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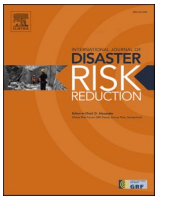

Enablers and barriers to implementing effective disaster risk management according to good governance principles: Lessons from Central Vietnam

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ABSTRACT

Despite the increasing frequency and intensity of natural hazard-induced disasters, global disaster risk governance predominantly focuses on theoretical frameworks and broad policies, with a noticeable gap in the effective local implementation of strategies grounded in good governance principles. This research aims to address this gap by evaluating the alignment of local disaster risk management policies with key good governance principles including: accountability, collaboration, transparency, information sharing, decentralization and autonomy, responsiveness and flexibility. Using Thua Thien Hue province in Central Vietnam, a region highly vulnerable to natural hazards, as a case study, this research combines legal document analysis and expert interviews to assess both enablers and barriers in disaster risk management. The findings identify several enablers, including clear legal frameworks, public transparency in resource allocation, active multi-stakeholder collaboration, and localized governance approaches that empower community involvement. However, persistent barriers include accountability gaps due to the lack of enforceable sanctions and incentives for proactive disaster prevention. Collaborative efforts remain predominantly government-led, with limited engagement from the private sector. Challenges in information sharing arise from insufficient dissemination of risk maps and hazard assessments at the community level. Decentralization and autonomy efforts struggle with personnel shortages and inadequate training. Responsiveness and flexibility suffer from the failure to adequately integrate vulnerability scenarios into legal frameworks. These findings highlight the importance of addressing barriers while leveraging existing enablers to strengthen governance frameworks in hazard-prone regions, providing valuable lessons that can be adapted to other disaster-prone areas globally.

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1. Introduction

Climate-related hazards, including floods, typhoons, and landslides, remain persistent challenges that pose significant threats globally [1]. The period spanning 2000 to 2019 witnessed a staggering 7348 documented natural hazard-induced disaster incidents, resulting in the loss of 1.23 million lives, impacting 4.2 billion individuals, and causing global economic losses estimated at approximately US$2.97 trillion [2]. The aftermath of such disasters extends over years, affecting environmental, social, and economic dimensions [3–5]. As the frequency and intensity of hazards and the potential for disasters continue to rise, the demand for effective disaster risk governance strategies becomes increasingly urgent to mitigate their impact and enhance the resilience of vulnerable regions [6–9].

The Sendai Framework for Disaster Risk Reduction -SFDRR (2015–2030) and its predecessor, the Hyogo Framework for Action (2005–2015), stand as pivotal milestones in the global effort to enhance resilience against disasters, emphasizing the critical role of disaster risk governance in shaping a robust and adaptive response to the growing threat of both natural and human-induced hazards [10–12]. This discourse has seen a paradigmatic shift, from a traditional focus on 'response and recovery' to a more proactive stance on 'prevention and preparedness' [8,13]. Central to this shift is the distinction between 'government' and 'governance'. While 'government' traditionally referred to centralized administrative structures with top-down management, 'governance' represents a more inclusive model that involves not only state actors, but also inter-sectoral, inter-governmental, and non-state stakeholders in decision-making [6,14]. In the context of disaster risk management, government approaches are often reactive, relying on hierarchical, command-and-control systems during and after disasters [15]. In contrast, disaster risk governance adopts a proactive, comprehensive approach that spans all four phases of the disaster risk management cycle: prevention, preparedness, response, and recovery. This approach fosters collaboration and inclusivity across various stakeholders to integrate risk considerations into development planning [16–18].

The concept of good governance is expanding in acceptance as a legitimate, accountable, and effective way to obtain and use public power and resources to further social goals [19,20]. Adhering to key principles of good governance, including accountability, collaboration, transparency, decentralization, responsiveness and flexibility and information sharing, is essential for efficient governance, particularly in the context of disaster risk management [21,22]. These principles, especially accountability, play a crucial role in ensuring that key actors are held responsible for their decisions, thereby enhancing the overall effectiveness of disaster risk management strategies [23]. Emphasizing collaboration encourages the active engagement of diverse stakeholders, recognizing the value of varied perspectives in comprehensive disaster risk management initiatives [24]. Transparency ensures that information and actions are open, accessible, and comprehensible to all stakeholders, fostering trust and active community participation [25]. Decentralization, advocating for decentralized decision-making, empowers local communities to take the lead, acknowledging the importance of contextual knowledge in effective governance [26]. Responsiveness and flexibility encompasses the capacity to adapt strategies and actions in response to evolving and unpredictable disaster scenarios. This entails the implementation of adaptive policies, regularly reviewed and updated to account for changes in environmental, social, and economic conditions. Moreover, it involves the ability of governmental and relevant agencies to react promptly and effectively to disaster events. This necessitates the establishment of reliable early warning systems, ensuring the timely detection and prediction of disasters, along with the effective dissemination of warnings to vulnerable populations [22,27].

While the majority of current global disaster risk governance, such as the SFDRR, focuses on theoretical frameworks and broad policies addressing large-scale challenges [10,28], the effective local implementation of these strategies, guided by the principles of good governance, remains a crucial component [12,22,29]. Existing studies have identified a deficiency in establishing these principles in legal frameworks [30,31], hampering governments' ability to orchestrate efficient disaster risk governance strategies [32]. For example, issues such as a lack of enforcement measures or unclear roles for the private sector serve as barriers to the effectiveness of disaster risk management [33]. Moreover, previous research has often focused on evaluating specific facets of good governance, such as transparency [34], decentralization [35,36], accountability [37], and collaboration [38]. This emphasizes the need for a comprehensive assessment of good governance principles [39].

Against this background, this paper uses Thua Thien Hue province, located in Central Vietnam, as a case study to assess the extent to which disaster risk governance principles are integrated into policy frameworks. Thua Thien Hue stands out as one of the areas most exposed and vulnerable to climate-related hazards in the country, with frequent occurrences of significant property damage and loss of life due to storms, floods, flash floods, and landslides [40,41]. Despite these challenges, Thua Thien Hue province is recognized as a role model in disaster risk management throughout the country [42]. Through a reform of the legal frameworks for disaster risk management, Thua Thien Hue has shifted from passive response to proactive prevention [43]. This context has raised important research questions.

- *To what extent have enables and barriers shaped Thua Thien Hue's preparation and implementation of disaster risk management policies in accordance with good governance principles?*
- *How are the principles of good governance applied differently across the various disaster risk management phases - prevention, preparedness, response, and recovery?*
- *How are good governance principles interconnected within the disaster risk management framework?*

By drawing practical lessons from Thua Thien Hue, this study aims to provide insights that can guide the design of targeted interventions and policy adjustments with broader applicability. The remainder of this paper is organized as follows: the next section

outlines the methodology. This is followed by the presentation and discussion of results, focusing on the enablers and barriers to disaster risk management under good governance principles. Finally, the conclusion summarizes the findings, offers policy recommendations, and suggests directions for future research.

2. Methodology

2.1. Case study: Thua Thien Hue province, Central Vietnam

Thua Thien Hue (see Fig. 1), a coastal province located in Central Vietnam, is geographically positioned between the latitudes of 16°–16.8° North and longitudes of 107°–108.2° East. Covering an area of approximately 5033 km^2, the province features a diverse landscape that includes a 120 km-long coastline, plain, mountainous terrain, rivers, and lagoons. According to the 2019 Population and Housing Census, Thua Thien Hue had a population of 1,128,620 people across 305,905 households. The province is highly prone to various natural hazards, including floods, typhoons, and landslides [40,43]. The tropical monsoon climate, characterized by high temperatures and heavy rainfall, further exacerbates the occurrence and severity of flood hazards, particularly during the rainy season from September to December [43]. The province's vulnerability is mainly driven by its socio-economic conditions, as a significant portion of the population relies on agriculture, aquaculture, and fishing, sectors that are particularly vulnerable to the impacts of natural hazards [43,44]. Given its diverse geography and socio-economic context, Thua Thien Hue is an ideal study area that offers valuable insights into disaster resilience and management, especially for the Global South and other regions where comparable conditions and hazards exist [45].

From 1999 to 2020, Thua Thien Hue province experienced significant losses due to natural hazard-induced disasters. These disasters resulted in 566 deaths and 645 injuries, with over 703,834 households affected during the 21-year period. Infrastructure damages were extensive, with 28,650 houses collapsed and 50,684 houses partially damaged. The total economic losses amounted to approximately $542.28 million USD. The most catastrophic year was 1999, which saw 359 deaths, 305 injuries, 300,000 households flooded, and 25,056 houses destroyed, causing losses of around $75.91 million USD (see Fig. 2). Another notable year was 2006, which recorded 9 deaths, 136 injuries, 1160 households flooded, and damages amounting to $127.43 million USD. In addition, 2007 recorded 23 deaths, 36 injuries, 83,370 flooded households, resulting in damages of approximately $50.52 million USD. The year 2017 recorded damages amounting to $40.06 million USD. Lastly, in 2020, the province experienced 41 deaths and economic losses of approximately $98.83 million USD [43].

