold.[54] This difference among countries could be linked to the type of disaster experienced and different disaster management strategies and capacities.

The most prevalent features among the reviewed applications were educational content and alert/early warning systems. Educational features play a critical role in raising public awareness and preparedness.[55,56] Effective disaster learning helps individuals and communities respond accurately to disasters, reducing vulnerabilities

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

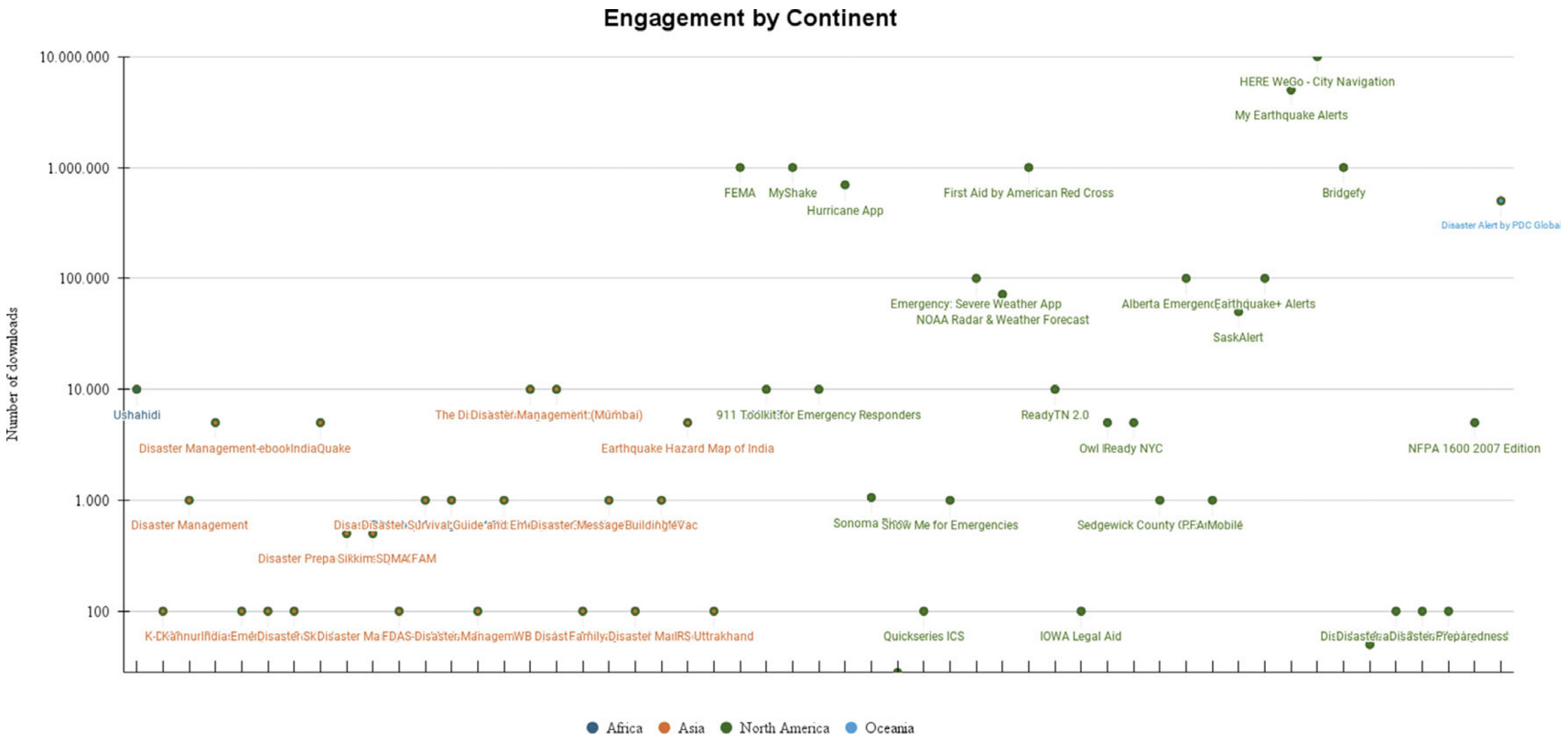


Figure 4. Number of downloads or uses by continent.

