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Digitalizing Disaster Evacuation Management: A Responsive Public Service Model for Vulnerable Groups in Local Government

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Abstract:
This study examines the digitalization of disaster evacuation management as a responsive public service model for vulnerable groups at the local government level. The study is based on the argument that evacuation management should not be understood merely as an emergency logistical operation, but also as an inclusive public service system that determines how affected populations are identified, protected, served, monitored, and referred during disasters. Using a qualitative case study approach, this research analyzes institutional readiness, data management practices, inter-agency coordination, shelter services, and the protection of vulnerable groups, including older persons, persons with disabilities, women, children, pregnant women, and people with chronic illness. Data were collected through in-depth interviews, field observations, and document analysis involving local disaster management agencies, social affairs offices, health offices, civil registration offices, communication and informatics offices, village governments, shelter managers, volunteers, and representatives of vulnerable groups. The findings show that conventional evacuation management remains constrained by fragmented data, manual registration, weak vulnerability profiling, and limited service integration. This study proposes an inclusive digital evacuation service model consisting of six components: pre-disaster vulnerability database, digital evacuee registration, vulnerability-based service classification, shelter and logistics monitoring, inter-agency referral system, and inclusive complaint handling. The novelty of this study lies in integrating disaster evacuation management, digital data governance, responsive public service, and social inclusion into a single local government framework. The proposed model enables local governments to provide evacuation services that are more accurate, accessible, accountable, and responsive to vulnerable groups.

Keywords: digital evacuation management; disaster management; responsive public service; vulnerable groups; local government; social inclusion

1. Introduction

Disaster evacuation management is one of the most critical dimensions of local disaster governance because it directly determines how affected populations are identified, protected, moved, served, and monitored during emergency situations. In disaster-prone countries such as Indonesia, evacuation is not only a matter of moving people from hazardous areas to safer locations. It also involves the provision of public services, including registration, temporary shelter, health assistance, food distribution, psychosocial support, protection services, family tracing, sanitation, disability access, and the prioritization of groups with specific needs. This makes evacuation management a public service issue, not merely a logistical or emergency response activity. When evacuation systems are poorly managed, vulnerable groups such as older persons, persons with disabilities, women, children, pregnant women, and people with chronic illness often face disproportionate risks before, during, and after displacement.

The problem becomes more complex because conventional evacuation management is frequently constrained by fragmented data, manual registration, weak inter-agency coordination, delayed needs assessment, limited demographic profiling, and insufficient mechanisms for monitoring evacuees in real time. In many local government contexts, evacuation data are collected after people have arrived at shelters, while information on vulnerability, health status, mobility limitations, family composition, and special service needs is often incomplete or inconsistently updated. This condition limits the ability of local governments to provide responsive, inclusive, and targeted services. As a result, evacuation centers may become administratively functional but socially insensitive, especially when public service delivery does not differentiate between general evacuees and groups requiring special protection.

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Digitalization offers an important opportunity to improve evacuation management by transforming scattered administrative records into integrated, real-time, and service-oriented data systems. Digital platforms can support evacuee registration, vulnerability profiling, shelter capacity monitoring, distribution of aid, referral services, family reunification, complaint handling, and coordination among disaster management agencies, social affairs offices, health services, civil registration offices, village governments, volunteers, and humanitarian organizations. In this sense, digitalization should not be understood merely as the adoption of applications or information technology. It should be positioned as a governance instrument that improves the accuracy, speed, transparency, accountability, and inclusiveness of disaster-related public services. Digital public service literature increasingly emphasizes that digital transformation must be linked to institutional capacity, interoperability, citizen trust, accessibility, and service equity (Popescu et al., 2024; Dewi, 2024; Dhal, 2023).

