

Transferability of International Flood Recovery Governance to Hat Yai, Thailand: A Qualitative Comparative Study

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Abstract:

Objective: Post-disaster recovery is increasingly guided by Post-Disaster Needs Assessment (PDNA) and Build Back Better (BBB) frameworks, yet recovery in many middle-income urban settings remains focused on restoration rather than future risk reduction. This study examined how governance mechanisms from international flood recovery cases could inform context-sensitive reforms in Hat Yai, Thailand.

Material and Methods: We used a qualitative comparative policy-learning design combining a structured synthesis of peer-reviewed literature on flood recovery governance in Japan and the Netherlands, a review of Hat Yai-specific literature, and in-depth interviews with eight residents affected by the November 2025 flood. Data were analyzed using an integrated framework combining PDNA, BBB, and policy learning across five governance dimensions.

This paper is part of the "Hat Yai Flooding 2025" collection

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Results: Recovery in Japan and the Netherlands was supported by institutionalised governance mechanisms linking recovery with long-term flood risk management. In Hat Yai, recovery remained centred on emergency coordination and short-term restoration despite strengthened preparedness and community resilience. Across five dimensions, mechanisms with the potential for contextual adaptation were identified and synthesised into three domains: (i) institutionalised recovery governance and policy learning, (ii) risk-aligned recovery financing and spatial planning, and (iii) institutionalised participation and protection of vulnerable groups. Unlike the reference cases, Hat Yai remained more dependent on emergency structures, household adaptation, and informal community networks.

Conclusion: Governance transferability should be understood as contextual adaptation rather than direct policy replication. Strengthening recovery governance, risk-aligned financing and spatial planning, and inclusive participation could advance long-term flood risk reduction in Hat Yai and similar middle-income urban settings.

Keywords: Build Back Better, flood recovery, governance, policy learning, Post-Disaster Needs Assessment, Thailand, urban resilience

Introduction

Floods are among the most frequent and destructive natural hazards worldwide, causing immediate physical destruction and long-term social, economic, and health consequences¹. Although preparedness and emergency response have received considerable attention, post-disaster recovery remains a persistent governance challenge. Recovery is increasingly expected to move beyond restoring pre-disaster conditions toward reducing future risks and addressing structural vulnerability². International frameworks such as the Post-Disaster Needs Assessment (PDNA) and Build Back Better (BBB) advocate integrating recovery with long-term risk reduction^{3,4}. While PDNA provides a structured framework for assessing recovery needs across multiple sectors, BBB emphasises recovery as an opportunity to reduce future risk and strengthen long-term resilience. Despite these advances, recovery in many low- and middle-income countries (LMICs) remains focused on rapid infrastructure restoration and financial compensation, with comparatively less attention to institutional reform and exposure reduction^{5,6}. Consequently, relatively little is known about how governance mechanisms from institutionalised

flood recovery systems can be contextually adapted to strengthen post-disaster recovery in middle-income urban settings without assuming direct policy replication and policy transfer across different institutional contexts^{7,8}.

In Thailand, flood governance is characterised by centralized administrative structures and engineering-led flood management strategies. Major flood events, including the 2011 Bangkok floods, exposed weaknesses in interagency coordination, uneven patterns of vulnerability, and the limited integration of post-disaster recovery with long-term spatial planning⁹. Recurrent severe flooding in Hat Yai, one of Thailand's most flood-prone urban centres, has stimulated the development of the "Hat Yai model"¹⁰, which has strengthened municipal preparedness, early warning systems, and multi-agency response coordination. The November 2025 Hat Yai flood, which followed prolonged heavy rainfall and saw the U-Taphao Canal reach a peak water level of 9.97 m above mean sea level, further illustrates the city's continuing exposure to severe flooding¹¹. Despite these advances, post-disaster recovery has been less systematically integrated with spatial planning, land-use regulation, and risk-sensitive redevelopment.

Consequently, Hat Yai provides an important case for examining how governance mechanisms identified from institutionalised flood recovery systems may be adapted to strengthen recovery within the existing administrative and institutional context.

In Japan and the Netherlands, post-disaster recovery is embedded within broader flood risk governance through legally defined institutional responsibilities, stable financing arrangements, integration with spatial planning, and structured policy-learning processes that enable major flood events to drive long-term governance reform. Although structural flood protection remains a central component of flood management, recovery has progressively evolved beyond infrastructure restoration towards integrated risk management through iterative institutional learning and adaptive governance¹²⁻¹⁴. These characteristics have made Japan and the Netherlands well-documented examples of institutionalised flood recovery governance. Consequently, Japan and the Netherlands provide valuable analytical reference cases for examining governance mechanisms that may inform context-sensitive recovery reforms in middle-income urban settings^{12,13}.

Although the Hat Yai model has strengthened preparedness, early warning, and emergency coordination, less attention has been given to how post-disaster recovery can move beyond restoration towards transformative recovery that integrates long-term governance, spatial planning, and risk reduction. Consequently, it remains unclear which governance mechanisms from institutionalised flood recovery systems can be adapted to support such recovery in Hat Yai within its existing institutional and administrative context, without assuming direct policy replication. To address this gap, this study adopts a policy-learning perspective that conceptualises governance transferability as the contextual adaptation of governance mechanisms rather than the replication of specific policies or institutional arrangements. Accordingly, we examined how governance mechanisms identified from international flood

recovery reference cases may inform context-sensitive, risk-reducing recovery reforms in Hat Yai, Thailand.

