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ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE DISASTER MANAGEMENT: BRIDGING TECHNOLOGY, POLICY, AND COMMUNITY RESILIENCE

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Abstract

Artificial intelligence (AI) emerged as an important technological solution for improving sustainable disaster management through enhanced prediction, emergency response, policy coordination, and community resilience. This study examined the role of artificial intelligence in bridging technology, policy, and community resilience within disaster management systems. The research investigated how AI-driven technologies improved disaster preparedness, emergency response efficiency, and sustainable recovery planning. A quantitative research design was adopted, and data were collected from a sample of 350 respondents including disaster management professionals, policymakers, humanitarian workers, technology experts, and community representatives. Statistical analysis was conducted using descriptive statistics, reliability analysis, correlation analysis, and multiple regression analysis through SPSS software. The findings revealed that artificial intelligence significantly influenced sustainable disaster management (β = 0.73, $p < 0.001$), while community resilience demonstrated the strongest impact on disaster management outcomes (β = 0.77, $p < 0.001$). Policy integration also showed a significant positive effect (β = 0.69, $p < 0.001$). The model summary reported an R^2 value of 0.709, indicating that 70.9% of the variation in sustainable disaster management was explained by artificial intelligence, policy integration, and community resilience. The study concluded that AI technologies strengthened disaster resilience through predictive analytics, intelligent communication systems, and collaborative governance frameworks. The findings emphasized the importance of ethical governance, digital infrastructure, and community participation in developing sustainable and adaptive disaster management systems.

INTRODUCTION

AI proved to be a gamechanger in the context of disaster management due to its capacity to analyze vast amounts of data, forecast disaster trends, and facilitate swift decision-making during emergencies. Governments and humanitarian actors were pushed by growing climate related disasters (floods, earthquakes, wildfires, pandemics and hurricanes) to consider advanced solutions through technology for risk reduction and crisis response. During emergencies, AI technologies like machine learning, deep learning, predictive analytics, robotics, and geographic information systems enhanced the precision of forecasts and coordination of operations. AI systems were found to improve situational awareness, speed up rescue operations, and optimize the use of resources in disaster response activities (Abid et al., 2021; Sun et al., 2024). The use of AI-driven decision support systems also improves disaster preparedness by combining real-time data from satellites, drones, and social media in disaster management processes (Dcruz et al., 2025).

Emerging demand for sustainable disaster management was to bring together technology, governance and community participation. Traditional disaster management systems were essentially reactive, resulting in delayed responses and inefficient coordination of institutions. AI-powered disaster management systems enabled better communication between disaster response agencies, policy makers and the local population by facilitating real-time risk assessment and predictive analysis. AI can facilitate and enhance crowd participation in emergency communication processes during disaster events, as reported in studies (Acikara et al., 2023; Abid et al., 2025). Adaptive systems that fused technology with social and institutional readiness to mitigate disaster vulnerability were also key for resilient communities, researchers noted (Liu and Mostafavi, 2025).

As the complexity of disasters increased, researchers and policymakers began to look at how AI could be applied to other areas of resilience and sustainability planning more than just disaster response. In the most at-risk areas, AI-powered urban resilience systems enhanced infrastructure surveillance, environmental risk assessment, and humanitarian logistics management (Raja et al., 2026).The integration of AI with the Internet of Things (IoT) and cloud technology enriched the management of emergencies, facilitating real-time tracking and intelligent coordination throughout the disaster management chain (Sun et al., 2024). Moreover, deep learning models facilitated community resilience evaluation, generating identified patterns of social vulnerability and infrastructure vulnerability, which would affect the outcome of disaster recovery (Yin et al., 2026). The developments highlighted the use of AI to improve the efficiency of operations and its role in sustainable and equitable disaster governance.

While immense technological advances were made, questions persisted on ethical governance, policy integration, digital disparity, and trust in AI systems within the community. There was a lack of institutional capacity, digital infrastructure, and public awareness on AI-based disaster technologies in many developing countries. The scholars highlighted the need for multi-stakeholder cooperation, including harmonization between governments, technology creation, humanitarian response, and community engagement, to ensure the transparent and inclusive implementation of AI in achieving disaster resilience (Aderibigbe et al., 2023; Daly et al., 2026). It is also essential that there are provisions for accountability, fairness, and transparency when considering disaster-related decisions, researchers pointed out, which is a component of responsible frameworks for using AI. (Dcruz et al., 2025)

Background of the Study

Traditional disaster management emphasized emergency response and recovery systems aimed at minimizing human and economic losses resulting from a disaster. The frequency of disaster occurrences and the severity of each disaster revealed the weaknesses of the conventional disaster management system, including forecast accuracy, coordination of disaster resources, and communication within the institutional framework. Climate change, urbanization, environmental degradation and population growth increased the disaster risk in both developed and developing countries. Governments and international organisations took the lead in addressing these issues by supporting technology based disaster management concepts that focussed on preparedness, prevention, and resilience building in the wake of a disaster. However, the process of change would not have been possible without the inclusion of AI, which is proving to be an essential tool for analyzing complex data and providing predictive insights in the context of emergency planning and response (Abid et al., 2021).