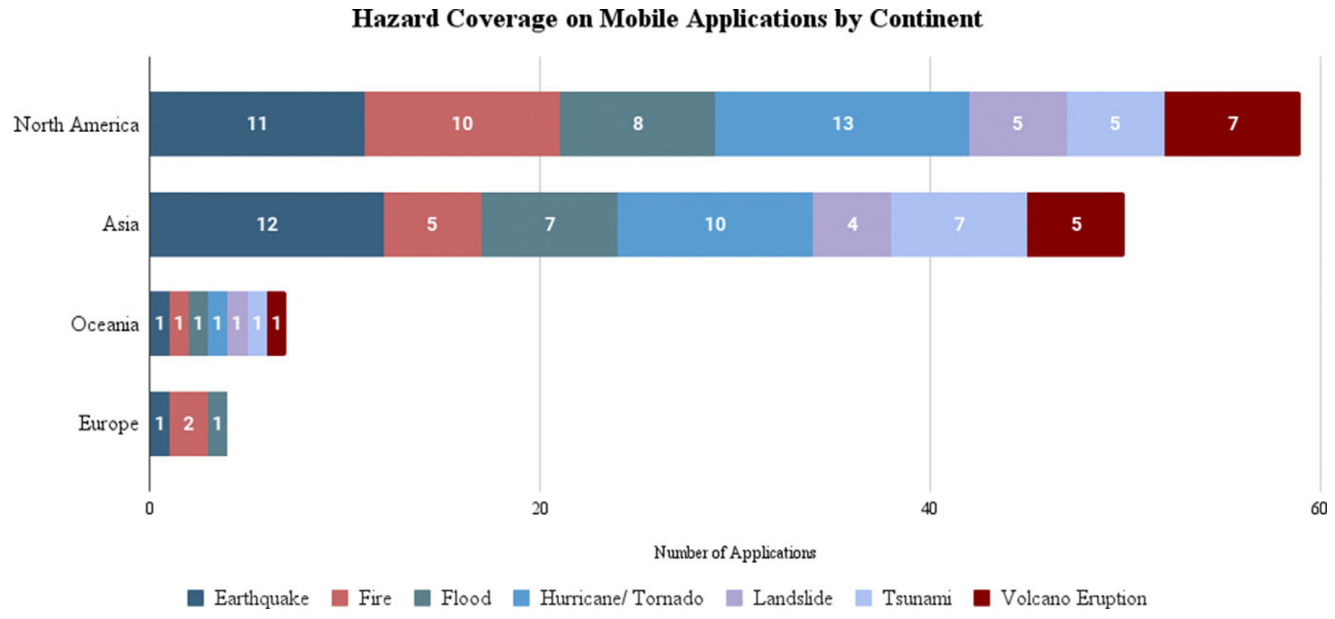


Figure 5. Hazard coverage on mobile applications by continent.

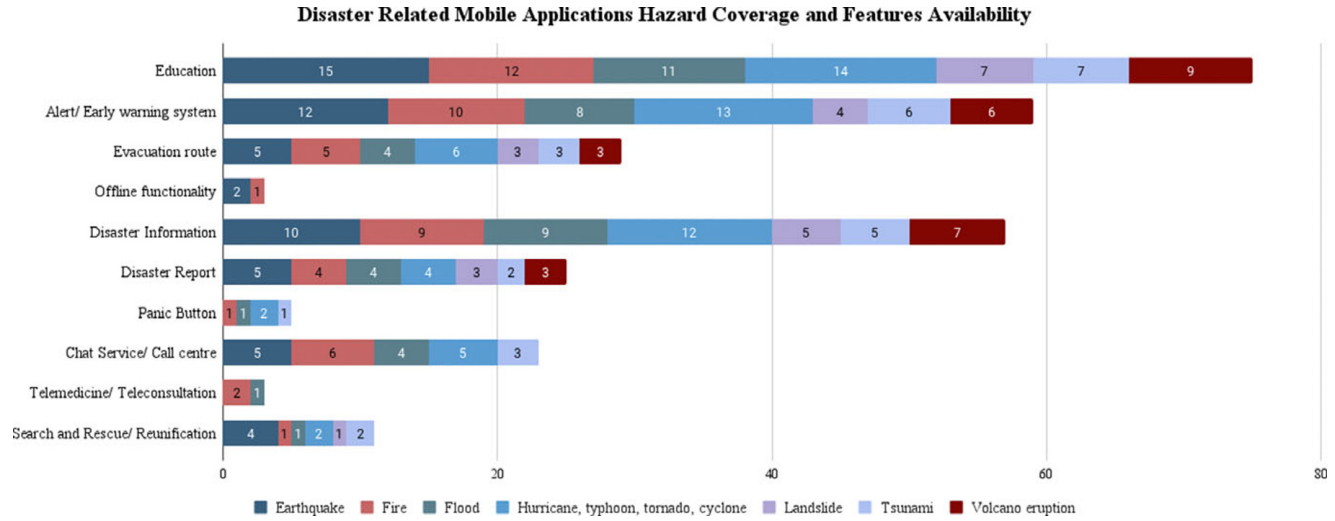


Figure 6. Disaster-related mobile applications hazard coverage and features availability.

and minimizing casualties, particularly in disaster-prone regions.[57,58] One study found that users were more satisfied with disaster learning delivered through mobile applications.[59] Additionally, another study emphasized that mobile applications offer personalized learning experiences, making disaster education more engaging and enjoyable.[60]