Previous studies have provided important insights into the relationship between disaster governance, vulnerable groups, and inclusive service delivery. Villeneuve et al. (2021) argue that disability-inclusive disaster risk reduction requires a person-centered capability framework so that disaster policies can respond to the actual capacities, barriers, and support needs of persons with disabilities. Sheehy et al. (2024) show that inclusive disaster risk reduction education for Indonesian children with special educational needs requires accessible communication, adapted learning processes, and institutional commitment. Rofiah et al. (2024) further demonstrate that disability-inclusive disaster risk reduction in schools needs measurable indicators and confirmatory assessment to ensure that inclusion is not merely rhetorical. Setijaningrum et al. (2024) also emphasize that disability-inclusive disaster governance must move beyond tokenistic participation toward a paradigm of resilience that gives persons with disabilities meaningful roles in disaster planning and response.

Other studies have examined evacuation, displacement, social vulnerability, and the role of information systems in disaster contexts. González et al. (2022) highlight the resilience of families in emergency evacuation centers and show that displacement affects not only physical safety but also family relationships, social adaptation, and access to support systems. Hernandez et al. (2021) found that displaced families experience relational strain during disasters, indicating that evacuation management must consider social and psychological dimensions. Kaya and Karanci (2023) reveal that persons with disabilities experience specific barriers during earthquakes, including mobility constraints, communication difficulties, dependence on caregivers, and limited institutional preparedness. Tan and Gaillard (2023) argue that access to disaster information for persons with disabilities should be framed as a rights-based priority, not as a secondary technical issue. These studies collectively show that evacuation management must be designed around differentiated needs rather than uniform administrative procedures.

Research on digital disaster management has also expanded in recent years. Digital innovation, e-governance, data systems, geospatial information, mobile applications, and platform-based coordination are increasingly discussed as tools for strengthening disaster preparedness and response. Dewi (2024) shows that digital innovation has become an important trend in disaster management and sustainable governance, while Dhal (2023) explains that e-governance-based disaster mitigation can improve institutional responsiveness and information flow. MacAfee et al. (2024) demonstrate that local knowledge and data-informed approaches can strengthen landslide disaster risk reduction in urban informal settlements. Kankanamge et al. (2020) and other studies on digital disaster communication indicate that information technology can support situational awareness and public participation during emergencies. Popescu et al. (2024), although not specifically focused on disaster management, provide a useful public administration perspective by showing that citizens' perceptions of digital public services are shaped by accessibility, reliability, transparency, and user experience. These findings are relevant because digital evacuation management depends not only on technical infrastructure, but also on whether citizens and vulnerable groups can actually access and benefit from digital services.

Despite these contributions, there remains a significant gap in the literature. Existing studies tend to examine three issues separately: disaster evacuation management, digital disaster systems, and inclusive protection for vulnerable groups. Few studies have explicitly integrated these three dimensions into a local government public service model. In particular, limited attention has been given to how local governments

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can design a digital evacuation management system that links evacuee data, vulnerability profiling, shelter services, inter-agency coordination, and inclusive public service delivery. This study addresses that gap by positioning digital evacuation management as a responsive public service model for vulnerable groups at the local government level. The novelty of this study lies in integrating disaster evacuation management, digital data governance, public service responsiveness, and social inclusion into a single analytical model. Accordingly, this study aims to develop a digital-based evacuation service model that enables local governments to identify, prioritize, serve, and protect vulnerable groups more effectively during disaster emergencies.

2. Methodology

This study employed a **qualitative research method** with a **case study approach**. The qualitative method was selected because this research aims to understand how disaster evacuation management can be digitalized as a responsive public service model for vulnerable groups at the local government level. The study does not seek to measure the effectiveness of a digital application statistically, but to examine governance processes, institutional readiness, data management practices, public service mechanisms, and inclusion strategies in evacuation management. Through a qualitative approach, the research is able to explore how local government institutions identify evacuees, classify vulnerability, coordinate shelter services, and respond to the specific needs of older persons, persons with disabilities, women, children, pregnant women, and other groups requiring special protection.

The case study approach was used because disaster evacuation management is closely influenced by local administrative capacity, disaster risk characteristics, technological infrastructure, inter-agency coordination, and the availability of population and vulnerability data. The case study focuses on local government institutions responsible for disaster management and public service delivery during emergency evacuation. The main unit of analysis is the local government's evacuation service system, particularly how evacuee data are collected, processed, shared, and used to support responsive services for vulnerable groups. This approach enables the study to examine not only the technical dimension of digitalization, but also the institutional, social, and service-oriented dimensions of evacuation governance.

