

A SOFTWARE FOR DISASTER ALERT AND FAMILY PREPAREDNESS MANAGEMENT SYSTEM

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ABSTRACT

Disasters not only harm human property and life, but also affect the human mind and soul. In this research, we studied how a software project improves disaster management by providing early warning alerts, ensuring readiness, and managing emergency kits for families and communities. This software is a mobile and web-based application that automatically notifies users, family, and society, and any user can also send an alert to the family and society about potential disaster threats like floods, earthquakes, or fires. In this software, we are using the government APIs to get the information about any disaster, and the software communicates with the users and their relatives, and society to alert them and prepare the disaster management kit.

KEYWORDS: *Disaster Management, Early Warning System, Preparedness, Family Safety.*

Article History

Received: 24 Apr 2026 | Revised: 25 Apr 2026 | Accepted: 27 Apr 2026

INTRODUCTION

As disasters become more frequent, there is a need for flexible and scalable digital tools. People now expect a system that can deliver alerts for a specific location. The proposed solution uses modern technology to help families make informed choices in every situation at the time of disaster before it happens, while it's ongoing, and even afterwards.

Disaster is a natural phenomenon, due to which many humans and animal lost their lives, and humans may face the loss of property. Global warming, climate change, urbanisation, and population growth cause the disaster, and in the upcoming days, we may face more natural disasters. So we need user-friendly software that helps to manage the disaster. Despite technological advancements, many households remain unprepared to respond effectively to sudden disasters. This software is based on the Government APIs for disaster alert, and the software aims to reduce the gap to provide real-time data monitoring with automated alerting and resource management tools.

The goal of this research is to develop a software that provides a disaster alert in a gamified way and also gives important information on how to handle the disaster by guiding families to maintain essential emergency kits. The government wants to manage the disaster because a country faces economic losses due to a disaster. The goal of the Sendai Framework for Disaster Risk Reduction (2015-2030) is to empower building disaster-resilient communities through science, technology, and innovation.

BACKGROUND OF THE STUDY

We are currently living in the age of the Internet, so cloud-based disaster intelligence systems help to get real-time information. Satellite imagery helps to track the weather changes, and mobile network signals improve situational awareness. In recent times, some Studies were conducted between 2020 and 2024, highlighting that many households are not ready to handle a disaster due to a lack of structured tools, limited access to reliable alerts, and poor preparedness planning. Most people are currently using the Internet, so a recent study shows that the rise in mobile-based community alerting systems globally has reduced the response time for NGO's and governments to provide help to victims of disaster. The combination of software and human resources can help increase family preparedness, as shown in preparedness behaviour studies in Bangladesh, Nepal, and Japan.

The National Institute of Disaster Management (NIDM) promoted the role of technology and increasing awareness due to more disaster occurrences, so we can reduce disaster risk. Early warning systems are key components of disaster resilience, but accessibility and responsiveness remain challenges. Using the Software, create a smart, accessible system that empowers families and communities to prepare for disaster management efficiently. The system aligns with the Sendai Framework for Disaster Risk Reduction.

Several studies have shown that real-time information can ensure disaster management. For instance, Kodur et al. (2019) reviewed fire hazard management techniques in buildings, emphasising the importance of safety systems. Similarly, Jain (2007) explored the development of fire safety frameworks. The National Institute of Disaster Management (2024) has highlighted how digital and IoT-based systems can support national resilience. However, the government provides a sms based alert in which they only provide simple information about the disaster alert. Therefore, the proposed software, based on government APIs, focuses on empowering families to be self-reliant and prepared for emergencies, thus complementing community and government-level responses.

