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Enhancing Emergency Management through AI-Augmented Central Coordination: Comparative Case Studies from the USA, New Zealand, and Bangladesh

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ABSTRACT

Centralized command is important for successful emergency management, especially as natural and man-made disasters are happening more often and are becoming more complicated. But most governments have problems with fragmented systems, misaligned communication, and a lack of technology integration, which makes it hard to respond quickly and effectively. This research examines coordination failures through a comparative case study involving the USA, New Zealand, and Bangladesh, focusing on both natural and anthropogenic disasters. Significant deficiencies have been recognized in command and control, interagency collaboration, and technical readiness. The research proposes a conceptual design for an AI-Augmented Central Physical Emergency Operations Center (AI-EOC) based on these discoveries. The AI-EOC is a combination of physical infrastructure and next-generation AI-enabled data analytics, real-time monitoring, and communication tools that help people understand what's going on, make decisions, and manage resources better. The framework aims to create a scalable, adaptable, and effective method for emergency response by combining centralized coordination with smart automation to handle a wide range of crisis situations. This work will improve disaster preparedness, response, and recovery, which will show how AI may be used to improve global emergency management systems.

INTRODUCTION

In the 21st century, there have been an increasing number of natural and man-made disasters that are harder to deal with (Cvetković *et al.*, 2025). Because of climate change, extreme weather events like cyclones, floods, wildfires, and earthquakes have gotten worse over time. Human-made events like industrial accidents, pandemics, terrorist attacks, and civil unrest also continue to put emergency management systems around the world to the test. These complex emergencies need quick, coordinated, and effective responses, which often depend on having a central command and control structure (Ongesa *et al.*, 2025). Centralized coordination is the greatest way to make sure that decisions are made in a cohesive way, resources are distributed efficiently, and communication between agencies is clear. All of these measures are important for minimizing damage, saving lives, and planning for the community's rehabilitation (Zajac *et al.*, 2025). But this centralized emergency coordination is often not good enough. Fragmented lines of operation, overlapping authorities, inadequate technical infrastructure, and a lack of cooperation across agencies all make crises worse and slow responses. In many nations, emergency operations are not well coordinated, there is not enough exchange of real-time information, and modern decision-support systems are not being used to their full potential (Yue & Shyu, 2024). These problems highlight the necessity for innovative paradigms that amalgamate immovable physical infrastructure with intelligent technologies to enhance situational awareness and operational efficacy.

This article examines several of these difficulties through comparative case studies in three distinct national contexts: the United States, New Zealand, and Bangladesh. The USA, a federal nation with robust technological resources and well-established disaster management agencies, offers valuable examples of best practices and areas necessitating enhancement within its extensive governance framework (Akingbemisilu, 2024). New Zealand, which has a smaller population but has had to deal with a lot of natural disasters (such earthquakes and cyclones), is an example of how a highly centralized but resource-limited government could work well in the face of natural disasters. Bangladesh, due to its high population density and vulnerability to disasters, has limited emergency reporting capabilities. However, it serves as a tangible illustration of the obstacles encountered by poor nations in coordinating automated technological responses (Tavasoli *et al.*, 2025). The research delineates common deficiencies in command and communication frameworks, inter-agency collaboration, and technology preparedness by juxtaposing these varied contexts (Hržica, 2025). Using these results, a conceptual model of an AI-Augmented Central Physical Emergency Operations Center (AI-EOC) is suggested. The suggested concept integrates physical operational hubs with AI-based analytics, real-time monitoring, and communication interfaces to develop a scalable and flexible way to deal with emergencies (Guang *et al.*, 2025). The AI-EOC masses work together with centralized control and smart automation to improve situational awareness, optimize

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resource provision, and make data-driven decisions in emergencies. The goal of this study is to create a model that can be used all over the world to fix problems with emergency control that are structural and technical (Yang *et al.*, 2024). The study presents implications for advancements in catastrophe preparedness, response, and recovery, while demonstrating the distinctive capacity of AI to improve centralized emergency management systems. The AI-EOC concept points the way to constructing a stronger, more efficient, and more integrated EOC that can handle the many different kinds of problems that may arise in the 21st century.