The research data were collected from both **primary and secondary sources**. Primary data were obtained through in-depth interviews with key informants, including officials from local disaster management agencies, social affairs offices, health offices, population and civil registration offices, communication and informatics offices, village or sub-district governments, shelter managers, disaster volunteers, community organizations, and representatives of vulnerable groups. These interviews were designed to explore existing evacuation procedures, data collection mechanisms, service delivery practices in evacuation centers, challenges in identifying vulnerable evacuees, digital infrastructure readiness, and opportunities for developing an integrated digital evacuation management model.

Field observations were also conducted in selected evacuation-related settings, such as temporary shelters, disaster posts, local disaster management offices, village-level emergency facilities, or simulation activities when available. The observations focused on the registration process, service flow, accessibility of shelter facilities, information channels, coordination mechanisms, aid distribution, health service referral, and the availability of special services for vulnerable groups. This observation process was important to understand whether evacuation services were delivered uniformly to all evacuees or adjusted according to specific vulnerability profiles.

Secondary data were collected through document analysis. The documents examined included regional disaster management plans, contingency plans, evacuation standard operating procedures, shelter management guidelines, local regulations, population data, social welfare data, disability data, health service records, disaster response reports, public service documents, and digital governance policies at the local government level. These documents were analyzed to assess whether evacuation management had been supported by integrated data systems, whether vulnerable groups had been explicitly identified in planning documents, and whether digital instruments had been used to improve public service responsiveness during disaster emergencies.

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Informants were selected using a **purposive sampling technique**. This technique was considered appropriate because the study required information from actors who have direct authority, experience, or knowledge related to disaster evacuation, public services, digital data management, and vulnerable group protection. The selection of informants was based on their institutional roles, involvement in disaster response, knowledge of evacuation procedures, and experience in serving vulnerable groups during emergencies. Snowball sampling was also used when necessary to identify additional informants, especially shelter managers, volunteers, community leaders, and vulnerable group representatives who were directly involved in evacuation experiences but were not initially listed in formal institutional structures.

Data analysis was conducted using an **interactive qualitative analysis model**, consisting of data condensation, data display, and conclusion drawing. Data condensation was carried out by selecting, simplifying, and categorizing information obtained from interviews, observations, and documents. The data were then organized into several thematic categories, including evacuation data collection, vulnerability profiling, digital system readiness, inter-agency coordination, shelter service delivery, accessibility of services, protection of vulnerable groups, and public service responsiveness. Data display was conducted by arranging these categories into matrices, narratives, and model components to identify patterns, gaps, and relationships among institutional actors, data flows, and service mechanisms.

The development of the proposed model was carried out through thematic interpretation and conceptual reconstruction. The model was formulated by connecting empirical findings with the principles of digital governance, disaster evacuation management, responsive public service, and social inclusion. The analysis focused on how local governments can design a digital evacuation service system that integrates evacuee registration, vulnerability classification, shelter capacity monitoring, aid distribution, health referral, complaint handling, and inter-agency coordination. The resulting model emphasizes that digitalization should not be limited to data storage or application development, but should become a governance mechanism that improves the speed, accuracy, accessibility, and inclusiveness of evacuation services.

To ensure data validity, this study applied **source triangulation and method triangulation**. Source triangulation was conducted by comparing information from local government officials, disaster volunteers, shelter managers, community organizations, and representatives of vulnerable groups. Method triangulation was carried out by comparing interview results, field observations, and institutional documents. This process was used to strengthen the credibility of the findings and reduce the risk of institutional bias. Ethical considerations were maintained by ensuring voluntary participation, protecting the identities of vulnerable informants when necessary, and representing their experiences respectfully in the analysis.