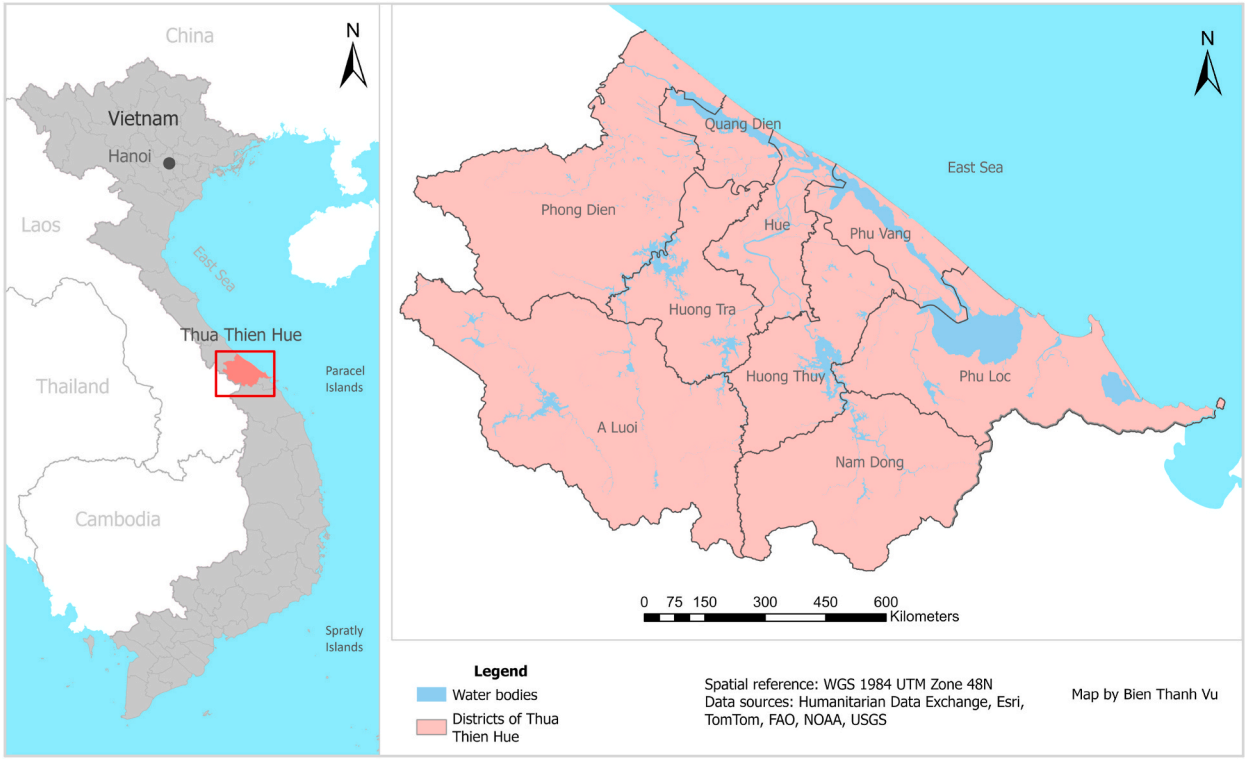

Fig. 1. Study area.

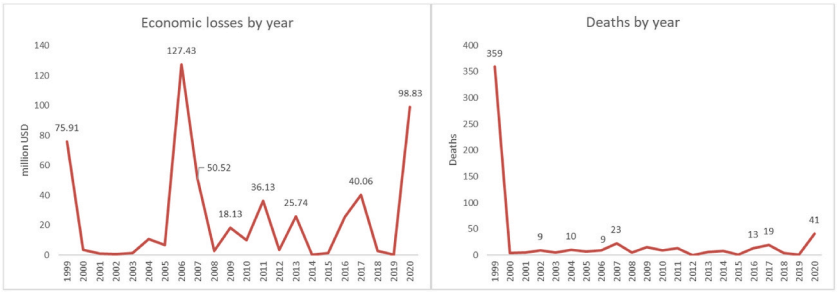

Fig. 2. Trends in economic losses (left) and annual death (right) caused by natural hazards from 1999 to 2020 (Data sources [43]).

2.2. Good governance principles

The principles were selected based on the work of Alam and Ray-Bennett [46], along with a review of relevant academic literature. A total of 14 principles of good governance were identified, but this paper focuses on 6 key principles that are most relevant to the Vietnamese legal context [47–50] and appear most frequently in the reviewed documents (see Appendix 2). Additionally, the selection of these principles was validated by policy makers to ensure their appropriateness in Vietnam. These indicators include: 1) accountability, 2) collaboration, 3) transparency, 4) information sharing, 5) decentralization and autonomy, and 6) responsiveness and flexibility (see Table 1).

2.3. Document analysis

Document analysis refers to a systematic and structured method of reviewing, evaluating, and interpreting written or visual materials, such as texts, reports, images, or other forms of documentation [53]. It is a crucial and versatile process employed across diverse fields for its ability to extract valuable information, understand context, and support decision-making. In this research, READ approach [54] was used as a guide for the document analysis. The procedures of READ approach are as follows: Ready materials; data extraction; data analysis; and distillation of findings.

The legal documents related to disaster risk management and climate change adaptation at both the national (Vietnam) and local (Thua Thien Hue province) levels were identified through a comprehensive search on online platforms, including https://thuvienphapluat.vn/, http://pclb.thuathienhue.gov.vn/, the Vietnamese government portal, and the Thua Thien Hue province website. Including both national and local documents is crucial, as national policies provide the overarching legal framework, while local documents reflect specific regional adaptations and implementation strategies of these policies. The identification process began with a thorough review of all available legal documents related to disaster risk management on these platforms. Additionally, we collaborated with local government agencies, such as the Thua Thien Hue Provincial Commanding Committee for Natural Disaster Prevention and Control, Search, and Rescue, to ensure the inclusion of all relevant policies, especially those at the local level.

After the initial search, a total of 110 documents were identified. To ensure that the documents included in the analysis are relevant to current and future disaster management strategies, we only included those adopted or updated in the last 10 years (2013–2023). This refinement resulted in a final dataset of 68 documents (see Appendix 1 for the full list of reviewed documents), each corresponding to a specific phase of the disaster risk management cycle, including: Prevention (23 documents), Preparedness (28 documents), Response (10 documents), and Recovery (7 documents). This categorization was based on the purpose and content of each document: prevention documents focus on reducing the likelihood or impact of disasters, preparedness documents address readiness for disaster events, response documents outline emergency measures during and immediately after a disaster, and recovery documents concentrate

Table 1
Key principles of good governance in disaster risk management.

Principles	Explanations	Related research
Accountability	Accountability implies that those actors who are involved in disaster risk governance are accountable for their actions and decisions.	[6,23,27,46,47,50]
Collaboration	Collaboration involves coordination between government agencies, nonprofits, the private sector, community groups and other actors to combine expertise and resources for more effective disaster risk management.	[6,24,27,46,49,50]
Transparency	Transparent governance fosters an understanding of decision rationales, resource allocation. It builds trust and allows scrutiny of decision-making.	[6,27,46,47]
Information sharing	Enabling seamless communication across diverse departments, communities, and stakeholders throughout all phases of the disaster risk management cycle.	[46,49–51]
Decentralization and autonomy	This principle recognizes the value of contextual knowledge in efficient governance and gives local communities the ability to take the lead.	[27,47–49,52]
Responsiveness and flexibility	Responsiveness and flexibility in disaster risk governance entail the ability of government and disaster risk management systems to promptly adapt to evolving circumstances.	[9,22,27,49]

on long-term rehabilitation and rebuilding efforts.

To convert the conceptual framework into a coding system for assessing the readiness of existing policy documents with respect to good disaster risk governance principles, a comprehensive list of relevant search strings was created (see Table 2). These search strings were employed to systematically code the legal documents. To ensure coding reliability and improve the reproducibility of the analysis, we implemented an inter-coder reliability process. Specifically, two independent coders were trained on the coding system, and both applied the same search strings to a subset of the documents. After coding, the results were compared to assess the consistency between the two coders. Any discrepancies were discussed and resolved through clarification of coding rules. The coding analysis was performed using MAXQDA (2020 version). Subsequently, the results were synthesized to provide a concise summary of the extent to which the six indicators of good governance are currently reflected in the analyzed legal documents.

