Can AI Replace Human Stakeholders in Emergency Management? Exploring the Promise and Pitfall of Automation on Authority, Trust, and Outcome Through a Narrative Literature Review

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Abstract: The increasing complexity of hazards and emergency-triggering events have accelerated the demand for more precise, rapid, data-driven decision making. Artificial Intelligence (AI) has so far demonstrated significant promises in hazard prediction, resource optimization, and situational awareness. However, the idea of AI replacing human as emergency managers raises critical concerns regarding operational viability, ethics, and accountability. To explore this possibility, this study employed a narrative literature review, informed by 27 peer-reviewed articles and reports and is synthesized into three thematic areas: *technical potential of AI*, *human judgment in contextual and sensitive decision-making* and, *ethical, legal, governance challenges in automating EM (emergency management) decision making*. Findings revealed that while AI excels in processing real-time data, predicting and optimizing logistics, it lacks moral reasoning, empathy, and contextual adaptability- essential for crisis leadership. Selected studies remained conceptual, or simulation based, with limited empirical validation in real-world EM scenarios. This paper concludes that while AI markedly enhances predictive and operational capacity in EM actions, it cannot replicate certain human attributes such as empathy, ethical reasoning, contextual adaptability- qualities that are indispensable in high-stake and morally complex environments. Hence AI should be positioned as a

collaborator in augmenting EM decision-making, rather than substituting human authority.

Keywords: Artificial Intelligence, Emergency management decision-making, Ethics, Human Judgment, Situational/Contextual adaptability

Introduction

Emerging threats from intensified emergency-triggering events have exponentially increased the complexity and urgency of EM (Emergency Management) decision-making process. In parallel, AI (artificial intelligence) and language models have shown tremendous advancements in EM capabilities such as rapid hazard prediction, efficient logistics, real-time situational awareness and targeted risk communication. Recent empirical studies showcase that AI powered solutions in diverse contexts, including early bushfire detection, typhoon trajectory forecasting and infrastructure failure prevention- each demonstrating marked improvements in preparedness, response speed and precise outcome ("The Tech That Could Stop a Catastrophe," 2025). Despite these advancements, deploying AI in EM introduces certain critical challenges around ethics, transparency, accountability and equity. Visave (2025) emphasizes how opaque AI systems often referred as ''black boxes' undermine decision making efficacy, especially when predictions disproportionately affect vulnerable populations, underscoring the compelling the need for transparency protocols and oversight mechanisms (Visave, 2025). A multi-disciplinary consensus led by WHO and University of Zurich argues for ethical frameworks that guide AI-assisted risk communication and infodemic response, reinforcing that public trust hinges on responsible and principled AI deployment (World Health Organization, 2025). Generative AI holds transformative promises in damage assessment scenarios. A recent survey highlights its multimodal data integration capabilities and scenario simulation potential across natural disasters although with caution regarding data security, misinformation risks and misuse (Raj et al., 2025). Large AI models also shown promise beyond traditional hazard risk detection such as (Guang

et al., 2025) describes AI's application in power industry's emergency management transition system from passive response toward intelligent proactive prevention. Similarly (Haykal et al., 2025) demonstrates AI's capability in disaster prediction, telemedicine support and supply chain optimization during humanitarian crisis, alongside persistently concerns about data privacy and access insecurities.

These studies altogether reflect a growing recognition of AI and generative AI's instrumental role in EM with increasing attention, yet academic discourse remains fragmented. While certain works focus primarily on technical enhancements and predictive accuracy ((Guang et al., 2025)), others emphasize ethical considerations and transparency (Visave, 2025) (World Health Organization, 2025) but the integration of both in a holistic framework for EM is very limited. There is also a scarcity on empirical validation of AI tools in real-world EM decision making settings and limited guidance on hybrid AI human decision-making models that preserve trust and accountability. This study addresses that gap by a narrative synthesis of existing literature, precise to say thematic summaries (Snilstveit et al., 2012), structured around three thematic areas- technical potential of AI, the role of human judgement in sensitive decision-making and ethical, legal and governance challenges of automation.