Another key feature is the alert system, which plays a vital role in early warning systems. Alerts communicate hazard monitoring or impact-based information in the form of actionable messages that can be easily understood by those at risk, enabling individuals, communities, and organizations to prepare and respond appropriately in time to minimize harm or loss.[61] An effective early warning can save lives and reduce damage by up to 30% if activated 24 hours before a disaster occurs.[62] Advancements in technology, such as Geographic Information Systems (GIS), allow for incident prediction, which can generate alerts for monitoring floodgates, detecting land fires, or tracking extreme weather conditions.[63,64] Additionally, the establishment of the Sendai Framework for DRR 2015-2030 has encouraged many countries to develop their own early warning systems.[65,66] The high frequency of these features in the mobile applications reflects their importance in effective disaster management and response. However, it is also important to ensure that this application and features are inclusive for vulnerable groups.[67] Study also highlights the importance of designing user-friendly applications that follow user-centric principles.[68]

The majority of disaster mobile applications are designed for the general public. This is in line with a finding that disaster-focused mobile applications can facilitate disaster management-related actions such as sharing important information and images to assess post-disaster damage and/or pre-disaster risk and to notify others about personal status after disasters.[69] For example, applications such as MyShake can harness smartphone sensors to collect earthquake data, and the recorded data can be used for further purposes, such as studying earthquake impacts on buildings, which makes it

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

important to target as many users as possible.[31] Applications targeted at government agencies and emergency responders are fewer. However, applications targeted at emergency responders are vital for coordinating response efforts and managing resources, such as applications like the FEMA (Federal Emergency Management Agency) app, which can be used to plan emergency meeting locations, or "911 Toolkit for Emergency Responders," which is useful for firefighter preparedness.[70,71] The design of these applications for specific user groups highlights their role in supporting various aspects of disaster management. Furthermore, we observed that there is a low number of telemedicine and panic button features, even though they are important for the general public. This may be due to several factors, such as not all countries have established partnerships with telemedicine providers or the necessary resources to support telemedicine infrastructure.[72] Additionally, panic button features are typically designed for specific groups, such as individuals with disabilities or those in high-risk situations, which may limit their widespread implementation.[73]

The reviewed mobile apps were found to be predominantly Android-compatible applications (46.67%), and this can be attributed to several reasons. First, Androids have a larger market share, in which in 2024 Android reached 70.71% global market share, while iOS followed at 28.54%.[74] Furthermore, development tools and the costs associated with developing apps for iOS, which often require more specialized hardware, software, as well as knowledge, can also deter developers from choosing iOS.[75,76] Although the iOS environment offers better security and results in larger per-app income, developers tend to choose Android due to its versatility and open-source origin.[77]

The variation in download numbers was analyzed and indicates different levels of adoption and utility. Applications with the highest number of downloads, such as HERE WeGo—City Navigation and My Earthquake Alerts, stand out with 10 million and 5 million downloads, respectively. Studies have shown that familiarity and perceived social usefulness can influence a user's intention to install a mobile application.[78,79] HERE WeGo has an interface that is familiar with everyday use maps, and its broad functionality, combined with breakthrough location mapping technology, also allows it to have widespread recognition.[80,81] However, the overall number of downloads is much less than one would anticipate, especially in areas that are frequently affected by natural hazard-induced disasters. As such, a significant gap is highlighted between the intended and actual audience reached by these apps.

A critical theme emerging from our analysis is the distinction between app adoption and user engagement. While download numbers offer a surface-level metric of an app's reach, they do not serve as a proxy for its utility or impact during a crisis. An app with millions of downloads is ineffective if it is opened only once, if its features are too complex for a panicked user, or if its alerts are ignored. The significant gap between the number of available apps and the low download counts for many (33.95% with fewer than 1,000 downloads) hints at a deeper problem of engagement. This challenge is likely linked to our finding that over half of the reviewed apps are now inactive. Apps that fail to engage users are less likely to receive the long-term support and maintenance required to remain viable. Perhaps alternative approaches for the dissemination of such apps should be considered for effective dissemination and adoption, e.g., pre-uploaded by mobile operators in disaster-prone areas.

The issue of limited impact, evidenced by low download numbers for many apps, is critically compounded by our finding that 55.8% of the reviewed applications are now inactive. This conclusion, derived from a rigorous, platform-specific verification, underscores a fundamental challenge in the field: sustainability. The high rate of inactive applications suggests that many are developed as short-term projects or by entities that lack a long-term maintenance model. This severely limits their potential for ongoing contribution to disaster preparedness, revealing a gap between the initial development of technological solutions and their long-term integration into disaster management strategies.

Strengths and Limitations

The study provides a comprehensive overview of disaster-related mobile applications globally, detailing their distribution, features, and the hazards they cover. By examining a substantial number of applications across diverse continents, the study offers valuable insights into the global landscape of disaster management tools. It highlights significant trends such as the prevalence of educational features, alert systems, and the varied focus on different types of hazards. This analysis aids in understanding how mobile applications contribute to disaster preparedness and response, revealing patterns in functionality and geographical distribution.