Finally, the Code Co-occurrence model is used to analyze and visualize the interrelationships between key principles of good governance in disaster risk management. This method identifies which principles frequently co-occur and how they are connected, providing insights into the dynamics and synergies between governance components. The analysis involves mapping the co-occurrence frequencies, with the width of connecting lines in the visualization representing the strength of these relationships [55].

2.4. Expert interviews

The study incorporates the opinions of 13 experts from Thua Thien Hue province (see Appendix A3), with whom semi-structured interviews were held both online and in-person. All interviews were conducted by Vietnamese and subsequently translated into English to ensure clarity and accuracy. The primary aim of the interviews was to complement the findings from the document-based analysis and allow for triangulation of data. The questions covered various facets of disaster risk management, focusing on the evolution of disaster management policies, the balance between 'response' and 'prevention'. More significantly, the interviews focused on the practical application of good governance principles while highlighting synergies and conflicts among these principles. Detailed expert interview questions are provided in Appendix A4. Regarding thematic saturation, during the semi-structured interviews, the themes that emerged were consistently repeated across different experts, and no new critical themes were identified in the latter stages of the interviews. This suggests that thematic saturation was achieved [56], ensuring that the key issues related to disaster risk management were thoroughly explored.

3. Results and discussion

3.1. Good governance principles in disaster risk policies of Vietnam and Thua Thien Hue

Good governance principles in disaster risk policies of Vietnam (national level) and Thua Thien Hue (local level) are underpinned by a number of legal documents (see Fig. 3). The nation's legislative landscape e.g. Law 33/2013/QH13 and Decision 379/QĐ-TTg establish the foundation for accountability, coordination, and transparency. Specifically, the primary authority responsible for disaster prevention and control is the National Steering Committee for National Disaster Prevention and Control. This committee is aided by Commanding Committees for Natural Disaster Prevention and Control, Search and Rescue operating at various levels, including national, provincial, district, and communal/ward levels [57]. At the provincial level, corresponding documents ensure effective implementation and alignment with national strategies. For example, Decision 2365/QĐ-UBND *(in effect 11/09/2020)* establishes the plan for natural hazard-induced disaster prevention, control, search and rescue for 2020–2025. Additionally, Plan 204/KH-UBND (*effective 09/09/2020*) aims to enhance accountability, coordination, and transparency in disaster prevention and control at the local level during the 2020–2025 period.

Local communities are integral to the success of disaster risk management. In 2021, The Vietnamese Government approved *Decision 553/QĐ-TTg* (*in effect 06/04/2021*) to enhance public awareness and community-based disaster risk management until 2030, recognizing the valuable insights and strengths that local populations bring to disaster management efforts. Additionally, empowering communities ensures a bottom-up approach to resilience building [10]. A key aspect of this transformation involves the decentralization of disaster management policies, emphasizing the "four on-the-spot" motto, which includes the development and maintenance of leadership, human resources, materials, and logistics at the commune level [48]. In Thua Thien Hue province, *Decision 3271/QĐ-UBND (effective 31/12/2022)* was issued to implement Decision 553/QĐ-TTg at the provincial level, further reinforcing the

Table 2
Coding system.

Coding categories	Search Strings
Accountability	Responsibility; ensuring; commitment.
Collaboration	Inter-agency collaboration; collaborative strategies; integration.
Transparency	Inspection; supervision; public disclosure.
Information sharing	Sharing of climate change adaptation data; dissemination of environmental monitoring information; disaster alerts; early warning; disaster information updated.
Decentralization and autonomy	Four 'on-the-spot'; involvement of local authorities; local knowledge; community-led disaster risk reduction; community-based actions.
Responsiveness and flexibility	Proactive approach; mainstreaming climate change scenarios, vulnerability scenarios; integration of disaster risk management; planning.

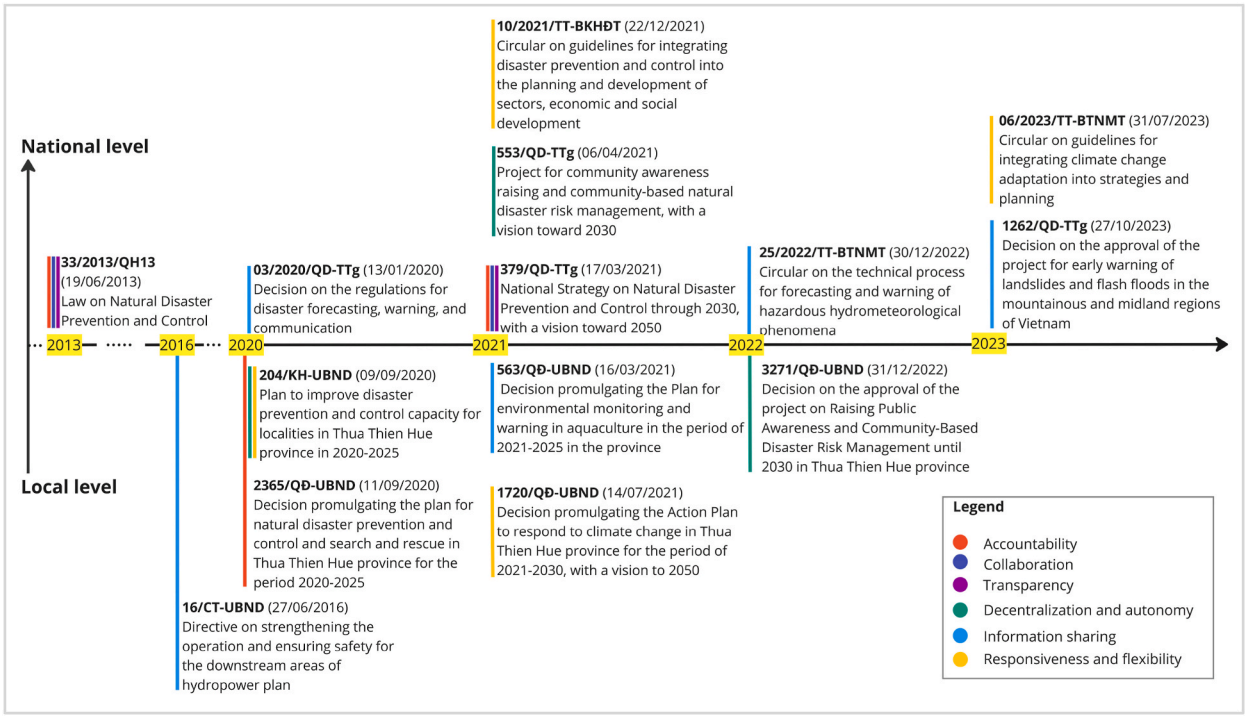

Fig. 3. Key disaster risk management policies aligned with 6 principles of good governance.

critical role of decentralization and autonomy in strengthening disaster risk management efforts in the region.

Effective information sharing is another fundamental pillar of disaster risk governance in Vietnam [58]. At the national level, Vietnam has established a robust legal framework for monitoring, forecasting, and warning. Notable documents include Circular No. 25/2022/TT-BTNMT (*in effect 15/03/2023*), outlining technical regulations for forecasting and warning of hazardous meteorological and hydrological phenomena. Particularly crucial in this context is the role of early warning systems for flash floods in the Decision 1262/QĐ-TTg (*in effect 27/10/2023*). Interestingly, Thua Thien Hue province has pioneered several of these efforts before national-level regulations were formalized. For example, Directive 16/CT-UBND (*in effect* 27/06/2016), which focuses on strengthening the operation and ensuring safety for downstream areas of hydropower plants, was issued at the provincial level years before national-level frameworks on similar issues were fully established. Additionally, Decision 563/QĐ-UBND (*in effect* 16/03/2021) promulgated the plan for environmental monitoring and warning in aquaculture for the 2021–2025 period in the province, again setting an example for other regions, including at the national level.