Community resilience was also embraced as a core facet of disaster sustainability as community involvement was identified as a critical and integral part of disaster preparedness, adaptation and disaster recovery. Increasingly it was being acknowledged that something more than technologies was needed to achieve effective disaster resilience, with the people themselves and institutions actively involved. In times of crisis, AI-powered crowdsourcing platforms facilitated the dissemination of up-to-date data via digital channels and social media, empowering communities.AI-driven crowdsourcing systems helped to disseminate real-time data through digital channels and social media networks, empowering communities in times of crisis. These systems facilitated better coordination among different levels of government and between government and impacted communities, and aided in collaborative decision-making (Abid et al., 2025). Researchers also suggested that resilient communities needed to have socio-technical systems that would consider social vulnerability, infrastructure resilience and governance coordination in one (Yin et al., 2026).

Policy construction and ethical governance of disaster management systems based on AI have also been cited as recent research priorities. As the policy makers were increasingly pushed for action, it became imperative to set rules for transparency, accountability, protection of privacy and equitable access to technology resources in disaster conditions. The intersections of AI and urban emergency response systems hold great promise for enhancing equitable disaster governance, but digital exclusion and algorithmic bias were prominent concerns (Sun et al., 2024).

Research Problem

Many disaster management systems still suffer from a lack of coordination, a slow response to the crisis and an unequal distribution of resources in crisis situations, despite the significant improvement of disaster prediction, emergency response and recovery planning, which nonetheless resulted from the use of artificial intelligence. In many parts of the world, disaster management context was mostly built around segmented institutional arrangements and conventional disaster response mechanisms which were an obstacle to the effective use of technological innovations. Additionally, the poor interoperability of AI technologies, public policies and community engagement limited the sustainability and inclusiveness of DR strategies. However, researchers found certain issues that may hinder the effective application of AI-based disaster management systems, including data reliability, data governance limitations, ethical concerns and issues of digital inequality.

Research Objectives

1. To examine the role of artificial intelligence in sustainable disaster management.
2. To evaluate the relationship between AI technologies and disaster response efficiency.
3. To analyze the influence of policy integration on AI-based disaster management systems.

4. To investigate the impact of community resilience on sustainable disaster preparedness and recovery.

Research Questions

Q1. How did artificial intelligence contribute to sustainable disaster management?

Q2. What relationship existed between AI technologies and disaster response efficiency?

Q3. How did policy integration influence AI-based disaster management systems?

Q4. What role did community resilience play in sustainable disaster preparedness and recovery?

Literature Review

Artificial Intelligence and Disaster Response Efficiency

AI played a key role in revolutionizing disaster response systems by enhancing the prediction, situational awareness, and coordination of emergencies, including those caused by natural hazards or human activities. Machine learning algorithms using AI were able to improve the analysis of real-time disaster information gathered from satellite, drone and sensor networks by emergency management organizations. Satellite, drone, and sensor data streams were deployed to collect real-time disaster information, which was analyzed by AI-powered machine learning algorithms, thereby enhancing the capabilities of emergency management agencies. During floods, earthquakes and wildfires, researchers noted that during the event, high-risk zones could be identified faster, and evacuation plans were optimized through the application of predictive analytics (Kankanamge et al., 2020; Chamola et al., 2020). Additionally, AI-powered tools that assist in decision-making have enhanced the operational efficiency, minimizing delays in response and optimizing the use of emergency resources in disaster-prone areas.

Recent research highlighted the ability of AI-enabled remote sensing technologies to enhance disaster monitoring and damage assessment by analyzing images and employing intelligent mapping systems. Geospatial data was processed more quickly and accurately through deep learning models to improve the identification of vulnerable sub-populations and damage to infrastructure by emergency responders. Researchers found that the deployment of AI for disaster surveillance improved the coordination among the rescue teams during the disaster crisis and helped in minimizing communication obstacles (Sharma et al., 2023; Saleem et al., 2022). AI also played a role in strengthening disaster resilience and sustainable recovery efforts in the humanitarian and emergency healthcare sectors. AI-driven robotics and autonomous systems were used to support rescue efforts in dangerous and challenging situations where it was not possible to enter by humans. AI powered healthcare monitoring systems are also found to be capable of quick medical diagnosis and checking of diseases and management of emergency triage during disaster time (Arora et al., 2023; Javaid et al., 2022).

Policy Integration and Governance in AI-based Disaster Management

Policy integration, governance coordination, and institutional preparedness are critical for the effective application of AI in disaster management and are becoming more significant. There was a growing awareness among governments and international organisations of the need for regulations ensuring transparency, accountability and ethical use of AI in disaster response operations. They stressed that emergency management policymaking governance through AI enhanced coordination between various emergency management agencies and fostered the efficient sharing of information throughout institutional networks (Cugurullo et al., 2021; Dwivedi et al., 2023).

Digital governance and policy innovation were pivotal in enabling equitable access to AI technologies in disaster scenarios. The implementation of AI for disaster management was hampered by various issues such as poor infrastructure, lack of technical resources, and disjointed policy implementation in many developing nations. Researchers contended that the approach of inclusive governance was essential in addressing technological disparities and increasing institutional resilience in vulnerable areas (Vinuesa et al., 2020; Gupta et al., 2021). Policymakers increasingly turned their attention to the incorporation of AI strategies within national policies on disaster risk reduction to enhance adaptive capacity and mechanisms for sustainable emergency planning. There were also ethical issues related to privacy, algorithmic bias, and data security that shaped their governance of AI-driven disaster management systems. The researchers noted that to sustain responsible AI governance, they found it was essential to use algorithms that were transparent, to have human oversight, and to have policy frameworks that are participatory and community-centered, aiming to create fairness and accountability in disaster-related decision-making processes (Floridi et al., 2021; Rane et al., 2024).