LITERATURE REVIEW

Emergency management is effective when resources, response people, and information are allocated and coordinated promptly. Centralized coordination has long been recognized as crucial due to its facilitation of unified command and control, targeted decision-making, and unambiguous communication among several stakeholders (Kianpour & Frantz, 2024). An Emergency Operations Center (EOC) is a centralized location where full-time or part-time personnel convene to address matters pertaining to an emergency crisis. This paradigm typically enhances resource operational efficiency, diminishes redundancy in role assignments, and augments overall situational awareness, particularly in complex emergencies (Esmaili *et al.*, 2025). Notwithstanding these advantages, numerous nations encounter difficulties in efficiently coordinating central replies. The disjointed emergency management systems, redundant responsibilities among units, and inconsistent communication result in a sluggish response framework with minimal operational efficacy. Decentralized or inadequately coordinated systems, especially in developing countries, frequently experience delayed decision-making and inefficient resource utilization. Some countries possess hierarchical Emergency Operations Centers (EOCs) that are multi-tiered, integrating command agencies at national, regional, and local levels, while others face institutional and physical limitations that diminish the efficacy of a centralized system. Technology plays a vital part in modern emergency management. Real-time data analytics, spatial monitoring, and early warning responses significantly enhance situational awareness, decision-making capabilities, and responsiveness. The application of these technologies varies per country, influenced by infrastructure, expertise, and resources. Emergency response in many developing regions is reliant on manual reporting and improvised coordination, resulting in an increased likelihood of delays and human error (Khan *et al.*, 2022). Emergency management possesses the potential for transformation through Artificial Intelligence (AI), however it remains remarkably underdeveloped. AI can serve as an adjunct method for predictive modeling, automated analysis of extensive information, and real-time decision assistance for swiftly recognizing dangers and efficiently allocating resources. AI-driven solutions might enhance interagency

information exchange, scenario simulations, and early warnings for cascading risks, hence addressing the shortcomings of centralized coordination (Upadhyaya *et al.*, 2025). While some rich economies have engaged in the development with AI-based emergency response systems, many developing countries encounter challenges in establishing such systems due to resource limitations, data complications, and governance limits. This review emphasizes three critical issues in the literature: (i) the merits and drawbacks of centralized versus decentralized emergency management models; (ii) the influence of technology on situational awareness and operational efficacy; and (iii) the impending AI-driven intelligent data coordination capabilities that can significantly enhance decision-making in disaster management. Collectively, these themes underscore the significance of a novel care paradigm that amalgamates centralized physical infrastructure with AI-driven decision assistance to surmount structural, technological, and coordination obstacles. While centralized Emergency Operations Centers (EOCs) possess clear benefits in managing complex catastrophes, they also exhibit several deficiencies, including technological implementation, interdepartmental and international coordination, and advancements in artificial intelligence. Developing an AI-EOC could significantly enhance disaster management efficacy and provide a scalable, adaptable, and generalizable framework for preparedness, response, and recovery.

MATERIALS AND METHODS

This paper employs a comparative case study methodology to examine the enhancement of emergency management using AI-augmented centralized coordination across several country contexts. The chosen countries for comparison are the USA (a high-income nation), New Zealand (a developed nation), and Bangladesh (with distinct governance, technology, and disaster culture). We performed a systematic literature review to gather primary and secondary data. Separate searches were done in academic databases (Scopus, Web of Science, and ScienceDirect) for artificial intelligence, centralized coordination in disaster response, and emergency management. These searches used well-defined keyword strings. We examined literature from 2015 to 2023, encompassing both i) established and ii) emerging research trajectories. The research was predicated on specific criteria, focusing on the examination of AI's involvement in emergency management, particularly with centralized or coordinated disaster-response policies, illustrated through national or regional case studies. Along with scholarly literature, we looked at national government reports, policy sets, and official emergency management framework documents from the three nations to get a better understanding. The data gathered underwent thematic analysis to ascertain the organizational model of central coordination, the alignment of AI technologies inside the EMD system, and the larger implications for

improving disaster preparedness and response. The comparative technique also helped to bring out patterns of similarities, clear contrasts, and lessons that could be applied to all three cases. This comprehensive approach

provides a robust framework for evaluating the potential impact of AI-enhanced central coordination on the development of supplementary emergency management skills.