The importance of responsiveness and flexibility characteristics in disaster risk governance has been underscored by the

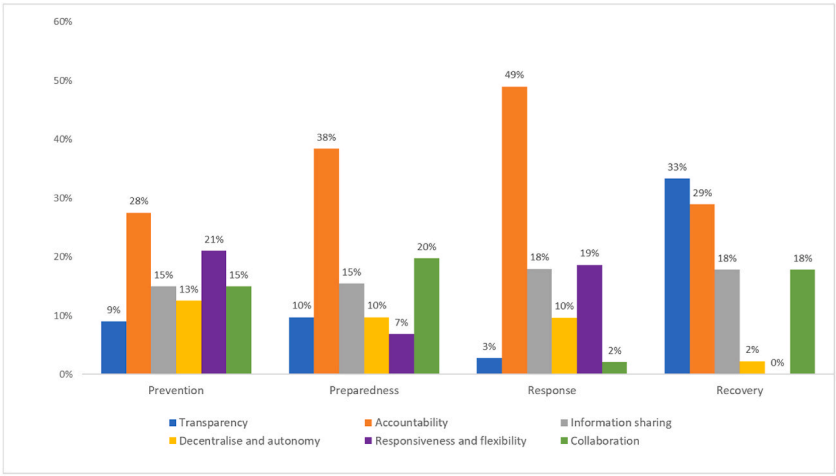

Fig. 4. Distribution of governance principles across disaster management phases.

mainstreaming of disaster risk reduction and climate change adaptation into planning systems [10]. At national level, this strategic approach is guided by two pivotal documents. Firstly, Circular No. 10/2021 (*in effect 10/02/2022*), released by the Ministry of Planning and Investment, offers comprehensive guidance on mainstreaming disaster risk reduction measures into sectoral and socio-economic development plans. Secondly, Circular 06/2023/TT-BTNMT (*in effect 01/10/2023*), issued by the Minister of Natural Resources and Environment, prioritizes the mainstreaming of climate change adaptation into strategies and planning. At the local level, Decision No. 1720/QĐ-UBND (*in effect* 14/07/2021) in Thua Thien Hue exemplifies the mainstreaming approach by incorporating both climate change adaptation and disaster risk reduction into a comprehensive action plan for the period 2021–2030, with a vision toward 2050, thereby embedding these priorities into local governance frameworks and operational strategies.

3.2. Implementation of good governance in disaster risk management in Thua Thien Hue

3.2.1. How does an overview of good governance principles apply across phases of disaster risk management?

Fig. 4 highlights the varying importance of six good governance principles across the four phases of disaster risk management: prevention, preparedness, response, and recovery. Accountability consistently plays a crucial role, having the highest proportion in the response phase (49 %) while also maintaining significant relevance in the preparedness (38 %) and prevention (28 %) phases. Information sharing demonstrates a relatively balanced role across all four phases: prevention (15 %), preparedness (15 %), response (18 %), and recovery (18 %). This consistency highlights its foundational importance throughout the disaster management cycle. During prevention and preparedness, it enables risk identification, early warnings, and awareness-building. In the response phase, its slight increase reflects its critical role in real-time coordination, while in the recovery phase, it supports transparency, trust-building, and alignment of reconstruction efforts with community needs. Collaboration is particularly notable in the preparedness (20 %) and recovery (18 %) phases, highlighting the importance of cooperative efforts among governments, communities, and private entities to build resilience and facilitate post-disaster rebuilding. Transparency emerges as a significant principle during the recovery phase (33 %), reinforcing the need for trust-building and equitable allocation of resources in reconstruction efforts. Responsiveness and flexibility play a crucial role in both the prevention (21 %) and response (19 %) phases. Meanwhile, decentralization and autonomy, though less emphasized overall, finds moderate importance in the preparedness (10 %) and prevention (13 %) phases.

3.2.2. How are good governance principles interconnected in disaster risk management?

The Code Co-occurrence Model (see Fig. 5) provides a detailed visual representation of the relationships between six key principles of good governance in disaster risk management. Among them, accountability emerges as the most prominent and frequently cited principle, underscoring its pivotal role in disaster risk governance. Accountability ensures that actors are responsible for their decisions and actions, which is fundamental to fostering trust, legitimacy, and effective coordination. A particularly strong relationship is observed between accountability and information sharing, highlighting the importance of transparent and timely communication in facilitating informed decision-making and promoting trust among stakeholders. Collaboration also demonstrates a robust connection with accountability, emphasizing the need for coordinated efforts among diverse stakeholders to address complex disaster scenarios effectively. Transparency plays a complementary role, closely tied to accountability and information sharing, as it fosters trust, openness, and confidence in decision-making processes. Meanwhile, decentralization and autonomy are essential for empowering localized governance, enabling tailored, context-specific solutions that are critical for effective disaster response and mitigation. This principle works in tandem with responsiveness and flexibility, which are vital for adapting to the dynamic and unpredictable nature of disasters. The model underscores the interconnectedness of these principles, suggesting that effective governance in disaster management requires a holistic approach where accountability is supported by strong communication, collaboration, adaptability, and localized decision-making [23].

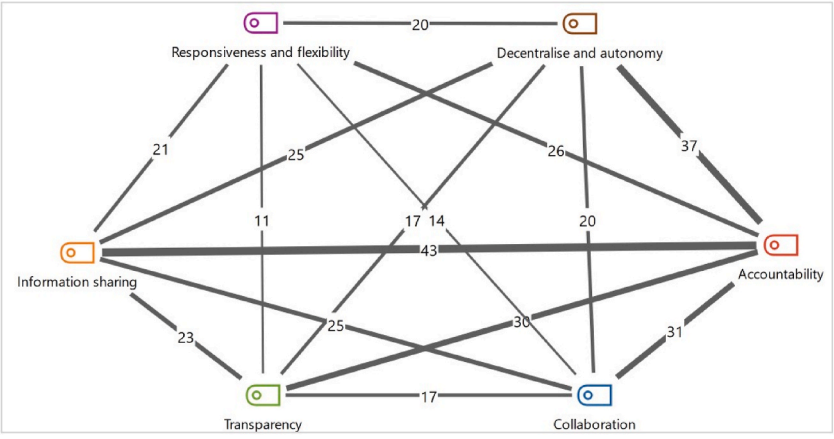

Fig. 5. Interconnections of good governance principles in disaster risk management.

3.2.3. To what extent are enables and barriers of good governance principles reflected in Thua Thien Hue's legal framework?

3.2.3.1. Accountability and collaboration. The effectiveness of disaster risk governance in Thua Thien Hue province is strongly shaped by the interconnection between collaboration, accountability (see Fig. 5). Accordingly, the People's Committees of provinces, districts and communes levels (PC-TTH), Military Command of Thua Thien Hue province/district (MC), and Thua Thien Hue Provincial Commanding Committee of Natural Disaster Prevention and Control, Search and Rescue (CCNDPC/SR) have collaborated during the prevention and preparation stages (see Fig. 6). Together, these offices have created disaster plans and run training courses on preventing natural hazard-induced disasters. In addition, the Department of Industry and Trade (DoIT) has collaborated with Enterprises and cooperatives (E&C) to organize the warehousing of necessities ahead of possible calamities. The legal documents highlight the consequences for violations, underscoring the seriousness of commitments regarding the quality and quantity of goods for disaster prevention efforts. The Save the Children organization works to improve the knowledge and skills of children living in flood-prone areas. The Asian Development Bank (ADB) provides technical support and disaster insurance for public properties. The responsibility of Japan International Cooperation Agency (JICA) which collaborate with Thua Thien Hue government is to manage critical infrastructure measures like dikes and reservoirs while United Nations Development Programme (UNDP) has concentrated on deploying the construction of storm- and flood-resistant homes, aimed at facilitating adaptation efforts and mitigating the risks associated with natural hazard-induced disasters.

During the phases of disaster response and recovery, PC-TTH actively supports citizens in their recovery, Electricity and telecommunications company (ETC) swiftly restores essential services, the MC partners with local authorities to clear and maintain roads. The documents also outline responsibilities of ETC, Civil Society Organizations (CSO), Hue university (HUEUNI), Department of Education and Training (DoET), and Food and Agriculture Organization (FAO) and Australia's aid program (AUS) related to providing social assistance after natural hazard-induced disasters and facilitating the recovery process from extreme weather events like hurricanes and floods. These responsibilities underscore the commitment to rebuilding communities and addressing the long-term effects of natural hazard-induced disasters, emphasizing a comprehensive recovery strategy that fosters accountability. However, one of the government official stresses that "A*lthough there are many parties involved in natural hazard-induced disaster risk management, the roles of the participants, especially private sectors, have not been clearly manifested*". The constraints involved imply that disaster risk reduction is not truly a responsibility for everyone; instead, it pertains primarily to a chosen few [33]. This reflects a key gap in disaster risk management frameworks, which is the underutilization of public-private partnerships (PPP). PPP has proven to be an effective model in developed countries for improving disaster resilience. For example, in the United States, the National Flood Insurance Program has successfully engaged private insurance companies to share the risk burden with the public sector. Similarly, in France, the government collaborates with private insurers through the Caisse Centrale de Réassurance, ensuring that all properties are covered by insurance for catastrophic events. These models illustrate how private sector engagement, particularly in logistics, infrastructure, and resource mobilization, can significantly enhance disaster preparedness and recovery efforts [59].