Community Resilience and Sustainable Disaster Management

Community resilience became a key element of sustainable disaster management as communities were involved in active participation during the disaster sanitization processes, including preparedness, response and recovery. Resilient communities exhibited more adaptive, cohesive, and mobilizing resources during emergencies, researchers said. AI-powered community resilience systems improved disaster preparedness by delivering risk communication, disaster forecasting, and emergency coordination via digital platforms and social media (Khalil et al., 2022; Cutter et al., 2021).

AI, big data analytics, and social networking technologies also helped to enhance participatory disaster management strategies, allowing people to share information with communities in real time during disasters. Disaster mapping, disaster reporting and public engagement activities were supported via crowdsourcing platforms and intelligent communication systems in disaster vulnerable areas. They found that situational awareness and the coordination between emergency response and affected population was enhanced using artificial intelligence-based social media analysis during a disaster event (Maddikunta et al., 2022; Yigitcanlar et al., 2021).

The incorporation of environmental sustainability, social equity and technological innovation into disaster management processes was becoming increasingly important in the context of sustainable disaster management. They said that climate change, urbanization and nature degradation increased disaster vulnerability, especially in low-income and marginalized communities. As noted by Ayyub (2020), AI-based resilience assessment models helped policymakers and emergency planners find vulnerable groups and create adaptive recovery plans that fostered long-term sustainability. Bosomworth et al. (2022) also pointed to this potential benefit of AI-based resilience assessment models.

Research Methodology

Research Design

This research employed a quantitative research methodology approach to investigate the integration of technology, policy, and community resilience in managing disasters sustainably using AI. The quantitative approach offered a structured approach to quantifying relationships between the disaster management system's research variables and assessing the effectiveness of AI in disaster management in terms of disaster management efficiency and resilience results. The study used the cross-sectional survey method because it was a method that would allow the researcher to collect data from a large number of respondents during a particular period of time.

Population of the Study

The study targeted disaster management professionals, disaster response personnel, community representatives, emergency response handlers, policymakers, and disaster technology experts engaged in measures related to disaster preparedness and response. The participants had relevant knowledge and hands-on experience of using AI and digital technologies in disaster management systems. The study adopted a sample of individuals who work for government agencies handling disasters in the region, NGOs, various emergency services agencies and institutions in local communities.

Sample Size and Sampling Technique

A total of 350 respondents were selected to have good representation and statistical reliability. The sample comprised disaster management officials, emergency responders, policymakers, technology specialists and members of the community. Purposive sampling method was used due to the technically qualified and first hand experience of the participants in activities related to disaster management and disaster resilience. This approach allowed the researcher to gather relevant and information-rich responses about the implementation of AI, the integration of policies, and strategies for building community resilience. The sample size selected yielded adequate data to run correlation, regression and reliability analyses.

Data Collection Method

The data were gathered from primary sources using a predetermined questionnaire, which was framed on the basis of research goals and variables. All the questions in the questionnaire were close-ended type and were measured by a 5 point Likert scale from 'Strongly Disagree' to 'Strongly Agree'. The survey instrument featured sections that covered various aspects of AI applications, disaster response efficiency, policy integration, and community resilience. Collection of data was carried out by online-based survey platforms and direct distribution to ensure participation of the respondents from various disaster management institutions across various regions. The use of the questionnaire method helped standardize the data and allowed collecting data for quantitative analysis.

Data Analysis Techniques

The data collected were analyzed by using Statistical Package for Social Sciences (SPSS) software. The recorded data were treated statistically using descriptive statistics (frequency distribution, mean values and standard deviations) to summarize the socio-demographic characteristics of respondents and the research variables. Cronbach's alpha was used for the reliability analysis of the measurement scales. Correlation analysis was used to analyze relationships between artificial intelligence, policy integration, community resilience and sustainable disaster management. Multiple regression analysis was used to determine the effects of factors on the disaster management results. The statistics verified the objective interpretation of the research hypotheses and gave empirical evidence of the effectiveness of Artificial Intelligence disaster management system.

Results and Analysis

Demographic Profile of Respondents

A demographic analysis was used to analyze the characteristics of the 350 who participated in the study. Gender, age, education level and professional background are analyzed to examine the sample population studying disaster management and disaster resilience, including diversity and representation of gender, age, educational level and profession of the sample population.