Despite its extensive coverage, the study has notable limitations. First, our reliance on academic databases means that many applications, especially those developed and used locally without a research component, might not be included, leading to potential publication bias. This gap may skew our findings toward applications developed in academic settings, potentially missing government-sponsored or locally funded apps. Second, the study predominantly includes applications documented in English, which may result in underreporting of apps from non-English speaking countries and introduce a geographical bias. Third, the completeness of our analysis was constrained by the inconsistent reporting of data within the primary studies we reviewed. For instance, key information such as the year of release for over a quarter of the apps and download statistics for nearly a third were unavailable, which impacted the comprehensiveness of our trend and adoption analysis.

There is also a near-total absence of user engagement metrics in the literature. While we could analyze metrics like download numbers, other crucial metrics such as active user statistics or user retention rates were not reported in the included studies. This prevents a deeper analysis of which applications are not only downloaded but are actively and effectively used by the public. Finally, the absence of a subgroup analysis means we could not explore potential differences in app characteristics between, for example, high-income and low-income countries. Such analysis could have revealed different priorities in app design. Apps from lower-income countries might prioritize offline functionality or SMS integration due to inconsistent internet connectivity, which we currently could not capture. We encourage future research focusing on these gaps.

Future Directions

Future research should move beyond describing app features to evaluating their real-world effectiveness and usefulness during a disaster event. Usability studies and impact assessments are crucial and should capture not just download counts but also active user statistics, user retention rate, in-app analysis, and qualitative analysis of user ratings and reviews from app stores to understand user needs and frustration. Additionally, given that a large proportion of apps have few downloads and over half are inactive, a critical area

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press

for study is the barrier to long-term adoption and maintenance; research should investigate the entire app lifecycle, from public awareness campaigns and user trust to the business and maintenance models that determine why so many apps become outdated or unavailable. Building on the example of Japan's J-ALERT system, comparative research is needed as well. Future work could evaluate the effectiveness, reach, and public trust in dedicated, downloadable mobile apps versus integrated, multi-channel government alert systems that do not require an opt-in from users. This will help policymakers decide where to invest resources for the most resilient communication strategies.

Conclusions

In conclusion, disaster-related mobile apps play a critical role in public education, early warning systems, and overall disaster management. The rise in app development corresponds to the increasing need for technological tools in disaster preparedness, response, and recovery. However, the variation in download numbers may reflect a number of underlying factors, such as the applications' utility and user familiarity, emphasizing their growing importance in disaster management efforts globally.

To enhance the effectiveness of disaster mobile applications, future efforts should focus on increasing accessibility, expanding feature integration, and fostering stakeholder collaboration. Ensuring that these applications are accessible to vulnerable populations by incorporating accessibility features such as voice interaction, text-to-speech, speech-to-text, or haptic feedback; developing clear and simple interfaces such as using high-contrast color schemes and large, readable fonts to accommodate users with visual impairments. This is especially crucial for low-income regions where disaster impacts are most severe. Integrating advanced technologies like predictive analytics, real-time data sharing, and offline functionality can further improve preparedness and response. Additionally, fostering international harmonization to standardize application features and promote knowledge sharing across borders can lead to more comprehensive and universally effective tools for disaster management.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/dmp.2025.10252.

Data availability statement. The data sets generated during and/or analyzed during this study are available from the corresponding author on reasonable request.

Acknowledgments. We would like to thank the Indonesian National Agency of Disaster Management (BNPB) and the World Bank for their immense support in this project.

Author contribution. Dewi Nur Aisyah led the study design, conducted the search strategy, performed paper screening for abstract and full-text review, and carried out data analysis. Dewi Nur Aisyah built the paper concept and supported the development of the methodology. Fauziah Mauly Rahman and Haniena Diva performed paper screening for abstract and full-text review, as well as built the first draft of the paper. Bambang Surya Putra, Muhammad Halik Rizki, and Mizan Bustanul Fuady Bisri validated the study and critically revised the manuscript content. Dewi Nur Aisyah had primary responsibility for the final content. All authors read and contributed to reviewing the study data, the manuscript design, and the approval of the final manuscript.

Funding statement. This research was carried out as part of the Indonesia Disaster Resilience Initiatives Project (IDRIP) under the Indonesian National Agency of Disaster Management (BNPB), supported by the World Bank.

Competing interests. While one of the authors is affiliated with Aceso Global Health Consultants Pte Limited, which is a private company, we declare that this research project does not receive funding from Aceso Global Health Consultants. The company does not have a role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript.