Comparing the periods before and after disasters, accountability and collaboration were predominantly established during the pre-disaster phase, signaling a transition in the field of disaster risk management from 'response and recovery' to 'prevention and

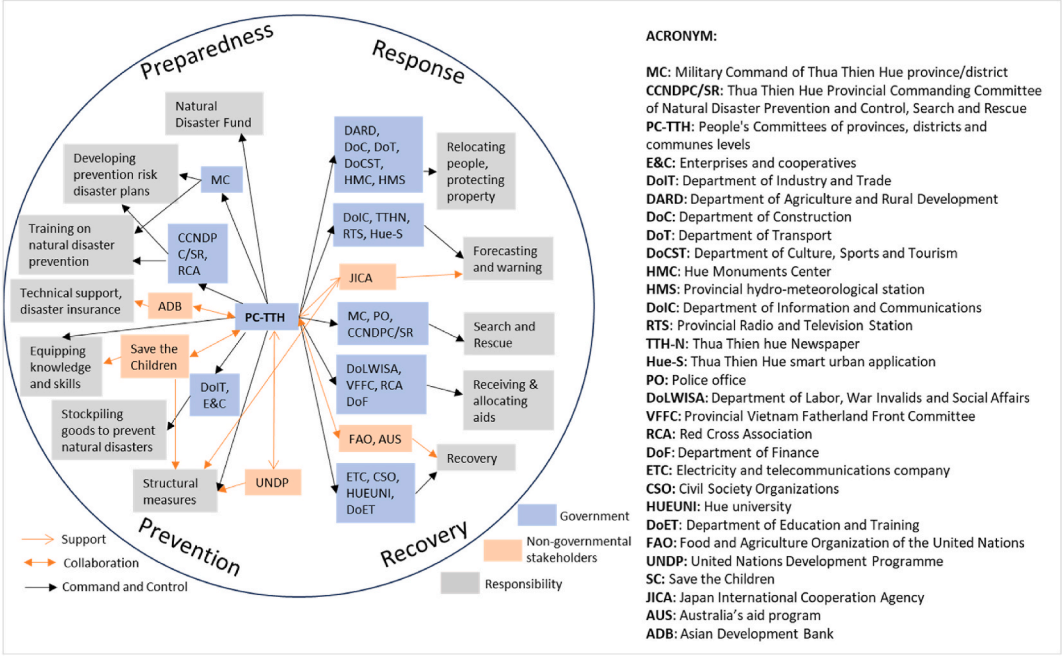

Fig. 6. Characteristics of accountability and collaborations in disaster risk governance.

preparedness'. This shift is also reflected in the allocation of funds in the Thua Thien Hue Province's 2021–2025 disaster prevention and search and rescue plan, with specific funding for the mitigation and preparedness phases amounting to 266.71 million USD, while the funding for response and recovery is 39.71 million USD [43]. While disaster response is crucial for immediate relief and recovery, investing in proactive disaster prevention offers a more sustainable, cost-effective, and humane approach to reducing the overall impact and frequency of disasters [60].

The documents articulate the Thua Thien Hue Provincial People's Committee's mechanism for inter-agency coordination in the implementation of disaster risk management. This approach aligns with the principles of the SFDRR, emphasizing the involvement of relevant stakeholders in working together towards shared goals [10]. The collaborative strategy ensures a well-organized response to disasters, with each agency understanding its specific role and responsibilities. The integration of disaster risk governance across the different domains of the political system significantly enhances their overall effectiveness [61]. Fig. 6 illustrates that, although numerous stakeholders are involved in disaster risk governance activities, a predominant majority originates from government agencies. However, positions within Thua Thien Hue government agencies are often characterized by duality and part-time commitments. Recognizing the state as a crucial actor, despite employing diverse governance strategies, the shortage of full-time staff also impacts the efficiency of disaster prevention and response activities [62].

In all four phases of disaster risk management, aspects of accountability such as financial accountability, collaborative accountability, and social accountability have been reflected in the legal framework governing disaster risk governance in Thua Thien Hue province. However, the documents do not specify concrete sanctions if the involved parties contribute to causing significant damages due to delays and negligence in directing and implementing disaster response efforts. As noted by an expert from a non-governmental organization "*Effective disaster risk management hinges not only on the preparation and response strategies but also on the accountability mechanisms that ensure responsible actions are taken at every phase. While the legal framework reflects aspects of accountability, it is critical that clear sanctions be established to hold parties accountable for delays or negligence that lead to significant damages*". Establishing both sanctions and incentives will promote accountability in disaster prevention and response efforts [23]. In Vietnam, ensuring that government officials can be held accountable, especially during emergencies, proves challenging due to a lack of individual responsibility shielded by their party positions [18,27]. Additionally, there are no established accountability rules for NGOs in legal frameworks in Thua Thien Hue province. Recognizing the growing importance of disaster risk reduction, it is essential to expand the definition of accountability [37]. This guarantees that both state and non-state entities address public demands, enhancing preparedness and mitigating vulnerability across the entire disaster management process [23]. Typically, assistance from local government and NGOs in Thua Thien Hue comes in the form of financial aid. However, as highlighted by Lee and Lee [63], these forms of assistance are considered inadequate. Affected households persist in shouldering the primary responsibility for repairing the incurred damage. This phenomenon can be attributed to the perception among 'at-risk' populations that disasters are predominantly private or household issues arising from individual errors, rather than acknowledging them as broader public problems rooted in systemic inequalities [64].

3.2.3.2. Transparency. Transparency plays a critical role in disaster risk management, ensuring accountability and trust across all phases. In the prevention and preparedness phases, transparency is evident in the oversight of disaster risk reduction programs, particularly in the planning and maintenance of critical infrastructure such as dikes and reservoirs. Government agencies are tasked with monitoring the implementation of these measures, ensuring alignment with established disaster management strategies and fostering public confidence in their efficacy. During the response and recovery phases, transparency shifts its focus to the equitable management of resources and accountability in recovery efforts. Public disclosure of the use and allocation of the disaster prevention fund is a key practice, enabling stakeholders to trust that financial contributions are utilized effectively. Details of these contributions and expenditures are made accessible to the public, ensuring resources are directed to areas of greatest need. Moreover, transparency is integral to the management of disaster-related assistance. For example, publicly disclosing the list of aid recipients at the commune level ensures fairness in distribution and allows the community to verify the appropriateness of allocations. Additionally, damage assessments are systematically conducted and consolidated from local to provincial levels, providing a reliable foundation for recovery planning. By ensuring public oversight and open access to information, transparency helps to minimize opportunities for corruption, fostering equitable resource allocation and strengthening trust in disaster governance [23]. As illustrated in Fig. 4, transparency is most dominant in the recovery phase, underscoring its importance in ensuring that resources reach those most affected and are utilized effectively. A government officer highlighted this impact, stating: "*Transparent financial reporting and public disclosure in Thua Thien Hue have greatly improved trust between local authorities and communities, enabling more collaborative and efficient disaster recovery efforts*".

3.2.3.3. Responsiveness and flexibility. Adaptability to uncertain climate challenges hinges on a governance system that can swiftly respond to various scenarios and needs, necessitating flexible policymaking processes capable of addressing both anticipated and unanticipated conditions [65]. Throughout the prevention and preparedness phase, Thua Thien Hue's policies underscore the imperative of formulating comprehensive natural hazard-induced disaster prevention plans at the commune, district, and provincial levels, reflecting a proactive approach to mitigate potential risks and enhance the region's resilience against calamities [10]. In addition, legal documents underscore the importance of responsiveness and flexibility, achieved through the integration of climate change scenarios into diverse plans such as socio-economic development and spatial planning [66]. However, these legal documents only address the integration of climate change scenarios without including vulnerability scenarios that consider changes in the socio-economic and environmental aspects. This is in line with the findings of a prior study on the assessment of flood risk in Vietnam, which discovered that assessments that were future-oriented frequently neglected vulnerability scenarios in favor of hazard and

exposure trends [67].

In addition, Deegan [68] contends that people have a role in making natural hazard-induced disasters worse and highlights the need for cooperation as well as the active participation of those impacted in efforts to lessen the effects of disasters. It is also vital to customize risk communication to the local context by critically analyzing risk information and applying risk scenarios that residents have developed [69]. Nevertheless, a government officer stated that "*Local authorities primarily undertake the formulation of scenarios and plans for natural hazard-induced disaster risk management, with limited involvement from the general populace*". Integrating community perspectives into disaster planning is crucial for ensuring locally relevant strategies. For instance, the Views from the Frontline (VFL) 2013 project in Cameroon involved communities in identifying local disaster risks and building resilience through surveys and consultations [70]. This participatory approach helped tailor disaster preparedness strategies to local needs. Similarly, in Los Angeles, the Community Disaster Resilience Initiative used community-partnered research to co-develop disaster resilience action plans, emphasizing collaboration and the inclusion of vulnerable populations [71].