Table 1. **Demographic Characteristics of Respondents (N = 350)**

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	214	61.1
	Female	136	38.9
Age	20–30 Years	88	25.1
	31–40 Years	132	37.7
	41–50 Years	86	24.6
	Above 50 Years	44	12.6
Education	Bachelor's Degree	124	35.4
	Master's Degree	158	45.1
	PhD Degree	68	19.5
Profession	Disaster Management Officers	102	29.1
	Policymakers	74	21.1
	Technology Experts	68	19.4
	Humanitarian Workers	57	16.3
	Community Representatives	49	14.0

The demographic results showed that the male respondents were 61.1% and the female respondents were 38.9% of the total number. The findings showed that representation was balanced but there was still a dominance of male responders in the disaster management and emergency response institutions. The Age Distribution of the respondents showed that there were 24.6% of the respondents aged 41 to 50 years, followed by 37.7% aged 31 to 40 years. The educational profile revealed that those who hold a master's degree made the highest percentages which is 45.1%, followed by those with a bachelor's degree (35.4%) and PhD (19.5%). These findings were consistent with a highly educated sample that could offer educated and informed views on AI, policy integration and community resilience. The age-wise analysis of the professional background of the respondents revealed that the highest number of respondents were disaster management officers (29.1%), followed by other policymakers (21.1%) and technology experts (19.4%). Community members and humanitarian personnel also shared important insights on resilience and resilience response systems.

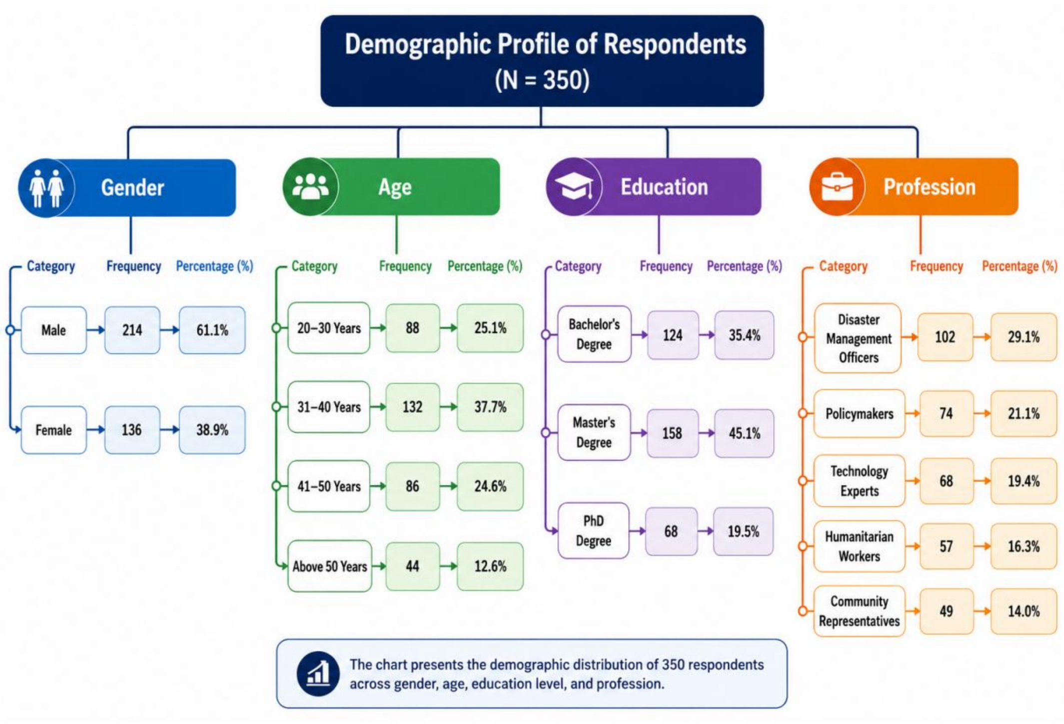

Figure 1.Demographic Characteristics of Respondents (N = 350)

Descriptive Statistics Analysis

The descriptive statistics analysis examined the mean values and standard deviations of the study variables including artificial intelligence, policy integration, community resilience, and sustainable disaster management.

Table 2. **Descriptive Statistics of Research Variables**

Variables	Mean	Standard Deviation
Artificial Intelligence	4.31	0.58
Policy Integration	4.18	0.63
Community Resilience	4.27	0.61
Sustainable Disaster Management	4.36	0.55

The descriptive results showed that Sustainable disaster management had the highest mean that is 4.36, whereas the standard deviation is 0.55. The result revealed high levels of agreement for the significance of Sustainable approaches in the Processes of Disaster Preparedness, Response and Recovery. Effective disaster management and sustainable outcomes in the long-term were achieved through the integration of technological innovation, institutional coordination and resilience planning, as acknowledged by respondents.

The mean score of AI was 4.31 with a Standard Deviation of 0.58, indicating positive perceptions about the effectiveness of AI technologies in disaster management systems. Participants indicated that the use of AI tools in disaster forecasting, coordination of disaster response efforts, resource allocation, and real-time decision-making processes was enhanced by these tools.The participants reported that the application of AI tools in the disaster forecasting, disaster response coordination, resource allocation, and real-time decision-making process was enhanced. The relatively small standard deviation provided uniformity in the responses of participants on the importance of the applications of AI in emergency management frameworks.Community resilience and policy integration also had high mean values of 4.27 and 4.18 respectively. The results indicated that people viewed the resilient communities and integrated governance systems as critical for sustainable disaster management.