Table 1: Search string

Source	Search String
Science Direct	("Disaster Management" OR "Artificial Intelligence" OR "Flood" OR "GIS" OR "Remote Sensing" OR "Machine Learning" OR "Deep Learning")
Web of Science	("Disaster Management" OR "Artificial Intelligence" OR "Flood" OR "GIS" OR "Remote Sensing" OR "Machine Learning" OR "Deep Learning")
Scopus	TITLE-ABS-KEY ("Disaster Management" AND "Artificial Intelligence") AND (LIMIT-TO (PUBYEAR, 2015–2020)) AND ("Disasters" OR "Human" OR "Disaster Management" OR "Disaster Planning" OR "Disaster Prevention" OR "Risk Management" OR "Natural Disasters" OR "Floods" OR "Remote Sensing" OR "Flooding" OR "GIS" OR "Flood Control" OR "Hazard Assessment" OR "Artificial Intelligence" OR "Geographic Information Systems" OR "Natural Hazard" OR "Disaster Relief" OR "Disaster Response" OR "Disaster Preparedness" OR "Deep Learning" OR "Forecasting" OR "Mapping" OR "Disaster Risk Reduction" OR "Disaster Recovery" OR "Machine Learning")

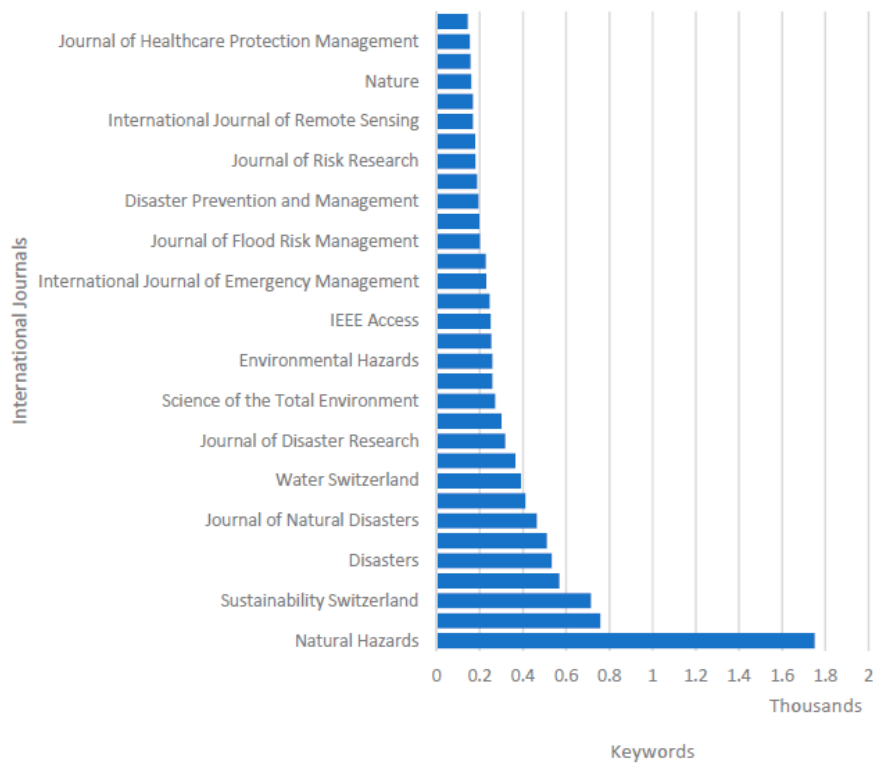


Figure 1: Keywords assessed within different international journals

A systematic review was done from 2015 to 2023 to examine the role of AI-enhanced central coordinating in emergencies, emphasizing experiences in the USA, New Zealand, and Bangladesh. They wanted to know how the combination of new technology and centralized control may improve: disaster preparedness, response, and recovery. Databases The first search began with a thorough search of databases including Scopus, Web of Science, and Science Direct since they