Study Objectives

This literature review critically examines the feasibility and implications of replacing human stakeholders with AI in EM system in three key thematic areas: technical

aspects of AI, human judgment in context decision making and ethical challenges of automation of emergency decision-making process, including certain objectives:

- To evaluate the technical aspects and current applications of AI in emergency management sector
- To address the role of human intuition, empathy and leadership in complex and uncertain emergency management decisions
- To explore the ethical, legal and governance challenges of automating decision authority in crisis contexts.

Following the study aim, certain research questions were developed to analyze the literature findings based to specific themes-

- What are the current capabilities and limitations of artificial intelligence in enhancing decision-making effectiveness across different phases of emergency management?
- To what extent can AI systems substitute human judgment, ethical reasoning and contextual sensitivity in high stake-emergency decision making phase?
- What ethical, legal and policy frameworks are necessary to guide the responsible integration of AI into human authority emergency management?

Research Methodology

This study follows narrative synthesis of selected literature to provide a broad overview of the research objectives (Snilstveit et al., 2012). The narrative review approach enables

a conceptual and integrative understanding of the theoretical, empirical, and ethical dimensions of AI adoption in EM decision-making. The narrative approach was chosen to critically interpret diverse scholarly, institutional literature to identify evolving patterns, key debates, research gaps related to automation of authority and trust. Insights from 27 peer-reviewed academic and institutional studies selected for their relevance to AI and decision support system in emergency management. The literature was identified through targeted database searches: Scopus, ScienceDirect, ResearchGate and Google Scholar, using a combination of keywords- *artificial intelligence, emergency management, decision-making, automation, ethics, governance.* The review followed a thematic synthesis approach, organizing the findings into following three major thematic areas. reflecting the multidimensional relationship between AI and human authority in EM decision-making:

a. *Technical potential of AI in emergency management*

Assessing advancements in predictive analytics, decision-support systems, and real-time situational intelligence

b. *Human judgement in contextual and sensitive decision-making*

Evaluation cognitive, ethical, and contextual limitations of automation in replacing human stakeholders

c. *Ethical, legal and governance challenges of automation*

Exploring trust, transparency, fairness, and accountability issues emerging from algorithmic decision-making in crisis contexts.

Study Limitations

While the narrative approach allows for interpretive depth, it also introduces subjectivity in thematic synthesis. The findings reflect qualitative integration rather than statistical generalization. Further research is required in this arena from mixed-method approach, to empirically validate and expand upon the conceptual insights developed in this paper.

Literature Review Based on Thematic Focus Areas

Technical Potential of AI

A significant body of research emphasizes AI's technical applications in enhancing risk assessment, logistics and decision support system, early contributions such as (Alexander, 2002) and (Comfort et al., 2004) provide foundational models of planning and coordination, which later studies envision being augmented through AI integration . (Blice et al., 2025) provided a broad overview showing that AI-driven tools can improve situational awareness, risk modelling, and decision-support systems. Similarly (Şimşek et al., 2023) and (Abid et al., 2021) emphasize AI application's role in disaster prediction, early warning system and resource allocation. (Chen et al., 2024) demonstrates the emerging application of knowledge graphs and large language models (LLMs), offering structured integration of diverse datasets to support real-time decisions. (Huang & Xiao, 2015) illustrate how mining social media data (e.g. Twitter) enhances geographic situational awareness. (Comfort et al., 2004) and (Kapucu & Garayev, 2011) highlight the importance of AI enabled coordination across rapidly evolving disaster networks. (Nuñez et al., 2024) further conceptualize a future where AI is embedded across all EM phases, from preparedness to recovery. The key takeaways from all these studies are- AI

improves data integration, predictive analytics, and situational awareness. Tools like LLMs (large language model), machine learning and social media mining have demonstrated value in enhancing responsiveness and foresight.