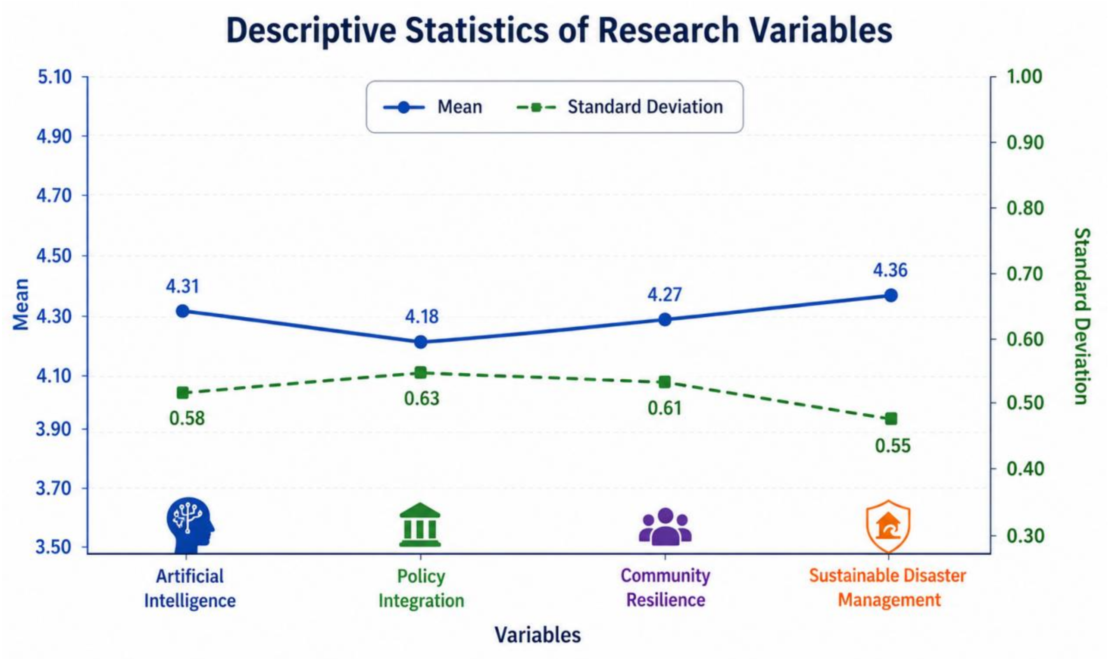

Figure 2.Descriptive Statistics of Research Variables

Reliability Analysis

Reliability analysis evaluated the internal consistency and stability of the research instrument using Cronbach's alpha coefficients. The analysis assessed whether the questionnaire items effectively measured the intended research variables.

Table 3. **Reliability Statistics**

Variables	Cronbach's Alpha
Artificial Intelligence	0.87
Policy Integration	0.84
Community Resilience	0.86
Sustainable Disaster Management	0.89

The reliability data showed good inter-term consistency for the research variables. The sustainable disaster management scale had the highest Cronbach alpha value of 0.89, artificial intelligence was 0.87 and community resilience was 0.86. Additionally, the integration of the policy showed a good Cronbach's alpha (0.84), which indicated that the measurement scale was reliable. The results indicated that the research tool was able to capture the perceptions of the respondents about the coordination of governance, preparedness of the institutions and the support of the policies to have disaster management systems through AI. The outcomes enhanced the trustworthiness of statistical analysis and justified the applicability of the questionnaire to explore relationships among the elements of AI, policy integration, community resilience and sustainable DRM.

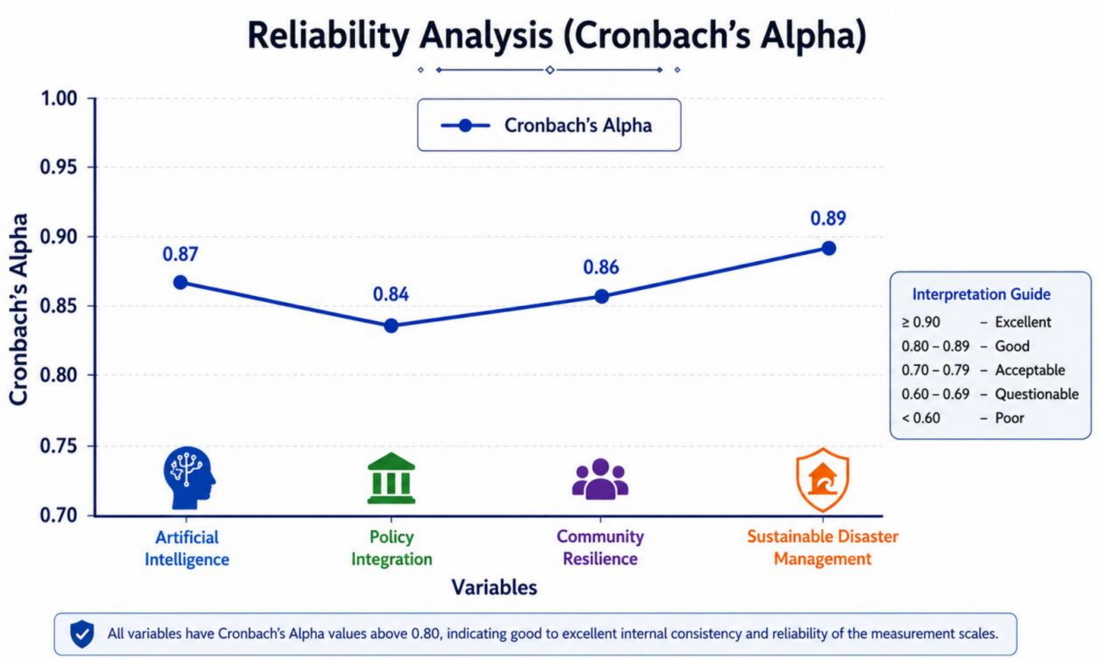

Figure 3.Reliability Statistics

Correlation Analysis

Correlation analysis examined the relationships among artificial intelligence, policy integration, community resilience, and sustainable disaster management. The analysis determined the strength and direction of associations between the study variables.