3.2.3.4. Decentralization and autonomy. Empowering local government and inclusive decision-making based on consensus has previously yielded improved results for disaster governance [72]. In Thua Thien Hue, the policy documents support the concept of decentralized and autonomous responses, empowering communities and local authorities to act swiftly and effectively in the face of disasters. The policies emphasize the active involvement of local authorities at all levels in the implementation of disaster risk reduction measures during the prevention and preparedness phases. It highlights the value of local knowledge in disaster risk reduction and climate change adaptation, emphasizing the necessity of creating solutions that are specifically tailored to the needs and difficulties faced by local communities [73]. In addition, the policy calls for communes to take the lead in prevention initiatives e.g. community-based coastal afforestation. Communities, as the frontline responders to disasters, play a central role in mitigating risks and adapting to the aftermath. Embracing community-based approaches allows disaster risk governance to tap into local knowledge, values, and resources, thereby creating a more nuanced and responsive strategy [74,75]. Local communities are empowered by this decentralized, autonomous approach, which puts them at the forefront of efforts to reduce disaster risk and adapt to climate change [15].

During the response and recovery phases, the policy highlights the imperative for localities to proactively address the aftermath of storms and floods through the 'four on-the-spot' approach (leadership on-the-spot; human resources on-the-spot; means on-the-spot; and logistics on-the-spot). The restoration of vital civil infrastructure, including transportation, water supply, education, healthcare, and irrigation, is given top priority in this strategy. By allowing communities to take charge of their own needs and problems, the policy encourages adaptable and responsive disaster recovery efforts that are tailored to the unique circumstances of each area. However, the implementation of the 'four-on-the-spot' approach is revealing certain limitations, as noted by a government officer in the Thua Thien Hue government: "*A shortage of on-site personnel and a lack of professionalism. Mobilizing vehicles and materials for disaster prevention is still insufficient and rudimentary. The on-site command capabilities of grassroots officials are also limited. Ensuring on-site logistics faces many difficulties due to food and supplies being washed away by rain and floods. These challenges and shortcomings have directly impacted the results of disaster risk management efforts*". Moreover, conflicts arise between decentralization and accountability in practice, particularly when local governments are empowered to make quick decisions, but accountability mechanisms to ensure proper management are still underdeveloped. As one scientist noted "*The challenge lies in balancing rapid local response with clear accountability mechanisms. Local governments often make swift decisions, but without proper oversight, these decisions can lack transparency and lead to inefficiencies*".

3.2.3.5. Information sharing. Information sharing is crucial for establishing streamlined and effective decision-making procedures in humanitarian logistical responses [76]. In Thua Thien Hue, multiple agencies like Department of Information and Communications (DoIC), Provincial Radio and Television Station (RTS), Thua Thien hue Newspaper (TTHN), and Thua Thien Hue smart urban application (Hue-S) are actively involved in providing natural hazard-induced disaster forecast information both before and during a disaster (Fig. 6). Various platforms, such as websites, social media, TV stations, and telecom companies, play a role in disseminating timely updates on disaster information, evacuation plans, emergency contact numbers, and shelter locations. The effectiveness of this information sharing is crucial for supporting authorities, organizations, and communities to make informed decisions, such as resource allocation, ultimately contributing to saving lives during disasters [77]. Furthermore, timely and accurate information delivery aids individuals in taking proactive steps to prepare for natural hazard-induced disasters [78]. Despite notable progress, the forecasting and warning efforts have not fully met practical requirements. A scientist emphasized: *"With the impact of climate change, extreme weather events tend to become increasingly complex, especially in forecasting precipitation. Currently, the density of rain gauge stations, wind measurement stations, and monitoring river flow in the province is still insufficient. In particular, the province needs to implement the construction of an early warning system for events such as landslides and floods"*.

The policy outlines a systematic approach to sharing information on loss and damage after a disaster, starting at the commune level and progressing to the district level. At the provincial level, the Department of Labor, Invalids, and Social Affairs consolidates data on disaster-related damages for the provincial chairman. This process ensures that decision-makers are well-informed and facilitate efficient resource allocation for relief in response to disaster situations. Furthermore, recognizing the paramount importance of information sharing in disaster risk management and reducing vulnerabilities, Thua Thien Hue Province prioritizes the establishment of robust mechanisms for sharing disaster-related data. This involves disseminating information on hazard assessments, risk maps, and early warning systems to ensure that all stakeholders, ranging from local authorities to communities, are well-informed and prepared to take proactive measures. Effective information sharing ensures that strategies for climate change adaptation and disaster risk

reduction are grounded in data-driven decision-making and planning [79].

3.3. Transferability

These findings on enables and barriers in disaster risk management from Thua Thien Hue offer transferable lessons for other regions with similar disaster risk profiles. For instance, challenges such as accountability gaps and decentralization are not unique to Vietnam. In Indonesia, nearly two decades of decentralization have revealed persistent obstacles, with local disaster risk management initiatives often lacking transparency and accountability [80]. Similarly, in Thailand, decentralization remains incomplete, as central authorities retain control over resources and power, while local administrative bodies often face capacity limitations [81]. In Nepal, disaster risk management efforts are hindered by the low level of community-level engagement [82]. Importantly, barriers in disaster risk management are not limited to the Global South, as countries in the Global North also face governance and coordination challenges. For example, in Sweden, communication challenges in sharing risk and vulnerability assessments among stakeholders weaken coordination, with issues such as one-way communication and limited collaboration [83].

Despite these challenges, many enabling factors from Thua Thien Hue's approach can serve as models for other regions. Community-based disaster risk reduction strategies, such as coastal afforestation, localized early warning systems, and integrating local knowledge into disaster response plans, offer scalable solutions for disaster-prone areas [28]. Additionally, transparent resource allocation, legal frameworks promoting multi-stakeholder collaboration, and efforts to strengthen public-private partnerships are transferable approaches that can enhance disaster resilience in other governance contexts. However, successful transferability requires consideration of regional factors, such as socio-political contexts, cultural and customary practices, existing legal systems, institutional maturity, decentralization levels, and the role of the private sector in disaster risk management [84,85]. For instance, countries with strong centralized governance may need different approaches to integrating local participation, while regions with weaker institutional capacities may require external support, capacity-building programs, and international collaboration to implement effective disaster risk management reforms [28]. Therefore, applying lessons from Thua Thien Hue to other contexts requires flexible adaptation to ensure alignment with local conditions and maximize effectiveness in disaster risk management.

4. Conclusion

This research addresses a critical gap in global disaster risk governance by providing a detailed examination of local implementation within the context of good governance principles. The case of Thua Thien Hue province in central Vietnam underscores several persistent vulnerabilities despite significant efforts toward disaster risk management reform. The enablers showcase proactive legal frameworks, multi-stakeholder collaboration, public transparency, effective information-sharing mechanisms, localized governance strategies, and community-led initiatives, all of which contribute to a more resilient disaster management system. However, this study identifies key barriers and provides new insights into disaster governance that previous research has not fully explored. *First*, the research identifies gaps in accountability and transparency, which are often regarded as governance pillars. However, without concrete enforcement mechanisms, such as sanctions for negligence or delays in disaster response, these principles lack effectiveness in practice. The study recommends that legal frameworks incorporate enforceable sanctions for non-compliance and negligence, alongside clear accountability standards, to ensure that both public and private stakeholders meet their disaster management obligations. *Second*, this research reveals a substantial lack of involvement from the private sector in disaster risk reduction efforts. Currently, disaster risk reduction remains predominantly a public sector responsibility, leaving potential partnerships underutilized. To address this, policy frameworks should mandate private sector participation and create incentives such as tax breaks, subsidies for disaster-resilient investments, or public-private partnerships for engagement, ensuring that private enterprises play a proactive role in disaster management. *Third*, the study highlights the limitations of decentralization in disaster risk governance. Although local authorities are granted autonomy, the shortage of trained personnel and limited professionalism among grassroots disaster managers undermine the effectiveness of this decentralization. Therefore, capacity-building initiatives, focused on enhancing the technical and managerial skills of local officials, are crucial to improving disaster risk management outcomes at the local level. *Finally*, a novel contribution of this study is the emphasis on mainstreaming vulnerability scenarios, alongside climate change scenarios, into disaster risk governance frameworks. Current strategies predominantly focus on hazard and exposure trends, but the inclusion of vulnerability scenarios will provide a more holistic and adaptive approach. Implementing these recommendations will significantly contribute to building a more resilient disaster risk governance framework in Thua Thien Hue. This approach addresses current challenges and lays the foundation for sustainable development in the face of natural hazard-induced disasters, setting a precedent for other disaster-prone areas worldwide.