3. Results and Discussions

1) Fragmented Evacuation Data and the Limits of Conventional Evacuation Services

The findings indicate that disaster evacuation management at the local government level is still largely constrained by fragmented data, manual procedures, and limited integration among institutions. In many evacuation situations, data on evacuees are collected after affected residents arrive at temporary shelters. Registration is often conducted manually by shelter officers, village officials, volunteers, or disaster response teams. Although this procedure helps identify the number of evacuees, it does not always provide accurate information on vulnerability profiles, health conditions, disability status, mobility limitations, pregnancy, age, family composition, or special protection needs. As a result, evacuation services often begin with incomplete information about who needs urgent assistance and what type of support should be prioritized.

The study found that conventional evacuation management tends to treat evacuees as a homogeneous population. In practice, however, evacuees have different capacities, risks, and service needs. Older persons may require medical supervision, assistive devices, accessible sanitation, or assistance during mobility. Persons with disabilities may need sign language interpretation, wheelchair-accessible facilities, personal assistants, disability-friendly information, or special evacuation routes. Women, children, pregnant women, and people with chronic illness may require protection services, privacy, reproductive health support, child-friendly spaces, nutrition assistance, psychosocial support, and referral mechanisms. When these

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differentiated needs are not recorded from the beginning, local governments face difficulty in delivering responsive and inclusive public services during emergencies.

The findings also show that evacuation data are often spread across different agencies. Population data may be held by civil registration offices, social welfare data by social affairs offices, disability data by social service units, health data by health offices, disaster impact data by local disaster management agencies, and shelter data by field posts or village governments. These data sets are rarely connected in real time during emergency response. This fragmentation creates delays in verification, duplication in aid distribution, gaps in service targeting, and weak monitoring of evacuees who move between shelters or return home. This condition confirms Dhal's (2023) argument that e-governance in disaster mitigation requires strong institutional integration, not only the presence of digital tools.

The limitation of conventional evacuation services is also reflected in the weak continuity between pre-disaster data and emergency response data. Ideally, local governments should already have updated vulnerability databases before disasters occur. Such databases can support evacuation planning, identification of priority households, preparation of accessible shelters, and rapid deployment of social and health services. The findings show that in many cases, vulnerability data are only collected during emergencies, when time is limited and administrative pressure is high. This creates a reactive service pattern rather than a preventive and anticipatory evacuation management system.

This finding is consistent with Villeneuve et al. (2021), who emphasize that disability-inclusive disaster risk reduction requires person-centered information about individual capabilities, barriers, and support needs. It also supports Kaya and Karanci's (2023) finding that persons with disabilities face specific barriers during earthquakes due to limited institutional preparedness and insufficient understanding of disability-related needs. In the context of evacuation management, these studies suggest that vulnerability cannot be managed only through general population data. It must be translated into operational service categories that help local governments decide who should be assisted first, what services should be provided, and which institutions should be responsible.

The study further indicates that manual evacuation management weakens accountability in public service delivery. Without integrated digital records, it becomes difficult to track whether vulnerable evacuees have received food assistance, health services, psychosocial support, assistive devices, protection services, or referral to specialized institutions. Complaint handling is also limited because evacuees often do not have accessible channels to report unmet needs. This finding shows that the problem of evacuation management is not only technical, but also administrative and ethical. Local governments have a responsibility to ensure that evacuation services are not merely available, but also accessible, equitable, traceable, and responsive to those most at risk.

2) Digitalization as a Responsive Public Service Mechanism for Vulnerable Groups

The findings reveal that digitalization can strengthen evacuation management when it is designed as a public service mechanism rather than merely as a technical data system. Digital evacuation management should not be limited to the development of an application for registration or reporting. It should function as an integrated service platform that connects evacuee data, vulnerability classification, shelter capacity, aid distribution, health referrals, protection services, and inter-agency coordination. In this model, digitalization becomes a governance instrument that enables local governments to respond more quickly, accurately, and inclusively to the needs of affected populations.