Research Gaps

Although providing technical functionality knowledge of AI in emergency management, most of the studies remained either conceptual or confined to experimental demonstrations rather than large scale real-world validation. While (Blice et al., 2025) provides an inquiry into AI's potential, it does not empirically test these systems in actual disaster events. Similarly (Chen et al., 2024) shows promise with LLMs and knowledge graphs but relies heavily on simulations. (Wirtz et al., 2019) notes that public agencies often lack the infrastructure, training, and interoperability standards necessary to effectively deploy these technologies. This points to a significant gap between technical innovations and operational readiness. Moreover, few studies address how AI systems perform when multiple disasters occur simultaneously or when communication infrastructures are compromised- conditions that characterize real-world emergencies.

Human Judgement in Contextual and Sensitive Decision-Making

The literature is consistent in emphasizing that while AI offers computational strength, it cannot replace the contextual and moral reasoning that underpins effective emergency management. (Visave, 2024) highlights that decisions about vulnerable population such as who receives aid first require a level of sensitivity to cultural values and ethical considerations that algorithms cannot replicate. (Cutter, 2006) underscores how social

vulnerability complicates decision-making process during a high-stress environment, indicating that neglection of human oversight may reinforce pre-existing inequities. Studies by (Kapucu & Garayev, 2011) (Reddy et al., 2009) show that collaborative decision-making that is grounded in trust and professional expertise remains in central in emergencies where local knowledge and interpersonal dynamics are critical. (Madhavan et al., 2006) adds that when automated systems fail even on simple tasks, they undermine trust and reduce operator's willingness to rely on them which can develop a risk of compromising response efficiency. Risk communication requires certain human traits such as empathy, transparency, cultural resonance etc. which are absent from AI applications. Collectively these studies affirm that human decision-makers provide an irreplaceable contextual judgement in high-stakes and socially sensitive settings.

Research Gaps

Although the selected literature acknowledges the centrality of human discretion, it offers limited empirical exploration of how practices intersect with AI systems in real-life crises. While (Kapucu & Garayev, 2011) describe collaborative dynamics in general, there is little research on how these dynamics shift once algorithmic tools are introduced. Moreover (Cutter, 2006) provide ethe insights on vulnerability remain largely unexamined in AI applications; few studies assess whether AI exacerbates or mitigates inequities in practice. Another overlooked area here is the trust calibration problem- which depicts how decision makers determine when to rely on AI- generated output and when to override them. Without this understanding there is a risk of both under-reliance and over-reliance, either of which could compromise outcomes in critical situations.

Ethical, Legal and Governance Challenges

The integration of AI into emergency management raises profound ethical, legal and governance challenges that go beyond technical functionality. (Winfield & Jirotka, 2018) argue that ethical governance structures are indispensable to ensure public trust, while (Floridi et al., 2018) propose that AI4people framework to embed principals such as fairness, autonomy and transparency into AI development. (Binns, 2018) further highlights the risk of reducing complex human lives to numerical percentages pointing to the fairness and justice as unresolved issues in algorithmic decision-making. Literature such as (Zhang & Dafoe, 2019) show that public trust in AI depends heavily on visible safeguards and accountability structures while (Allen & Chan, 2017) raise concerns about national security implications of deploying AI in high stakes domains. (Russell et al., 2015) adds into research ethics reminding that research on AI application must prioritize robustness and societal benefit to prevent harmful unintended consequences. Collectively these works reveal that governance is not a peripheral issue but rather central to the sustainable and legitimate integration of AI in emergency management.

Research Gaps

Despite the availability of ethical frameworks, there is limited research on how these principals are operationalized in the design and deployment of AI systems in public-sector crisis contexts. Most frameworks such as *AI4people* still remain at the conceptual level, without guidance on create implementation. Furthermore, accountability and liability remain underexplored, when an AI enables decision leads to harm, it is unclear whether responsibility lies with developers, policymakers, or frontline practitioners. There is also

comparative analysis of governance models across countries or sectors, leaving unanswered questions about whether best practices can be generalized or must be locally adapted. Finally, chosen studies have not yet adequately addressed the role of public participation in shaping governance mechanisms, even though legitimacy in democratic societies depends on such engagement.