References

1. **IFRC**. What Is a Disaster? https://www.ifrc.org/our-work/disasters-climate-and-crises/what-disaster
2. **World Population Review**. Natural Disaster Risk by Country 2024. Updated 2024. https://worldpopulationreview.com/country-rankings/natural-disaster-risk-by-country
3. **Ritchie H**, **Rosado P**, **Roser M.** *Natural Disasters*. 2022. Accessed August 25, 2024. https://ourworldindata.org/natural-disasters
4. **World Meteorological Organization**. *WMO Atlas of Mortality and Economic Losses From Weather, Climate and Water Extremes (1970–2019).* 2021. Accessed August 25, 2024. https://library.wmo.int/records/item/57564-wmo-atlas-of-mortality-and-economic-losses-from-weather-climate-and-water-extremes-1970-2019
5. **Asian Disaster Reduction Center**. *Asian Disaster Reduction Center: 2021 Annual Report.* December 1, 2022. Accessed August 25, 2024. https://www.adrc.asia/publications/annual/21/21eng/index.php
6. **Jonkman SN**, **Curran A**, **Bouwer LM**. Floods have become less deadly: an analysis of global flood fatalities 1975–2022. *Nat Hazards*. 2024 Feb 27;**120**(7):6327–6342. doi:10.1007/s11069-024-06444-0
7. **Huang W**, **Li S**, **Vogt T**, et al. Global short-term mortality risk and burden associated with tropical cyclones from 1980 to 2019: a multi-country time-series study. *Lancet Planet Health*. 2023 Aug;**7**(8):e694–e705. doi:10.1016/s2542-5196(23)00143-2
8. **World Meteorological Organization**. *Tropical Cyclone.* Updated December 16, 2022. https://wmo.int/topics/tropical-cyclone
9. **World Health Organization**. *Earthquakes.* Accessed August 25, 2024. https://www.who.int/health-topics/earthquakes#tab=tab_1
10. **Bündnis Entwicklung Hilft**. *World Risk Report 2023.* September 19, 2023. https://weltrisikobericht.de/worldriskreport/
11. **United Nations Framework Convention on Climate Change**. *World Risk Report.* October 14, 2014. https://unfccc.int/news/world-risk-report
12. **World Bank**. *World Bank Climate Change Knowledge Portal - Climate Change Overview*. https://climateknowledgeportal.worldbank.org/climate-change-overview
13. **Oxfam International**. 5 Natural Disasters That Beg for Climate Action. Updated May 25, 2022. https://www.oxfam.org/en/5-natural-disasters-beg-climate-action
14. **Keya TA**, **Leela A**, **Habib N**, et al. Mental health disorders due to disaster exposure: a systematic review and meta-analysis. *Cureus*. 2023 Apr 2;**15**(4). doi:10.7759/cureus.37031
15. **Novia K**, **Hariyanti T**, **Yuliatun L.** The impact of natural disaster on mental health of victims lives: systematic review. *IJSOC*. 2020 Jul 12;**2**(3):65–85. doi:10.54783/ijsoc.v2i3.128
16. **United Nations Development Programme**, United Nations Office for the Coordination of Humanitarian Affairs. *Innovation in Disaster Management: Leveraging Technology to Save More Lives.* Mar 2024. Accessed August 25, 2024. https://www.undp.org/policy-centre/istanbul/publications/innovation-disaster-management-leveraging-technology-save-more-lives
17. **Paul JD**, **Bee E**, **Budimir M.** Mobile phone technologies for disaster risk reduction. *Clim Risk Manag*. 2021;**32**:100296. doi:10.1016/j.crm.2021.100296
18. **Budimir M**, **Bee E**, **Paul J.** *Using mobile phone technologies for Disaster Risk Management: Reflections from SHEAR.* 2021. Accessed August 25, 2024. https://nora.nerc.ac.uk/id/eprint/530631/1/SHEAR_MobileTechs_v6.pdf
19. **Singh R.** The role of geographic information systems (GIS) in disaster management and planning. *Int J Geogr Geol Environ*. 2024 Jul 1;**6**(2):195–205. doi:10.22271/27067483.2024.v6.i2c.305
20. **Fauzi MA**. Social media in disaster management: review of the literature and future trends through bibliometric analysis. *Nat Hazards*. 2023 Jul 3; **118**(2):953–975. doi:10.1007/s11069-023-06079-7