have high-quality, peer-reviewed information. We used a more precise list of phrases for artificial intelligence, emergency operations centers, centralized coordinating disaster response, and decision support systems to find useful material. The search took place in June 2024 so that it may include both old and new studies. The first search turned up 2,742 documents. After removing 1204 duplicate entries from databases, the studies were filtered by reading their titles and abstracts. This

process left out 1133 papers that were not relevant. A second full-text examination led to the removal of 205 more articles since they didn't talk about AI integration or central coordination in emergency response management. Ultimately, 200 studies met all inclusion criteria and were selected for further examination (Mallik *et al.*, 2025). These studies were supplemented with national policies, governmental reports, and official emergency management materials from the USA, New

Zealand, and Bangladesh to provide further context. The comprehensive dataset offered a comparative analysis of global research, as well as the specific constraints and opportunities encountered by three case countries. The data are analyzed for the source journal and geographical prevalence to illustrate the evolution of scholarly communication regarding AI-enhanced central coordinating in emergency response and the associated regional priorities.

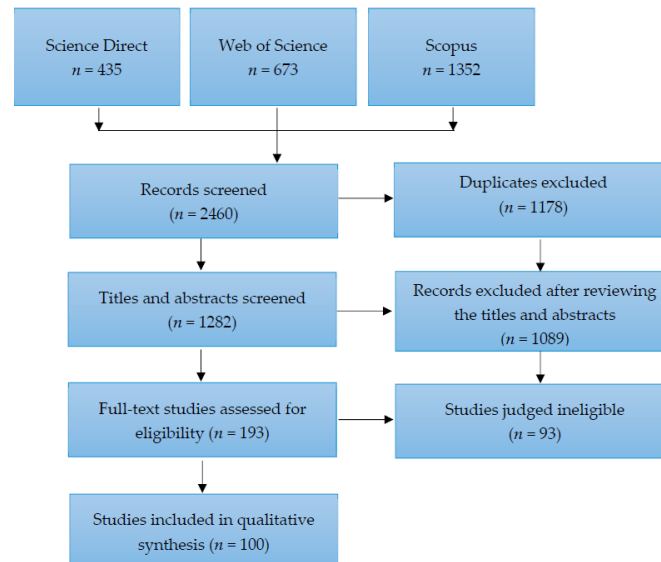


Figure 2: The detailed screening process of the latest articles for AI and disaster management

To gain a preliminary understanding of the study on AI and AI-enhanced central coordination in EM, a wider array of peer-reviewed articles and works was analyzed. The literature review focused on the USA, New Zealand, and Bangladesh, aiming to facilitate international comparisons (Mallik, 2025). Most of the research were

from affluent countries like the US, which showed that these countries were early adopters of AI in disaster management systems. New contributions from New Zealand and Bangladesh shown that AI-driven central coordinating may be customized to various governance frameworks and resource contexts.



Figure 3: Country Contexts: USA, New Zealand, and Bangladesh

The review covered publications, situating the cases of the USA, New Zealand, and Bangladesh within the broader global research landscape. This approach underscores both the concentration of research in developed nations and the growing interest in applying AI-augmented emergency management in diverse national settings.