Table 4. **Correlation Matrix**

Variables	1	2	3	4
1. Artificial Intelligence	1			
2. Policy Integration	0.741	1		
3. Community Resilience	0.768	0.784	1	
4. Sustainable Disaster Management	0.815	0.772	0.803	1

The correlation results showed that there are positive and high correlation between all the study variables. The results show that artificial intelligence has a strong positive correlation with sustainable disaster management (r = 0.815), that is, the higher the AI adoption rate, the better the disaster preparedness, effective emergency responses, and the resilience planning. The results indicated that AI solutions played a pivotal role in achieving sustainable disaster management outcomes by enabling predictive analytics, intelligent monitoring systems, and coordination and response mechanisms. There was also significant positive correlation between community resilience and sustainable disaster management (r = 0.803). This finding led to a conclusion that resilient communities improved preparedness, adaptive recovery and disaster response that created collaborative decision-making processes. The positive relationships among policy integration, AI (r = 0.741), community resilience (r = 0.784), and sustainable disaster management (r = 0.772) were observed. These results illustrated the significance of the coordination and collaboration of governance and institutions to support AI-based disaster resilience frameworks. The findings validated the adoption of technology, institutional capacity building, and intergovernmentalism and cooperation among the government, humanitarian actors, and communities underpinned by the integrated policies.

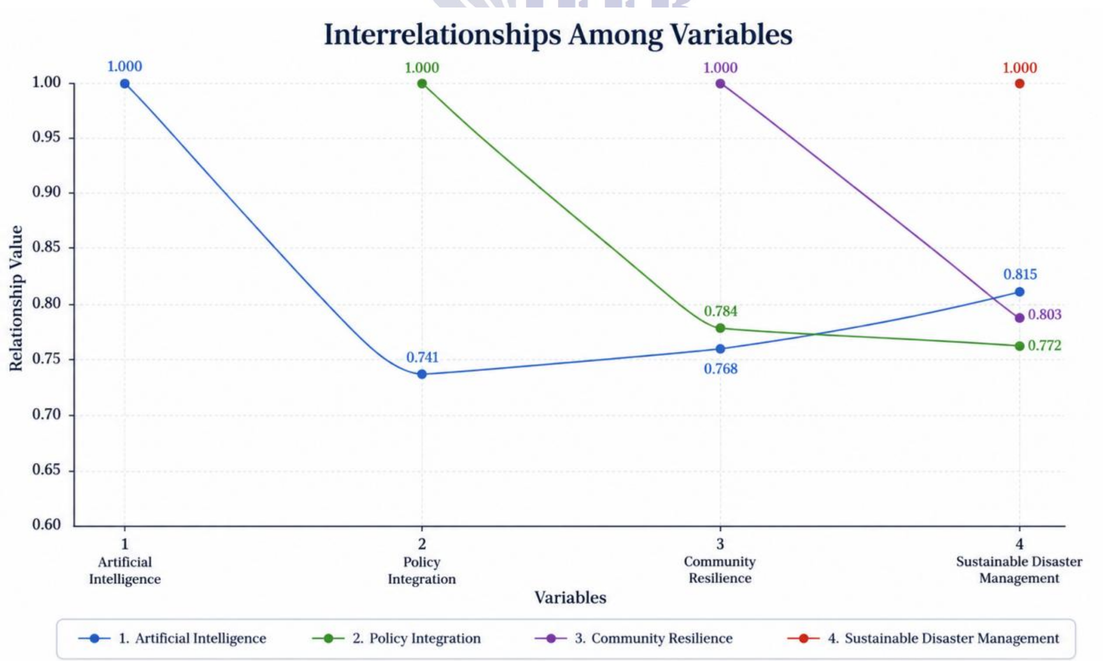

Figure 4. Correlation Matrix

Regression Analysis

Regression analysis evaluated the impact of artificial intelligence, policy integration, and community resilience on sustainable disaster management. The analysis measured the predictive influence of independent variables on disaster management outcomes.

Table 5. **Regression Analysis**

Variables	**Beta (β)**	**t-value**	**p-value**
Artificial Intelligence → Sustainable Disaster Management	0.73	15.82	0.000
Policy Integration → Sustainable Disaster Management	0.69	13.94	0.000
Community Resilience → Sustainable Disaster Management	0.77	16.48	0.000

The results of the regression showed that there was a significant influence of artificial intelligence on sustainable disaster management with the beta value of 0.73, p-value 0.000. The results showed that the use of AI technologies enhanced the accuracy of disaster prediction, efficiency of disaster response, and coordination of operations in disaster situations. The most important predictor for sustainable management of disaster was community resilience with the beta value of 0.77 and p value of 0.000 (statistically significant). This finding revealed that local involvement, linkage, and capacity of adaptation was critical in the disaster preparedness and recovery process. Resilience mechanisms in communities were found to have a positive impact on disaster response coordination and recovery sustainability in disaster situations. The integration of policy also had a considerable positive influence on sustainable disaster management with a beta value of 0.69. Based on the model summary, the model was able to explain the majority of the variance in sustainable disaster management ($R^2 = 0.709$).