A responsive digital evacuation system should begin with pre-disaster vulnerability profiling. This means that local governments need to integrate population data, social welfare data, disability data, health data, and disaster risk data before emergencies occur. Such integration allows local governments to identify households and individuals who may require priority assistance during evacuation. For example, older persons living alone, wheelchair users, pregnant women, children without caregivers, people with chronic illness, and residents in high-risk zones can be mapped in advance. This data can then inform evacuation route planning, shelter preparation, transport allocation, volunteer deployment, and emergency service design.

The findings suggest that digital registration at evacuation centers can improve service accuracy if it includes vulnerability-based indicators. Registration forms should not only record names, addresses, identity

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numbers, and household size, but also specific service needs. These may include disability type, mobility condition, medical needs, pregnancy status, child protection needs, caregiver availability, special dietary needs, assistive devices, and referral requirements. Through this mechanism, local governments can move from general evacuation administration to needs-based service delivery. This supports Tan and Gaillard's (2023) argument that disaster information for persons with disabilities should be treated as a rights-based issue. Access to accurate data is essential because inclusive services cannot be delivered without knowing who needs support and what kind of support is required.

Digitalization can also improve shelter management. The findings indicate that one of the recurring problems in evacuation centers is the lack of real-time information on shelter capacity, population composition, logistics availability, sanitation conditions, and service gaps. A digital shelter dashboard can help local governments monitor the number of evacuees, identify vulnerable groups, track aid distribution, assign health services, and coordinate referrals. This system can also reduce duplication of assistance and improve transparency because service delivery can be recorded and monitored. Popescu et al. (2024) argue that the quality of digital public services is shaped by accessibility, reliability, transparency, and user experience. In disaster evacuation management, these principles are highly relevant because digital systems must support practical service decisions under emergency conditions.

The findings further show that digitalization can support inter-agency coordination. Evacuation management requires collaboration among disaster management agencies, social affairs offices, health offices, civil registration offices, communication and informatics offices, village governments, police, military, volunteers, non-governmental organizations, and community groups. Without a shared data platform, coordination often depends on informal communication, manual reports, and repeated verification. A digital evacuation management system can create a shared operational picture that enables each institution to understand its responsibilities and act based on the same data. This finding is in line with Dewi (2024), who notes that digital innovation in disaster management should be connected to governance capacity and sustainable institutional coordination.

The study also found that digital services must remain accessible to vulnerable groups. Digitalization may create new exclusion if systems are designed only for people with smartphones, internet access, digital literacy, or formal identity documents. Therefore, digital evacuation management must combine online and offline mechanisms. Local governments need assisted registration desks, mobile service teams, accessible information formats, community-based data verification, and volunteer-supported digital input. For persons with disabilities, information should be available in accessible formats, including visual, audio, simple-language, and sign-supported communication where possible. For older persons and children, digital systems should be mediated by caregivers, social workers, teachers, health workers, or trained volunteers.

This finding is consistent with Sheehy et al. (2024), who emphasize that inclusive disaster risk reduction requires accessible communication and institutional adaptation for children with special educational needs. It also aligns with Rofiah et al. (2024), who argue that disability inclusion requires measurable indicators, not only general policy statements. In the context of this study, digital evacuation management should include inclusion indicators that can be monitored, such as the number of vulnerable evacuees identified, the percentage receiving appropriate services, the availability of accessible shelters, the response time for health referrals, and the number of complaints resolved. Such indicators can help local governments assess whether digitalization actually improves inclusion or merely digitizes existing administrative routines.

3) Toward an Inclusive Digital Evacuation Service Model at the Local Government Level

Based on the findings, this study proposes an inclusive digital evacuation service model that integrates evacuation management, responsive public service, and social inclusion. The model consists of six interconnected components: pre-disaster vulnerability database, digital evacuee registration, vulnerability-based service classification, shelter and logistics monitoring, inter-agency referral system, and inclusive complaint handling. These components are designed to ensure that digitalization does not stop at data collection, but directly supports service delivery for vulnerable groups.

The first component is a pre-disaster vulnerability database. Local governments need to build and regularly update an integrated database of residents who may require special assistance during disasters.