Future Research Recommendations

Analyzing the existing gaps in current literature it is evident that despite high-end advancements most of the studies have not moved beyond proof-of-concept models to rigorously evaluate whether AI can sustainably assume decision-making functions traditionally held by human stakeholders. Empirical evidence is still lacking regarding the outcomes of substituting human-led processes with fully automated systems. Field based experimental studies could assess whether AI-driven systems deliver equivalent or superior results to human managed coordination during actual crises. Further comparative research is needed to analyze hybrid vs. fully automated decision-support system, asking whether AI's technical; advantages hold under stress, uncertainty, and infrastructure breakdown tin different disaster contexts. Methodological advancements should also include cross-context evaluations (natural disasters, public health emergencies, cyber crises) to determine transferability of AI authority across diverse emergency management domains. A central research question that remained unanswered in selected studies is whether AI can truly replace the contextual and moral authority of human stakeholders in disaster response. Studies have shown that social vulnerability, equity, and local trust networks strongly shape outcomes, but little is known

about how these factors would fare in AI-led systems. Future research should therefore explore how frontline practitioners negotiate trust in AI recommendations and whether displaced human authority affects public compliance, legitimacy, and community resilience. Longitudinal studies could examine how trust evolves when AI assumes a greater role in sensitive decisions such as resource allocation or prioritizing life-saving interventions. There is also a need for cross-cultural studies to assess how reliance on AI interacts with local values, traditions, and risk perceptions, given that trust in authority is not universal but socially constructed. Notably future work should investigate whether the removal or reduction of human discretion results in better or worse disaster outcomes, especially in contexts whether empathy, negotiation or moral reasoning are critical. If AI is to overpower or kept under control, the role of human stakeholders, robust governance mechanisms must be in place to safeguard trust, fairness, and accountability. Future research should develop operational governance frameworks that define who hold authority and responsibility when AI systems make consequential decisions. This includes establishing clear lines of accountability in cases of AI errors of harm and exploring whether legal personhood, liability or shared responsibility models are appropriate in EM contexts. Another critical area is public deliberation research. Studies should examine how citizens perceive shifts in authority from human responders to AI systems and whether such shifts enhance or erode public trust in institutions. Comparative policy studies could also analyze national and regional governance models, asking whether societies with stronger trust in technology are more willing to allow AI to replace huma stakeholders, and what safeguards mitigate risks of over-automation. Ultimately, the future research agenda must grapple with the normative question: should AI replace

humans in EM at all, and under what ethical conditions? Taken together, these recommendations highlight that the central research frontier lies not only in improving AI's technical capacity, but in critically examining the consequences of shifting authority away from human stakeholders. Future studies must address whether automation enhances outcomes without undermining legitimacy, whether it builds or erodes trust and how governance structures can align technological efficiency with ethical responsibility. Only through interdisciplinary empirically grounded research can it be determined where AI should remain a supportive partner or evolve into a partial replacement for human stakeholders in emergency management.

Conclusive Remarks

Technically AI holds extraordinary potential for improving situational awareness, predictive accuracy, and operational efficiency. Yet this review demonstrates the central challenge lies not in what AI can do, but in what it should do. Human judgement, contextual awareness, and ethical reasoning remain crucial in navigating the moral complexity of emergency management- elements that algorithms for now cannot replicate. The future of AI in emergency management is unlikely to involve full replacement of human stakeholders but rather a reconfiguration of authority, where humans and machines can co-produce decisions in complementary ways. Achieving this balance requires interdisciplinary research that bridges technical innovation with ethical, legal, and social insight. Only then can the field endure that automation enhances trust and legitimacy rather than undermines that lie at the heart of effective emergency management governance.

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