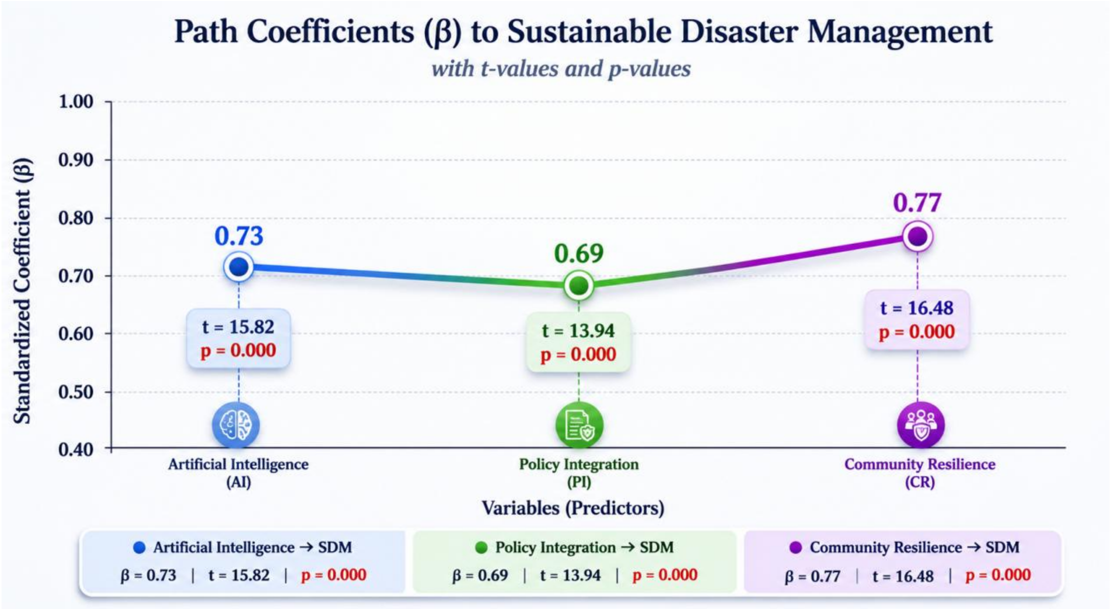

Figure 5. Regression Analysis

Discussion

The results of the study showed that the use of artificial intelligence technologies greatly contributed to sustainable disaster management, in terms of increased prediction accuracy, faster response to emergencies, policy coordination and strengthening community resilience. AI-related systems were shown to have strong positive relationships with sustainable disaster management, suggesting that they facilitated adaptation and efficiency in delivering more sustainable disaster management and recovery systems. This discovery was consistent with recent studies that highlighted the benefits of AI technologies in disaster prediction, emergency logistics, and real-time decision making, leveraging sophisticated machine learning algorithms and predictive analytics skills (Khalifa et al., 2024; Naser et al., 2023). By incorporating AI into their disaster management infrastructures, institutions were better able to handle vast amounts of environmental and operational data effectively, minimizing uncertainty and enhancing response capabilities in disaster scenarios.

The study also revealed that the use of artificial intelligence contributed to the improvement of the processes of emergency coordination and resource management. AI powered systems enhanced the connectivity among emergency response agencies, decision makers, and the community by providing better, real-time information sharing and transparency. The findings were consistent with a previous study that found that the development of AI-powered communication networks and intelligent systems for monitoring natural disasters and health emergencies led to increased awareness and improved coordination of the response efforts (Rana et al., 2024; Ahmed et al., 2023). AI drones, Geographic Information Systems, and remote sensing technology also improved the efficiency and precision of disaster damage assessment and disaster relief activities, especially in high-risk areas where human labour was problematic, researchers said.

The results showed that one of the most important factors influencing sustainable disaster management was community resilience. Communities that show greater preparedness [also known as adaptive capacity] and efficiency in recovery during a disaster [shown by higher scores in adaptive capacity, digital engagement, and institutional support] were more likely to be prepared. This finding was in line with the increased significance of involving local knowledge and community participation in AI-driven disaster management systems. Recent research showed that collaborative technologies, participatory governance, and digital inclusion were critical components of resilient communities in terms of their disaster adaptation and longer-term recovery experiences (Mhlanga, 2023; Kurniawan et al., 2024; Raja et al. 2026).

Additionally, the strong linkage between policy integration and sustainable DM pointed to the need for institutional coordination and governance mechanisms to facilitate the incorporation of AI. Good policies ensured transparency, accountability, and strategic government cooperation with humanitarian actors and technology providers. The results corroborated with research that emphasized digital governance and policy innovations as key to creating robust disaster resilience systems leveraging AI (Allam et al., 2022; Valle-Cruz et al., 2023).

The study demonstrated that AI technologies enhanced the prediction and notice of disasters through analyzing the data of the environment, climate, and infrastructure in real time. Machine learning models helped government officials discover patterns of risk and make accurate predictions for floods, earthquakes, hurricanes, and wildfires. The results were consistent with the past research, which has proved that AI-driven predictive systems improved emergency response intelligently and reduced the response delays to disasters (Zhao et al., 2022; Chui et al., 2023). A second key insight was around the use of AI systems to assist in the recovery and resilience planning following disasters for an issue of sustainability. "The systems powered by AI enhanced the rehabilitation efforts after the disaster by assessing infrastructure damage, tracking recovery progress, and optimizing resources (Raja et al., 2026).