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This database should be developed through collaboration among local disaster management agencies, social affairs offices, health offices, civil registration offices, village governments, community health centers, schools, disability organizations, women's groups, child protection institutions, and local volunteers. The database should not be used to stigmatize vulnerable groups, but to ensure that their needs are recognized before disasters occur. Data protection principles must also be applied, especially when dealing with health information, disability status, children's identities, and other sensitive personal data.

The second component is digital evacuee registration. During evacuation, local governments should use digital registration tools that can capture both demographic and vulnerability information. This registration should be flexible enough to be used in shelters, mobile posts, village offices, health facilities, and temporary service points. The system should allow officers to update evacuee status, record family members, identify special needs, and track movement between shelters. Digital registration can reduce delays and improve the accuracy of emergency data, but it must be supported by offline backup procedures in case electricity, internet access, or devices are disrupted.

The third component is vulnerability-based service classification. After registration, evacuees should be classified according to their service needs. This classification may include urgent medical attention, disability assistance, child protection, pregnancy and maternal health, elderly care, psychosocial support, assistive devices, special nutrition, and protection from gender-based violence. Such classification allows local governments to prioritize services based on need rather than on the order of arrival or general household categories. This component reflects the principle of responsive public service, in which government action must be adjusted to citizens' conditions, risks, and rights.

The fourth component is shelter and logistics monitoring. Digital systems should help local governments monitor shelter capacity, accessibility, sanitation, food availability, medical services, protection spaces, and logistics distribution. Shelter data should be connected with evacuee profiles so that aid distribution can be more accurate. For example, shelters with many older persons may require more health workers and mobility assistance, while shelters with many children may require child-friendly spaces, nutrition support, and psychosocial services. This approach is consistent with González et al. (2022), who show that emergency evacuation centers affect family resilience and social adaptation. Shelter management should therefore be understood as a social service environment, not only as a temporary physical location.

The fifth component is an inter-agency referral system. Vulnerable evacuees often require services that cannot be provided entirely within shelters. Persons with serious medical conditions may need referral to hospitals. Children separated from families may require child protection services. Persons with disabilities may need assistive devices or specialized support. Survivors of violence may need safe spaces and legal assistance. A digital referral system can help record cases, assign responsible institutions, monitor follow-up actions, and prevent vulnerable evacuees from being overlooked. This component strengthens accountability because each case can be traced from identification to service completion.

The sixth component is inclusive complaint handling. Evacuees need accessible channels to report unmet needs, discrimination, service delays, lack of food, unsafe facilities, health problems, or protection concerns. Complaint mechanisms should not rely only on digital applications because vulnerable groups may face barriers in using them. Local governments should provide multiple channels, including help desks, volunteers, call centers, village officers, disability assistants, women and child protection officers, and community representatives. Complaints should be recorded digitally so that they can be followed up, categorized, and evaluated. This mechanism strengthens the public service dimension of evacuation management because it gives evacuees a voice in assessing service quality.

The proposed model contributes to disaster governance studies by shifting the focus from evacuation as a logistical operation to evacuation as an inclusive public service system. Previous studies have emphasized the importance of disability-inclusive disaster risk reduction, accessible disaster information, and digital innovation in disaster management (Villeneuve et al., 2021; Tan & Gaillard, 2023; Dewi, 2024). This study extends those discussions by integrating these dimensions into a local government service model. The central argument is that digitalization becomes meaningful only when it improves the ability of government institutions to identify, prioritize, serve, protect, and monitor vulnerable groups during displacement.

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The model also has practical implications for local government. First, local governments need to develop interoperable data systems across disaster management, population administration, social welfare, health, and village governance. Second, evacuation planning must include vulnerability indicators and service standards for vulnerable groups. Third, shelter management should be supported by real-time data dashboards that monitor population composition, service needs, and logistics. Fourth, digital systems must be designed with inclusion and accessibility principles so that they do not exclude those with limited digital literacy, disability-related barriers, or restricted access to devices. Fifth, local governments need clear data governance arrangements, including data protection, institutional responsibility, standard operating procedures, and accountability mechanisms.