Future research should continue to evaluate the effectiveness of disaster risk management from the perspective of local communities. While this study examines disaster governance through legal document analysis and insights from government officials and disaster risk management experts, incorporating community perspectives will offer a more comprehensive assessment of disaster risk management in practice. Future studies should also quantify the interactions between governance principles and their collective impact on disaster risk management, addressing limitations of this study, such as the qualitative nature of the data and the lack of quantitative validation. Finally, future research should prioritize the development and integration of vulnerability scenarios into disaster risk management. Creating dynamic models that anticipate shifts in community vulnerabilities will enable more targeted and effective disaster responses.

CRediT authorship contribution statement

Bien Thanh Vu: Writing – original draft, Visualization, Validation, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Olabisi S. Obaitor:** Writing – review & editing, Validation, Investigation. **Lena C. Grobusch:** Writing – review & editing. **Dominic Sett:** Writing – review & editing. **Michael Hagenlocher:** Writing – review & editing, Project administration, Funding acquisition. **Ulrike Schinkel:** Writing – review & editing, Investigation. **Linh Khanh Hoang Nguyen:** Writing – review & editing, Project administration, Funding acquisition. **Felix Bachofer:** Writing – review & editing, Project administration, Funding acquisition. **Son Thanh Ngo:** Writing – review & editing. **Matthias Garschagen:** Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix

A1. List of reviewed legal documents

1. Prevention	
1.1 National level	
2023	Circular No. 06/2023/TT-BTNMT, dated July 31, 2023, on guiding the integration of climate change adaptation content into strategies and plans.
2021	Circular No. 10/2021/TT-BKHĐT, dated December 22, 2021, providing guidance on integrating disaster prevention and control into sectoral, economic, and social development planning.
2021	Decision No. 553/QĐ-TTg, dated April 6, 2021, on the approval of the project "Enhancing Community Awareness and Community-Based Disaster Risk Management by 2030".
2021	Decision No. 379/QĐ-TTg, dated March 17, 2021, on the approval of the National Strategy for Natural Disaster Prevention and Control until 2030, with a vision to 2050.
2019	Decision No. 1606/QĐ-TTg, dated November 13, 2019, on the issuance of the operational procedure for the inter-reservoirs on the Huong River basin, the Prime Minister.
2019	Decision No. 173/QĐ-TTg, dated February 13, 2019, on the National Week for Disaster Prevention and Control.
2017	Decision No. 419/QĐ-TTg, dated April 5, 2017, on the approval of the National Program on Greenhouse Gas Emission Reduction through Forest Loss and Degradation Prevention; Conservation, Enhancement of Carbon Stocks, and Sustainable Forest Resource Management by 2030.
2017	Decision No. 1670/QĐ-TTg, dated October 31, 2017, on the approval of the Target Program on Climate Change Response and Green Growth for the 2016–2020 period
2017	Decision No. 1618/QĐ-TTg, dated October 24, 2017, on the approval of the Project on Developing the National Database on Resource and Environmental Monitoring
2016	Decree No. 119/2016/NĐ-CP, dated August 23, 2016, on certain policies for the management, protection, and sustainable development of coastal forests in response to climate change.
2016	Decision No. 914/QĐ-TTg, dated May 27, 2016, on the approval of the Action Plan for the Implementation of the Integrated Coastal Zone Management Strategy of Vietnam to 2020, with a vision to 2030
2016	Decision No. 90/QĐ-TTg, dated January 12, 2016, on the approval of the National Resource and Environmental Monitoring Network Planning for the 2016–2025 period, with a vision to 2030, Hanoi.
2014	Decision No. 1054/QĐ-TTg, dated June 26, 2014, on the approval of the Master Plan for the Development of the Vietnam Coastal Information System to 2020, with an orientation to 2030, Hanoi.
1.2 Local level	
2022	Decision No. 363/QĐ-UBND, dated January 28, 2022, on the reorganization of personnel for the Project Management Board for the operation of emergency reservoirs and effective flood management using an integrated disaster management information system.
2021	Decision No. 1720/QĐ-UBND, dated July 14, 2021, on the issuance of the Climate Change Response Action Plan for Thua Thien Hue Province for the 2021–2030 period, with a vision to 2050.
2021	Decision No. 2801/QĐ-UBND, dated November 3, 2021, on the consolidation of the Steering Committee for Climate Change Response in Thua Thien Hue Province.
2021	Decision No. 563/QĐ-UBND (16/03/2021) for environmental monitoring and warning in aquaculture in the period of 2021–2025 in the province

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1. Prevention	
1.1 National level	
2020	Decision No. 3283/QĐ-UBND, dated December 25, 2020, on the issuance of the Implementation Plan for the Paris Agreement on Climate Change in Thua Thien Hue Province.
2019	Decision No. 603/QĐ-UBND, dated March 13, 2019, on the announcement of the list of newly issued administrative procedures in the fields of dam and reservoir safety management and cross-border trade, under the jurisdiction of the Department of Industry and Trade of Thua Thien Hue Province.
2019	Decision No. 858/QĐ-UBND, dated April 4, 2019, on the announcement of the list of administrative procedures in the field of dam and reservoir safety management under the jurisdiction of the district-level People's Committees.
2019	Decision No. 2006/QĐ-UBND, dated August 19, 2019, on the establishment of the Steering Committee for the Forestry Sector Modernization and Coastal Resilience Enhancement Project in Thua Thien Hue Province.
2017	Decision No. 1576/QĐ-UBND, Thua Thien Hue, dated July 12, 2017, on the establishment of the Forest Protection and Development Fund for Phong My Commune, Phong Dien District, Thua Thien Hue Province.
2017	Decision No. 04/2017/QĐ-UBND, dated January 16, 2017, on the issuance of the Inter-sectoral Coordination Regulation for Developing, Appraising, and Implementing Programs and Projects in the Field of Climate Change Response and Adaptation in Thua Thien Hue Province.
2. Preparedness	
2.1 National level	
2023	Decision No. 1262/QĐ-TTg, Hanoi, October 27, 2023, Approving the project on early warning for landslides and flash floods in mountainous and midland areas of Vietnam.
2022	Circular No. 25/2022/TT-BTNMT, dated December 30, 2022, on regulations for technical procedures for forecasting and warning of hazardous meteorological and hydrological phenomena.
2021	Decision No. 20/2021/QĐ-TTg, dated June 3, 2021, on the promulgation of the list and regulations on the management and use of specialized materials, means, and equipment for disaster prevention and control.
2021	Decision No. 18/2021/QĐ-TTg, dated April 22, 2021, on regulations regarding disaster forecasting, warning, communication, and disaster risk levels
2020	Decision No. 05/2020/QĐ-TTg, dated January 31, 2020, on regulations on water levels corresponding to flood warning levels on rivers
2020	Decision No. 03/2020/QĐ-TTg, dated January 13, 2020, on regulations for forecasting, warning, and communicating information on natural disasters.
2015	Directive No. 20/CT-TTg, dated July 27, 2015, on strengthening the management of planning, investment, construction, and land management of coastal projects.
2013	Law No. 33/2013/QH13, dated June 19, 2013, on Natural Disaster Prevention and Control.
2.2 Local level	
2022	Decision No. 2935/QĐ-UBND, dated December 5, 2022, on the approval of the list of areas requiring the establishment of coastal protection corridors in Thua Thien Hue Province.
2021	Decision No. 3406/QĐ-UBND, dated December 24, 2021, on the consolidation of the Steering Committee for the implementation of Decision No. 48/2014/QĐ-TTg, dated August 28, 2014, by the Prime Minister on policies to support poor households in building storm- and flood-resistant houses in the Central Region.
2021	Decision No. 3198/QĐ-UBND, dated December 6, 2021, on the approval of the revenue and expenditure plan for the Disaster Prevention Fund of Thua Thien Hue Province.
2021	Decision No. 2592/QĐ-UBND, dated October 14, 2021, on the consolidation of the Coordination Board for Integrated Coastal Zone Management in Thua Thien Hue Province.
2021	Decision No. 2202/QĐ-UBND, dated September 6, 2021, on the announcement of the list of newly issued administrative procedures in the field of disaster prevention and control under the jurisdiction of commune level People's Committees in Thua Thien Hue Province.
2021	Decision No. 2203/QĐ-UBND, dated September 6, 2021, on the approval of internal procedures and electronic procedures for resolving newly issued administrative procedures in the field of disaster prevention and control under the jurisdiction of commune level People's Committees in Thua Thien Hue Province.
2021	Plan No. 205/KH-UBND, dated June 7, 2021, on the stockpiling of goods for flood and storm prevention in 2021.
2021	Decision No. 866/QĐ-UBND, dated April 19, 2021, on the approval of internal procedures and electronic procedures for administrative procedure resolution in the field of disaster prevention and control under the state management authority of the Department of Agriculture and Rural Development
2020	Decision No. 2137/QĐ-UBND, dated August 20, 2020, on the establishment of the Steering Committee for Disaster Prevention, Control, and Search and Rescue for the Ta Trach Irrigation System
2020	Decision No. 2365/QĐ-UBND, dated September 11, 2020, on the issuance of the Disaster Prevention, Control, and Search and Rescue Plan for Thua Thien Hue Province for the 2020–2025 period.
2020	Plan No. 204/KH-UBND, dated September 9, 2020, on strengthening disaster prevention and control capacity for localities in Thua Thien Hue Province for the 2020–2025 period.
2020	Decision No. 2138/QĐ-UBND, dated August 20, 2020, on the establishment of the Civil Defense Steering Committee of Thua Thien Hue Province.
2020	Decision No. 1456/QĐ-UBND, dated June 19, 2020, on the announcement of newly issued administrative procedures in the field of disaster prevention and control under the state management authority of the Department of Agriculture and Rural Development of Thua Thien Hue Province
2019	Decision No. 2462/QĐ-UBND, dated October 8, 2019, on the announcement of administrative procedures in the field of natural disaster prevention and control under the jurisdiction of the People's Committees of communes, wards, and townships in Thua Thien Hue Province.
2018	Decision No. 1963/QĐ-UBND, dated September 6, 2018, on the issuance of the Regulation on the Organization and Operation of the Disaster Prevention Fund of Thua Thien Hue Province.
2018	Document No. 5754/UBND-NN, dated August 7, 2018, on the implementation of key tasks to prepare for the 2018 storm and rainy season.
2017	Decision No. 3042/QĐ-UBND, dated December 27, 2017, on the establishment of the Appraisal Council for the "Planning of the Resource and Environmental Monitoring Network in Thua Thien Hue Province for the 2016–2025 period, with a vision to 2030.
2017	Directive No. 4619/UBND-CT, dated July 3, 2017, on strengthening warning measures to ensure safety for people in downstream areas during hydropower operations, Thua Thien Hue Province.
2017	Decision No. 97/2017/QĐ-UBND, dated November 24, 2017, on the issuance of the Coordination Regulation for State Management of Meteorology and Hydrology in Thua Thien Hue Province.
2016	Directive No. 16/CT-UBND, dated June 27, 2016, on strengthening the operation and ensuring safety for downstream areas of hydropower plants, Thua Thien Hue Province.
3. Response	