21. Global Facility for Disaster Reduction Recovery. *Using Technology to Stay Ahead of Natural Disaster Risk*. 2016. https://www.gfdrr.org/en/feature-story/using-technology-stay-ahead-natural-disaster-risk
22. **Page MJ**, **McKenzie JE**, **Bossuyt PM**, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021 Mar 29;**372** (n71):n71. doi:10.1136/bmj.n71
23. **Aedo I**, **Yu S**, **Díaz P**, et al. Personalized alert notifications and evacuation routes in indoor environments. *Sensors*. 2012 Jun 8;2012;**12**(6):7804–7827. doi:10.3390/s120607804
24. **Bachmann DJ**, **Jamison NK**, **Martin A**, et al. Emergency preparedness and disaster response: there's an app for that. *Prehosp Disaster Med*. 2015 Sep 15; **30**(5):486–490. doi:10.1017/s1049023x15005099
25. **McAtee KJ**, **Bedenbaugh R**, **Lakis D**, et al. Emergency preparedness and disaster response: there's an app for that 2.0. *Prehosp Disaster Med*. 2021 Dec 17;**37**(1):117–123. doi:10.1017/s1049023x21001321
26. **Zhao X**, **Ding Y**, **Yu Y**, et al. Public-participant quick cable force investigation method using smartphone for bridges in disaster area. *Adv Mech Eng*. 2016 Dec;**8**(12). doi:10.1177/1687814016683600
27. **Wahyuningtyas N**, **Ruja IN**, **Yahya MH**, et al. Developing of a learning media for smartphones for disaster mitigation education. *Int J Emerg Technol Learn*. 2021 Apr 9;**16**(07):160. doi:10.3991/ijet.v16i07.21195
28. **Susmini S**, **Feri J**, **Wijaya S**, et al. The effects of a disaster preparedness app on community knowledge and intentional behavior in hurricane risk areas. *Disaster Med Public Health Prep*. 2022 Mar 25;**17**. doi:10.1017/dmp.2022.46
29. **Usman F**, **Hariyani S**, **Basuki Kurniawan E**, et al. Mount Bromo eruption disaster preparedness with Android mobile based application. *JIAT*. 2020 Dec 15;**6**(2):1049–1058. doi:10.21776/ub.jiat.2020.006.02.7
30. **Fathoni M**, **Usman F**, **Hariyani S**, et al. Health disaster preparedness using Android mobile based application case Mount Bromo eruption. *J Ners*. 2020 Jul 7;**15**(1Sp):173–177. doi:10.20473/jn.v15i1sp.19005
31. **Seligman J**, **Felder SS**, **Robinson ME**. Substance Abuse and Mental Health Services Administration (SAMHSA) behavioral health disaster response app. *Disaster Med Public Health Prep*. 2015 Jul 13;**9**(5):516–518. doi:10.1017/dmp.2015.84
32. **Nakai H**, **Itatani T**, **Horiike R.** Application software that can prepare for disasters based on patient-participatory evidence: K-DiPS: a verification report. *Int J Environ Res Public Health*. 2022 Aug 6;**19**(15):9694. doi:10.3390/ijerph19159694
33. **Lu Z**, **Cao G**, **La Porta T.** TeamPhone: networking smartphones for disaster recovery. *IEEE Trans on Mobile Comput*. 2017 Dec 1;**16**(12):3554–3567. doi:10.1109/tmc.2017.2695452
34. **Kong Q**, **Allen RM**, **Schreier L**, et al. MyShake: a smartphone seismic network for earthquake early warning and beyond. *Sci Adv*. 2016 Feb 5;**2**(2). doi:10.1126/sciadv.1501055
35. **Kirsch TD**, **Circh R**, **Bissell RA**, et al. "Just-in-time" personal preparedness: downloads and usage patterns of the American Red Cross hurricane application during Hurricane Sandy. *Disaster Med Public Health Prep*. 2016 Jun 28;**10**(5):762–767. doi:10.1017/dmp.2016.52
36. **Heinz AJ**, **Wiltsey-Stirman S**, **Jaworski BK**, et al. Feasibility and preliminary efficacy of a public mobile app to reduce symptoms of postdisaster distress in adolescent wildfire survivors: Sonoma rises. *Psychol Serv*. 2022;**19** (Suppl 2):67–79. doi:10.1037/ser0000576
37. **Frigerio S**, **Schenato L**, **Bossi G**, et al. Hands-on experience of crowdsourcing for flood risks. An Android mobile application tested in Frederikssund, Denmark. *Int J Environ Res Public Health*. 2018 Sep 4;**15**(9):1926. doi:10.3390/ijerph15091926
38. **Berawi MA**, **Leviäkangas P**, **Siahaan SAO**, et al. Increasing disaster victim survival rate: SaveMyLife mobile application development. *Int J Disaster Risk Reduct*. 2021;**60**:102290. doi:10.1016/j.ijdrr.2021.102290
39. **Sukhwani V**, **Shaw R.** Operationalizing crowdsourcing through mobile applications for disaster management in India. *Prog Disaster Sci*. 2020 Jan;**5**: 100052. doi:10.1016/j.pdisas.2019.100052
40. **Bellini P**, **Boncinelli S**, **Grossi F**, et al. Mobile emergency, an emergency support system for hospitals in mobile devices: pilot study. *JMIR Res Protoc*. 2013 May 23;**2**(1):e19. doi:10.2196/resprot.2293