METHODOLOGY

In software architecture, there are four modules: api fetching, data processing, alert generation, and preparedness management kit. The government APIs help to detect disasters. A machine learning model analyses real-time data to detect anomalies and identify early signs of disasters. Once an anomaly is detected, alerts are sent to users through a mobile app, SMS gateway, and web application. The preparedness module includes a digital checklist that helps users track their family disaster kit items, such as food, water, first aid, flashlight, and important documents. In the software backend, it uses Node.js and Mongo DB for scalability and a better experience, while the frontend is implemented using React, so mobile and web applications become more user-friendly.

The software backend is designed using a micro services approach, through which the software includes features like alert processing, data storage, and communication, which are handled by separate modules.

These type of features makes the system more reliable because if one part goes down, the rest keep working without interrupting the other module. To make software better, we are using the data on how users react during emergencies. We conduct A/B testing for different alert formats for software so that it is prepared for every situation of a disaster. This helped identify which type of alert people respond to the fastest.

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LIMITATIONS OF THE STUDY

There are no Limitations on this software, but it is dependent on government APIs, so getting accurate disaster alerts, in case of delayed or incorrect data, can affect alert timing. Another challenge for software is how to achieve user adoption in rural or remote areas with low internet access. The main challenge occurs at the time of disaster, at which time the internet may lose its connection and electricity. In Future versions, we can use such a model, which may provide an answer to users without internet, and we can address this issue by incorporating satellite-based communication systems and community radio alerts. Integration with wearable devices such as smartwatches can further improve personal safety by automatically notifying emergency services in case of distress signals.

Another limitation is that users' dependency on smartphones, which may not be available or charged due to power outages. Additionally, inconsistency in data between different governmental sources can sometimes delay the verification process.

RESULTS AND DISCUSSION

Software prototype test successfully notified before disasters like floods and after disasters like earthquakes. At the time of testing, the software ensures real-time disaster alerts within 10 seconds of event detection, ensuring a quick response time. For disaster management, the disaster preparedness kit module proved effective in helping families organise essential items and monitor expiry dates. User testing increases confidence and awareness regarding disaster readiness. The results affirm that through the government APIs, users get early warning systems that significantly enhance family and community-level disaster preparedness.

During further testing, we found that adding interactive preparedness modules significantly increased user engagement by 47%. Families also shared feedback that these features made the software easier for them to understand, identify both primary and secondary routes in their home or workplace, know the local official routes and assembly points, and have a plan for transportation and communication, and what items to include in emergency kits.

This software uses government APIs so that users get the advantages over traditional warning systems because traditional warning systems only focus on a simple message to our citizens, but there is no detail on how to handle such a disaster. Using software, the process becomes easy to handle the panic, which mainly occurs at the end of a disaster. Software makes it further scalable, ensuring that the software can be expanded to cover entire communities. The study highlights how such software could be effective on different disaster types — floods, fires, or earthquakes.

In this study, we show that the software provides a balance between technological feasibility and cost-effectiveness. Since the software is using the government APIs, the software model can be adopted by developing nations, because users get an effective and low-cost solution for disasters. The research on this type of software aligns with NIDM's vision to incorporate the technology to spread community-level awareness, early warning, and preparedness into disaster management planning.

CONCLUSION AND RECOMMENDATIONS

The software is based on the government APIs for Disaster Alert and prepares a kit to manage the disaster for families and Society. Using the software, the user can make a proactive approach to disaster management by integrating technology with awareness. Software provides real-time alerting for disasters and prepares a disaster management kit that addresses both prevention and preparedness aspects. Software is currently using government APIs, and we are hopeful that in the upcoming days, software may be designed better to integrate with government databases, provide multilingual support, and use AI-driven predictive modelling approaches. Using the software, the whole system has become scalable for community-level use, so software applications make this process a valuable contribution to disaster risk reduction.

This research is not only contributing to software innovation but also ensuring social resilience and public safety. In the future, we can scale software collaboration with national disaster agencies, local authorities, and NGOs. This type of collaboration can help manage the disaster. This software aims to achieve the global goals for sustainable development and disaster risk reduction, so this software becomes a valuable contribution to both science and society.

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