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1. Prevention	
1.1 National level	
3.1 National level	
2020	Decision No. 03/2020/QĐ-TTg, dated January 13, 2020, on regulations for forecasting, warning, and communicating information on natural disasters.
3.2. Local level	
2021	Document No. 17/CĐ-UBND, dated October 23, 2021, on proactively implementing measures to respond to heavy rainfall, floods, and inundation.
2021	Document No. 16/CĐ-UBND, dated October 17, 2021, on proactively implementing measures to respond to heavy rainfall, floods, and inundation.
2021	Document No. 15/CĐ-UBND, dated October 6, 2021, on the implementation of response measures to the tropical depression and heavy rainfall.
2021	Document No. 18/CĐ-UBND, dated December 17, 2021, on proactively implementing measures to respond to Super Typhoon RAI.
2021	Document No. 8374/UBND-NN, dated September 13, 2021, on readiness for responding to natural disasters.
2021	Document No. 14/CĐ-UBND, dated September 10, 2021, on the implementation of response measures to Typhoon No. 5.
2020	Document No. 9655/UBND-NN, on the implementation of response measures to Typhoon No. 9.
2020	Document No. 17/CĐ-UBND, dated October 26, 2020, on the implementation of response measures to Typhoon No. 9.
2017	Document No. 05/CĐ-UBND, dated October 14, 2017, on the implementation of response measures to Typhoon No. 11.
4. Recovery	
4.1 National level	
2013	Law No. 33/2013/QH13, dated June 19, 2013, on Natural Disaster Prevention and Control.
4.2. Local level	
2020	No. 18/CĐ-UBND, dated October 30, 2020, on overcoming the consequences of rain, storms, and floods, and implementing response measures for the complex developments of natural disasters in the coming period.
2020	No. 15/CĐ-UBND, dated October 20, 2020, on overcoming the consequences of exceptionally heavy rainfall and floods, and implementing response measures for heavy rain, flash floods, and landslides.
2020	No. 11/CĐ-UBND, dated September 18, 2020, on overcoming the consequences caused by Typhoon No. 5.
2020	Decree No. 50/2020/NĐ-CP, dated April 20, 2020, on regulations for the reception, management, and use of international emergency aid for disaster relief and recovery.
2018	Decision No. 46/2018/QĐ-UBND, dated August 17, 2018, on regulations for emergency social assistance policies for households and individuals facing difficulties caused by natural disasters, fires, or other force majeure events in Thua Thien Hue Province.
2017	Decision No. 65/QĐ-UBND, dated January 13, 2017, on the allocation of crop seeds to support recovery from natural disaster damages in 2017.

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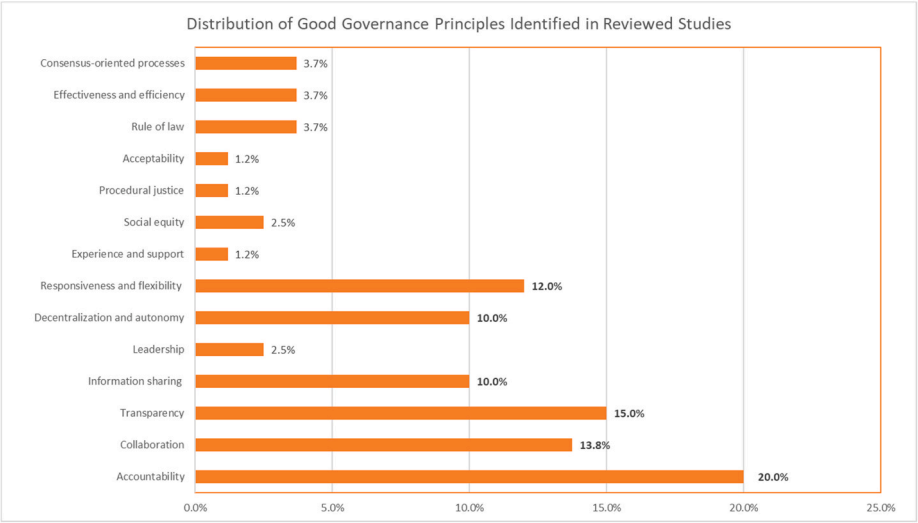

A3. List of expert interviews in Thua Thien Hue

No	Experts	Numbers of experts
1	Thua Thien Hue Provincial Commanding Committee of Natural Disaster Prevention and Control, Search and Rescue	1
2	Department of Agriculture and Rural Development in Thua Thien Hue	1
3	Department of Natural Resources and Environment	1
4	Chairman of communes/wards	3
5	Hue university	3
6	Central Climate Change Research Center	1
7	Asian Development Bank (ADB)	1
8	Luxembourg Development Cooperation Agency- LuxDev	1
9	Binh Dien Hydropower Joint Stock Company	1

A4. Expert interview questions

1. Can you briefly introduce your role and experience in disaster risk management?
2. How have disaster risk management policies in Thua Thien Hue evolved over the past decade?
3. In your opinion, is there an appropriate balance between disaster response and prevention in current policies? Why or why not?
4. Good governance principles
   - Accountability: How effectively are responsibilities and commitments outlined in the current legal frameworks for disaster management?
   - Collaboration: How well do inter-agency collaboration and stakeholder integration function in disaster risk management?
   - Transparency: Are mechanisms like public disclosure and inspection adequately implemented to ensure transparency in resource allocation and decision-making?
   - Information sharing: How effective are current systems for sharing disaster-related data, including early warnings and updates?
   - Decentralization and autonomy: To what extent do local authorities and communities participate in disaster risk management? Are there challenges in empowering local entities?
   - Responsiveness and flexibility: How well do the current policies incorporate proactive and flexible approaches to addressing evolving disaster scenarios?
5. Are there specific lessons from Thua Thien Hue's experience that could be applied to other regions in Vietnam or internationally?

Data availability

Raw data can be provided by the corresponding author upon request

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