Intelligent technologies reinforced long-term sustainability by incorporating monitoring systems for the environment, urban resilience planning and social vulnerability assessment into the recovery process (Bhardwaj et al., 2022; Sarker, 2024).

The results also highlighted the increasing significance of the ethical governance and responsible implementation of AI in disaster management systems. While the adoption of AI technologies helped boost efficiency and effectiveness, data privacy, algorithmic bias, and digital inequality remained to shape public trust and policy design. Transparent governance frameworks and ethical AI regulations were still found to be crucial for fostering fairness and accountability in decision-making processes regarding disasters (Jobin et al., 2023; Cowls & Floridi, 2024). This study has shown how AI has helped improve intergovernmental collaboration as well as collaboration between emergency responders and the local community. The use of digital platforms and communication systems with Artificial Intelligence enabled quicker transmission of emergency messages and better coordination regarding disaster response tasks. In 21st century disaster management studies, researchers highlighted the benefits of AI-enabled collaboration on becoming more resilient and collaborative in problem-solving during emergency situations (Nguyen et al., 2024; Taddeo et al., 2023).

The regression analysis showed that artificial intelligence, policy integration, and community resilience together accounted for a significant percentage of variance in the outcomes of SRDM. It was concluded from these results that sustainable disaster resilience was a result of a combination of technological innovation, effective governance, and social participation. Current research also suggested that the integrated socio-technical systems enhanced the adaptability to disaster and boosted the long-term resilience of vulnerable areas (Bai et al., 2023; Yadav et al., 2024).

The study further indicated that there was a need for greater investment in digital infrastructure, technical training and policy development in developing countries for optimum utilization of disaster management based on AI. Challenges related to institutional capacity and access to technologies persisted in many parts of the world where disaster risk exists. As the understanding of the potential and challenges of AI-driven disaster management systems grew, researchers continued to call for a more inclusive approach to digital transformation, advocating for making technology more accessible, fostering institutional learning, and raising public awareness.The researchers' calls for a more inclusive approach to digital transformation continue, emphasizing the need for increased accessibility of technology, institutional learning, and public awareness regarding the role of AI in disaster management (Rasheed et al., 2023; Sharma & Gupta, 2024).

Conclusion

The study pointed out that artificial intelligence has contributed much to support sustainable disaster management by developing better disaster prediction, coordination of disaster response, integrating into policymaking and creating community resilience. The results revealed how AI could improve the effectiveness of disaster preparedness and recovery processes, such as using AI to aid in real-time decision-making, making predictions, and allocating resources effectively. The results of statistical analysis have shown strong positive relationships between the variables of artificial intelligence, policy integration, community resilience and sustainable disaster management outcomes. Community resilience showed the highest level of prediction of sustainable disaster management, followed by the integration of artificial intelligence and policy.

Based on the regression analysis, artificial intelligence had a significant effect on SDM ($\beta = 0.73$, $p < 0.001$), and community resilience had the greatest effect ($\beta = 0.77$, $p < 0.001$). The model summary showed that the R^2 value was 0.709, which means that the independent variables explained 70.9% of the variation in sustainable disaster management. The study also found that for a disaster-tolerant society, there is a need for cooperation among governments, humanitarian agencies, technology providers and local communities. However, ethical governance, digital infrastructure, and institutional coordination were also crucial for disaster-friendly successful implementation of AI.

Recommendations

Governments and disaster management bodies are advised to invest more in AI technologies to enhance the forecasts, communication and resource management systems during disasters. Governance frameworks that establish transparency, accountability, and ethical guidelines for the use of AI in disaster management should be created by policymakers at all disaster management institutions. Digital training programs and technical workshops should enhance the digital competences and operational capacity of emergency responders, policy makers, and the local community when it comes to disaster systems supported by AI. The findings also highlighted the need for enhanced partnership building between public institutions, technology developers, humanitarian organizations, and academic researchers, to develop comprehensive approaches to disaster resilience. Community needs to be further involved in this through awareness creation campaigns, online engagement spaces and promoting local participation in disaster preparedness and recovery planning to build resilient communities.

Future Directions

The effectiveness of these AI applications in long-term disaster response efforts warrant further exploration in various disaster scenarios such as climate-resilient disasters, pandemics and urban disaster situations. A comparative analysis between developed and developing countries can contribute to understanding the challenges of implementing policy, adopting technologies and institutional capacity in the context of an AI-based disaster management system. Ethical aspects of AI, such as protecting privacy, ensuring fair algorithms, and incorporating digital inclusion in disaster governance, are also areas that future studies would benefit. Long-term studies could provide evidence on the impact of AI technologies on community resilience and sustainable recovery processes. Further studies on combining AI technology with emerging technologies like blockchain, Internet of Things, cloud computing, and digital twins (Raja et al., 2025), to enhance the disaster management efficiency and sustain-ability are encouraged. Research on culturally accommodative and community-based AI systems that facilitate inclusive disaster resiliency approaches for vulnerable and marginalized communities is also recommended as areas for future research.

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