41. **Callaway DW**, **Peabody CR**, **Hoffman A**, et al. Disaster mobile health technology: lessons from Haiti. *Prehosp Disaster Med*. 2012 Apr;**27**(2):148–152. doi:10.1017/s1049023x12000441
42. **Betjeman TJ**, **Soghoian SE**, **Foran MP**. mHealth in Sub-Saharan Africa. *Int J Telemed Appl*. 2013;**2013**:1–7. doi:10.1155/2013/482324
43. **Sharma SK**, **Misra SK**, **Singh JB**. The role of GIS-enabled mobile applications in disaster management: a case analysis of cyclone Gaja in India. *Int J Inf Manag*. 2020 Apr;**51**:102030. doi:10.1016/j.ijinfomgt.2019.10.015
44. **Bhattacharjee S**, **Roy S**, **Das Bit S.** Post-disaster map builder: crowdsensed digital pedestrian map construction of the disaster affected areas through smartphone based DTN. *Comput Commun*. 2019 Jan;**134**:96–113. doi:10.1016/j.comcom.2018.11.010
45. **Cicek D**, **Kantarci B.** Use of mobile crowdsensing in disaster management: a systematic review, challenges, and open issues. *Sensors*. 2023 Feb 3;**23**(3): 1699. doi:10.3390/s23031699
46. **Choi Y-J**, **Jung H-S**, **Choi E-J**, et al. Disaster healthcare workers' experience of using the Psychological First Aid mobile app during disaster simulation training. *Disaster Med Public Health Prep*. 2021 Oct 22;17. doi:10.1017/dmp.2021.308
47. **Plaza Roncero A**, **Marques G**, **Sainz-De-Abajo B**, et al. Mobile health apps for medical emergencies: systematic review. *JMIR Mhealth Uhealth*. 2020 Dec 11;**8**(12):e18513. doi:10.2196/18513
48. **Case T**, **Morrison C**, **Vuylsteke A.** The clinical application of mobile technology to disaster medicine. *Prehosp Disaster Med*. 2012 Aug 14;**27** (5):473–480. doi:10.1017/s1049023x12001173
49. **US News**. These Countries Have a Well-Developed Digital Infrastructure. *US News*. Accessed August 25, 2024. https://www.usnews.com/news/best-countries/rankings/well-developed-digital-infrastructure
50. **Dyvik EH**. *Countries With the Most Natural Disasters* 2023.July 4, 2024. https://www.statista.com/statistics/269652/countries-with-the-most-natural-disasters/
51. **NOAA National Centers for Environmental Information**. *Billion-Dollar Weather and Climate Disasters*. Updated 2024. https://www.ncei.noaa.gov/access/billions/events/US/2020-2024?disasters[]=all-disasters
52. **Lee MYH**. Why Does Japan Have so Many Earthquakes and Tsunamis? *The Washington Post*. Accessed September 18, 2024. https://www.washingtonpost.com/world/2024/01/03/japan-earthquake-reason-2024-tsunami/
53. **Muhammad Afif Al F**, **Syamsul M**, **Syamsunasir S**, et al. Implementation of the Disaster Risk Reduction Program in Japan as an effort for disaster risk reduction in Indonesia. *IJHESS*. 2023 Aug 8;**3**(1). doi:10.55227/ijhess.v3i1.587
54. **World Bank**. *Information and Communication Technology for Disaster Risk Management in Japan: How Digital Solutions Are Leveraged to Increase Resilience Through Improving Early Warnings and Disaster Information Sharing*. 2019. https://documents1.worldbank.org/curated/en/979711574052821536/pdf/Information-and-Communication-Technology-for-Disaster-Risk-Management-in-Japan.pdf
55. **Aliperti G**, **Cruz AM**. Promoting built-for-disaster-purpose mobile applications: an interdisciplinary literature review to increase their penetration rate among tourists. *J Hosp Tour Manag*. 2020 Sep;**44**:193–210. doi:10.1016/j.jhtm.2020.06.006
56. **Bachri S**, **Rahman Hakiki AR**, **Wibowo NA**, et al. Developing an education support system for disaster management through an ethnoscience-based digital disaster learning module. *Int J Disaster Risk Reduct*. 2024;**100**: 104214. doi:10.1016/j.ijdrr.2023.104214
57. **Putera RE**. The Importance of Disaster Education in Disaster-Prone Areas Towards Disaster-Resilient Indonesia. August 29, 2018. Accessed September 18, 2024. https://doi.org/10.31227/osf.io/5p29t
58. **Majd P**, **Torani S**, **Maroufi S**, et al. The importance of education on disasters and emergencies: a review article. *J Edu Health Promot*. 2019;**8**(1): 85. doi:10.4103/jehp.jehp_262_18
59. **Sari KP**, **Komalasari R**, **Kanegae H.** Disaster learning through a map-based mobile application: an evaluation of its readability and user satisfaction. *IOP Conf Ser: Earth Environ Sci*. 2020 Nov 1;**592**(1):012004. doi:10.1088/1755-1315/592/1/012004
60. **Sukmawati G**, **Prima E**, **Eliyawati E.** "Shake It Up" as Android mobile learning application based on earthquake mitigation for Junior High School students. In: *Proceedings of the 7th Mathematics, Science, and Computer*