RESULTS AND DISCUSSION

The systematic review and comparative cases investigate the importance of AI-enhanced central coordination in emergency response and management in the USA, New Zealand, and Bangladesh. After a thorough review, we selected 200 research together with government papers, policy documents, and official emergency management frameworks from all three nations (Mallik *et al.*, 2025). These sites give a good overall picture of how AI can be used to get ready for, respond to, and recover from disasters. The distribution of studies indicates that the majority originate from technologically advanced nations, like the USA, China, South Korea, Australia, and Italy. This shows that these countries were early adopters of AI in disaster management. Innovative efforts from New Zealand and Bangladesh have demonstrated that an AI-driven central coordination system is already being adapted to various governance styles and resources (Mallik *et al.*, 2024). A keyword analysis of journals revealed significant topics concerning artificial intelligence, centralized coordination, emergency response, geographic information systems (GIS), machine learning, and disaster preparedness, underscoring the growing focus on the integration of AI in global emergency operations (Chowdhury *et al.*, 2025). A preliminary search of the Scopus, Web of Science, and Science Direct databases yielded 2,742 publications. After removing 1,204 duplicates, screening the titles and abstracts of 1,133 research, and reviewing the full texts of 205 publications that were not relevant to AI integration or central coordination, the total number of papers was reduced to 205. Ultimately, 200 research met all inclusion requirements and were selected for comprehensive analysis, providing both global and country-specific insights into AI technology employed in emergency management. A comparative investigation of three countries revealed both shared and divergent characteristics. The US has well-organized emergency operations centers that use AI techniques to help with all elements of forecasting, staying informed of the situation, and allocating resources for different types of catastrophes. New Zealand stresses reactive central coordination, uses AI to foresee and prepare for hazards, and still puts a lot of emphasis on strong community involvement and operational flexibility. Bangladesh is an exception to this trend, as the AI ecosystem there is characterized by low adoption. By examining journal sources and the geographical distribution of works, we ascertain that publication is significantly concentrated in disaster management, natural hazards, and sustainability. The time series of studies published from 2015 to 2023 indicate a steady rise in research on AI for emergency

management, reflecting global perspectives on AI's potential and the importance of centralized coordination in disaster response. Although studies predominantly focus on industrialized nations, the inclusion of Bangladesh provides profound insights into the practical use of AI-assisted central coordination across diverse socio-economic and institutional contexts. Key findings It is concluded that the integration of AI with GIS enhances disaster modeling, hazard mapping, and risk assessment. Using AI-powered emergency operations centers for centralized command and control improves situational awareness, decision support, and the distribution of resources throughout the affected areas. The extent and modality of AI integration are very adaptable, contingent upon a country's governmental framework, disaster risk assessment, and technology capabilities, hence necessitating a flexible strategy. Also, even though the developed world is slow to use what AI research finds, it can be used with local limits and resources, like in Bangladesh, where central AI-augmented coordination can help people get ready for anything. Overall, the results show that centralized coordination based on AI would have a big positive effect on emergency management, including speeding up the process of making decisions or improving situational awareness and resource use. To successfully implement, the USA, New Zealand, and Bangladesh have taught us that technology readiness, institutional support, and capacity building should all be in line with national priorities and disaster risks. These results show that AI-enabled central coordination could be useful for disaster response in any part of the world where there is a lot of demand. They also show advanced and developing economies how to construct systems that are adaptable, scalable, and efficient for reacting to disasters.

Discussion

The findings from this study underscore the transformative potential of AI-enhanced central coordinating in disaster management on a global scale, with adaptations tailored to individual countries. The comparative analysis of the USA, New Zealand, and Bangladesh indicates that AI integration is advancing in industrialized nations; nonetheless, its applicability, implementation, and acceptance are contingent upon the governance framework, local technological proficiency, and resource accessibility. In the United States, AI incorporated into advanced command and control centers has markedly enhanced predictive forecasting, situational comprehension, and resource allocation. These findings corroborate previous research that underscores the significance of data-driven decision-making in enhancing disaster response efficacy and reducing human errors. The extensive use of AI technology in the U.S. is an example of how a strong technical foundation and institutional framework can make AI-based emergency management work. New Zealand has a distinct way of doing things. It focuses on flexible central coordination and community

involvement, with AI-powered hazard prediction and readiness. The findings reveal that centralized control relies not solely on advanced technologies but also on flexible operating processes and resilient human-in-the-loop systems. This reinforces the necessity of conforming to institutional procedures and socio-cultural contexts as prerequisites for the proper functioning of AI-augmented systems.