In this sense, the novelty of this study lies in proposing digital evacuation management as a responsive public service model for vulnerable groups. The model integrates data governance, evacuation operations, service delivery, and social inclusion within one framework. It responds to the lack of studies that connect digital disaster management with inclusive public service at the local government level. Through this model, evacuation management can move from reactive and fragmented emergency administration toward anticipatory, data-informed, accountable, and inclusive disaster public service governance.

4. Conclusion

This study concludes that disaster evacuation management at the local government level should be understood not only as an emergency logistical operation, but also as a responsive public service system. The findings show that conventional evacuation management is still constrained by fragmented data, manual registration, weak inter-agency coordination, and limited vulnerability profiling. These constraints reduce the ability of local governments to provide timely, accurate, and inclusive services for older persons, persons with disabilities, women, children, pregnant women, people with chronic illness, and other groups requiring special protection.

The study found that vulnerable groups are often not adequately identified at the early stage of evacuation. Evacuee registration usually focuses on general demographic data, while information on disability status, mobility limitations, health conditions, pregnancy, child protection needs, caregiver availability, and other specific service requirements is not consistently recorded. This condition causes evacuation services to be delivered uniformly, even though evacuees have different levels of risk and different service needs. The findings indicate that the absence of integrated vulnerability data is one of the main reasons why evacuation services remain reactive rather than anticipatory.

The contribution of this study lies in proposing digital evacuation management as a responsive public service model for vulnerable groups. The model integrates six main components: pre-disaster vulnerability database, digital evacuee registration, vulnerability-based service classification, shelter and logistics monitoring, inter-agency referral system, and inclusive complaint handling. These components show that digitalization should not be limited to application development or administrative data storage. Digitalization must function as a governance mechanism that connects data, institutions, service delivery, protection systems, and accountability.

The novelty of this study is found in the integration of disaster evacuation management, digital data governance, responsive public service, and social inclusion within a single local government framework. Previous studies have discussed disability-inclusive disaster risk reduction, digital disaster management, public service transformation, and emergency evacuation separately. This study extends those discussions by demonstrating that evacuation digitalization becomes meaningful only when it improves the government's capacity to identify, prioritize, serve, protect, and monitor vulnerable groups during displacement. In this sense, the study contributes to disaster governance literature by shifting the analytical focus from evacuation as population movement to evacuation as inclusive public service governance.

The findings also have practical implications for local governments. First, local governments need to develop interoperable data systems that connect disaster management agencies, social affairs offices, health offices, civil registration offices, communication and informatics offices, village governments, and shelter management units. Second, evacuation planning should include clear vulnerability indicators and service

standards for vulnerable groups. Third, shelter management should be supported by real-time data on population composition, service needs, accessibility, logistics, health referrals, and protection services. Fourth, digital systems must be designed with accessibility principles so that they do not exclude people with disabilities, older persons, children, or residents with limited digital literacy. Fifth, data governance must include privacy protection, institutional responsibility, and ethical safeguards, especially when handling sensitive information related to health, disability, children, and gender-based protection.

This study has several limitations. Its qualitative case study design provides an in-depth understanding of institutional processes and service challenges, but it does not statistically measure the effectiveness of a particular digital evacuation application. The study also focuses primarily on the local government level, while the relationship between local, provincial, and national disaster data systems requires further analysis. In addition, the experiences of vulnerable groups may vary depending on hazard type, shelter conditions, socio-economic status, gender, disability category, age, and access to digital technology.

Future research should test the proposed model through comparative case studies across different disaster-prone regions and hazard types. Further studies may also use mixed-method approaches to measure whether digital evacuation systems improve response time, service accuracy, aid distribution, referral completion, complaint resolution, and satisfaction among vulnerable evacuees. Research is also needed to develop digital inclusion indicators, data protection protocols, and interoperability standards for evacuation management. In addition, future studies should examine the direct experiences of vulnerable groups in using or being served through digital evacuation systems so that technological innovation remains grounded in social justice, accessibility, and human dignity.

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