Science Education International Seminar, MSCEIS 2019, 12 October 2019, Bandung, West Java, Indonesia. EAI.
61. **Kovalevski V.** *Early Warning Systems*. 2023. PrepareCenter. Accessed September 18, 2024. https://preparecenter.org/topic/early-warning-systems/
62. **International Labour Organization**. *The importance of early warning systems in disaster risk reduction*. 2022 Oct 13. Accessed September 18, 2024. https://www.ilo.org/resource/article/importance-early-warning-systems-disaster-risk-reduction
63. **Jayawardene V**, **Huggins TJ**, **Prasanna R**, et al. The role of data and information quality during disaster response decision-making. *Prog Disaster Sci.* 2021 Dec;**12**:100202. doi:10.1016/j.pdisas.2021.100202
64. **Esri Indonesia**. Disaster Management Solutions. Updated August 24, 2021. https://esriindonesia.co.id/uc/disaster-management-solutions
65. **United Nations Office for Disaster Risk Reduction**. *What Is the Sendai Framework for Disaster Risk Reduction?* April 4, 2023. https://www.undrr.org/implementing-sendai-framework/what-sendai-framework
66. **Li G**, **Zhao J**, **Murray V**, et al. Gap analysis on open data interconnectivity for disaster risk research. *Geo-Spat Inf Sci.* 2019 Jan 2;**22**(1):45–58. doi:10.1080/10095020.2018.1560056
67. **Apostolidou E**, **Fokaides PA**. Enhancing accessibility: a comprehensive study of current apps for enabling accessibility of disabled individuals in buildings. *Buildings*. 2023 Aug 17;**13**(8):2085. doi:10.3390/buildings13082085
68. **Bhishitcharoentat Y**, **Saengtabtim K**, **Leelawat N**, et al. Effective user interface and user experience design for disaster-related applications: a review. In: *MODSIM2023, 25th International Congress on Modelling and Simulation.* Modelling and Simulation Society of Australia and New Zealand; 2023.
69. **Tan ML**, **Prasanna R**, **Stock K**, et al. Mobile applications in crisis informatics literature: a systematic review. *Int J Disaster Risk Reduct*. 2017 Sep;**24**:297–311. doi:10.1016/j.ijdrr.2017.06.009
70. **Craig L**, **Craig N**, **Calgaro E**, et al. Chapter 13 - People with disabilities: becoming agents of change in Disaster Risk Reduction. *Emerging Voices in Natural Hazards Research*. Elsevier; 2019:327–356.
71. **Wisconsin Department of Health Services**. *Emergency Preparedness Apps (for Phones and Tablets) and Resources Apps for Volunteers, Emergency Responders, and People With Disabilities.* Accessed September 23, 2024. https://www.dhs.wisconsin.gov/cpd/emergency-prep-apps.pdf
72. **Wu P**, **Zhang R**, **Luan J**, et al. Factors affecting physicians using mobile health applications: an empirical study. *BMC Health Serv Res*. 2022 Jan 4;**22**(1). doi:10.1186/s12913-021-07339-7
73. **Nezamdoust S**, **Abdekhoda M**, **Rahmani A.** Determinant factors in adopting mobile health application in healthcare by nurses. *BMC Med Inform Decis Mak*. 2022 Feb 22;**22**(1). doi:10.1186/s12911-022-01784-y
74. **Sherif A.** *Mobile OS Market Share Worldwide 2009*–2024. May 2024. https://www.statista.com/statistics/272698/global-market-share-held-by-mobile-operating-systems-since-2009/
75. **Götz FM**, **Stieger S**, **Reips U-D**. Users of the main smartphone operating systems (iOS, Android) differ only little in personality. *PLoS One*. 2017 May 3;**12**(5):e0176921. doi:10.1371/journal.pone.0176921
76. **Kovács M**, **Johanyák ZC**. Comparative analysis of native and cross-platform iOS application development. *Műszaki Tudományos Közlemények*. 2021 Oct 1;**15**(1):61–64. doi:10.33894/mtk-2021.15.12
77. **Gajulapally A**, **Kumar Boddapati U**, **Vijayargi A.** Differences in Android and iOS development. *IRJMETS*. 2024 Feb 22;**6**(2). doi:10.56726/irjmets49149
78. **Harris MA**, **Brookshire R**, **Chin AG**. Identifying factors influencing consumers' intent to install mobile applications. *Int J Inf Manag*. 2016 Jun;**36**(3):441–450. doi:10.1016/j.ijinfomgt.2016.02.004
79. **Normalini MK**, **Lurudusamy SN**, **Arokiasamy L.** Factors that influence mobile application usage among undergraduates in Malaysian Public University. *IAJSE*. 2018 Jun 1;**05**(01):120–133. doi:10.9756/iajse/v5i1/1810011
80. **Here. HERE WeGo**. https://www.here.com/products/wego
81. **Here International**. *HERE Technologies Sustainability Report 2023*. 2024. Accessed April 2025. https://www.here.com/sites/g/files/odxslz256/files/2024-06/here_sustainability_report_update_11_6_24.pdf

https://doi.org/10.1017/dmp.2025.10252 Published online by Cambridge University Press