The research indicates that the utilization of AI in flood and cyclone control in Bangladesh is in its nascent stages, significantly constrained by technological infrastructure and resource limitations. Despite the limitations, innovative AI-driven methodologies are employed to enhance early warning systems and disaster response planning (Harmin *et al.*, 2025). This is similar to what we observe in other poor countries: even when resources are limited, using AI technology in the right way can make a big difference in resilience. The findings underscore the necessity of governmental support, capacity enhancement, and infrastructure development to expand the AI-enhanced emergency management system in these contexts. A global analysis of 200 studies shows that AI research is mostly done in countries that are more technologically advanced. This is because these countries are early adopters and have access to a lot of resources that are needed to set up complex AI systems (Rhaman *et al.*, 2025). However, the inclusion of case studies from New Zealand and Bangladesh indicates that AI-enhanced central coordinating is applicable across many socio-economic contexts and governance systems (Muyed *et al.*, 2025). These findings suggest that implementation techniques in LMICs may benefit from the insights gained in HICs, while local restrictions and priorities must be meticulously evaluated. AI + GIS together is a common theme in the research. This combination can considerably improve disaster modeling and prediction, risk assessment, and situational awareness. The research findings indicate that utilizing AI as input for central coordination can optimize resource planning, facilitate real-time decision-making in response to dynamic developments, and promote proactive measures for disaster prevention (Mallik *et al.*, 2025). Nonetheless, the extent and assimilation of AI use are contingent upon institutional preparedness, technical proficiency, and infrastructural accessibility. The findings have policy ramifications for the government, necessitating greater emphasis on investments in technology infrastructure, workforce development, and organizational frameworks that facilitate AI integration. Collaborative collaborations between developed and developing nations could facilitate the exchange of knowledge, so enabling the customization of AI tools for emergency management to suit particular situations (Mallik *et al.*, 2025). Furthermore, the incorporation of AI into the whole framework of catastrophe risk reduction can facilitate the adaptation of technical solutions to existing emergency management dimensions, rather than functioning as isolated systems. This study demonstrates that utilizing AI-enhanced

central coordinating constitutes not merely a technological advancement, but, more significantly, a strategic facilitator of intelligent and adaptable emergency response tailored to specific contexts. Insights from the USA, New Zealand, and Bangladesh help us figure out what lessons can be learned to make AI-based coordination systems a reality in both developed and developing economies, which will improve disaster preparedness, response, and recovery.

CONCLUSION

This study shows that AI-enhanced central coordination has a lot of potential to make emergency response better in diverse countries. Comparisons across the USA, New Zealand, and Bangladesh have demonstrated that the utilization of AI technology can improve situational awareness, optimize resource allocation, and bolster catastrophe preparedness and response. The findings indicate that nations possessing technological and institutional capabilities, such as the United States, have utilized advanced technological infrastructures to create cutting-edge AI-enhanced operation centers. Conversely, countries like New Zealand and Bangladesh illustrate that adaptive, context-sensitive methodologies can also result in significant enhancements in disaster management. In New Zealand, AI is used to predict and prepare for hazards with a lot of community involvement. In Bangladesh, AI-based solutions are being created to help manage floods and cyclones better than ever before, even with little resources. The study shows that AI adoption needs to be in line with governance frameworks, technological preparedness, and local catastrophe risk profiles. To make sure that implementation goes well, you need to do more than just invest in technology. You also need to focus on growing skills, supporting policies, and creating coordination structures that work for each country and region. Experiences from emerging economies can also be useful for developed countries, as long as the lessons learned are adapted to the situation of the developed country. In short, AI-powered central coordination will change the way emergencies are handled in different social, economic, and institutional situations. By combining new technology with strong governance and transparent operational procedures, countries may get better at being ready for, responding to, and recovering from disasters. This work represents a starting point for researchers, politicians, and emergency management organizations to create AI-powered coordination systems that can be used in many different situations and are effective at making people more resilient to both natural and man-made disasters.

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