Material and Methods

Study design

This study employed a qualitative comparative policy-learning design to examine how governance mechanisms identified from the international flood recovery literature may inform context-sensitive reforms in Hat Yai, Thailand. Rather than comparing national governance systems, the study compared governance mechanisms that perform similar recovery functions across different institutional contexts. Three complementary sources of evidence were used: (1) a structured, concept-driven synthesis of peer-reviewed literature on flood recovery governance in Japan and the Netherlands to identify governance mechanisms and assess their potential transferability, (2) Hat Yai-specific literature to contextualise local governance and disaster management, and (3) in-depth interviews with flood survivors to explore recovery experiences and contextualise how governance was experienced at the community level. The interviews were not intended to evaluate institutional governance directly but to provide experiential evidence that supported interpretation of the comparative findings. Data were interpreted using an integrated analytical framework combining the PDNA, BBB, and a policy-learning perspective. PDNA structured the recovery domains, BBB guided the assessment of recovery orientation, and the policy-learning perspective informed the comparative interpretation and contextual adaptation of governance mechanisms.

Case selection and operationalization of transferability

Japan and the Netherlands were selected as analytical reference cases because they are widely recognised as examples of institutionalised flood recovery governance, where post-disaster recovery is embedded within legally defined responsibilities, stable financing,

spatial planning, and structured policy-learning processes. Rather than serving as normative benchmarks, they were used to identify governance mechanisms that may be adapted to strengthen recovery in Hat Yai. Accordingly, transferability was conceptualised as the contextual adaptation of governance mechanisms rather than the replication of specific policies or institutions. Transferability was operationalised by examining whether governance mechanisms identified through the comparative literature addressed governance challenges in Hat Yai and could be adapted within its existing institutional, administrative, and fiscal context. Guided by the integrated PDNA–BBB–policy-learning framework, the analysis focused on five governance dimensions: institutional anchoring and coordination, financing and incentive alignment, integration of recovery with spatial planning, participation and protection of vulnerable groups, and governance learning.

Peer-reviewed literature review

A structured, concept-driven comparative literature synthesis was undertaken to identify governance mechanisms relevant to post-disaster flood recovery and assess their potential transferability to Hat Yai, Thailand. Rather than providing an exhaustive review, the synthesis identified information-rich studies explaining institutional arrangements, governance design, and policy-learning processes relevant to the study objectives. The literature selection was therefore guided by conceptual relevance rather than comprehensiveness, and additional studies describing similar governance mechanisms were not purposively included once sufficient analytical depth had been achieved.

The search included publications available up to March 2025 and was conducted in Scopus, Web of Science, and Google Scholar using combinations of the terms flood recovery governance, post-disaster recovery, policy learning, BBB, and PDNA, together with country identifiers (Japan and the Netherlands). To contextualise

governance in the study setting, supplementary searches used location-specific terms including Hat Yai flood, Hat Yai flood management, Hat Yai recovery, Songkhla flood governance, and Hatyai Climate. Titles and abstracts were screened for relevance before full-text review. The analysis focused on five governance dimensions: institutional anchoring and coordination; financing and incentive alignment; integration of recovery with spatial planning and exposure management; participation, communication, and protection of vulnerable groups; and governance learning and policy adaptation.

Studies were included if they provided evidence on recovery governance, institutional design, financing, spatial planning, policy learning, or governance reforms following flood disasters. Priority was given to peer-reviewed publications, with selected official programme and policy documents used for contextual information. Studies focusing solely on emergency response or preparedness, technical or engineering issues without governance implications, opinion pieces, editorials, commentaries, and other grey literature were excluded. Because the objective was to identify governance mechanisms rather than evaluate intervention effectiveness, formal quality appraisal was not undertaken. Instead, studies were selected based on conceptual relevance, analytical depth, and source credibility.

Survivor interviews

Eight in-depth interviews were conducted with residents of Hat Yai District directly affected by the November 2025 flood to explore lived recovery experiences. Participants were purposively selected to maximize variation in age, livelihood, household composition, residential location, and flood severity, ensuring diverse recovery experiences rather than statistical representativeness. Interviews were conducted within one month of the flood to minimize recall bias. Topics included housing damage and repair, temporary relocation, access to compensation and recovery assistance, livelihood disruption, interactions

with government authorities, communication, perceptions of recovery fairness, and household risk-reduction measures. The interviews complemented the comparative literature synthesis by providing experiential evidence of how recovery governance was perceived and experienced by affected households, rather than evaluating institutional decision-making or governance performance directly.

Interviews were audio-recorded with participants' consent, transcribed verbatim, anonymised, and analysed using a combined inductive-deductive thematic approach. Deductive coding was guided by the five governance dimensions of the integrated PDNA-BBB analytical framework, while inductive coding identified emergent themes, including administrative boundary ambiguity, informal community coordination, communication challenges, and household adaptation. Themes were developed iteratively and interpreted alongside the comparative literature and Hat Yai-specific documentary evidence. Interview data were used as contextual and experiential evidence to complement, rather than independently assess, the governance mechanisms identified through the comparative analysis.

Analytical framework

Data were analysed using an integrated analytical framework combining the PDNA, BBB, and a policy-learning perspective to examine governance mechanisms relevant to post-disaster recovery. These complementary frameworks were selected because the PDNA structured recovery across governance, economic, housing, infrastructure, and social domains; BBB guided assessment of whether recovery was restoration-oriented or promoted long-term risk reduction; and the policy-learning perspective informed the interpretation of governance mechanisms and their contextual adaptation to Hat Yai. The analysis focused on five cross-cutting governance dimensions: (1) institutional anchoring and coordination, (2) integration of recovery with spatial planning and exposure management, (3) financing

mechanisms and incentive alignment, (4) participation, communication, and protection of vulnerable groups, and (5) governance learning and institutional review. These dimensions provided a consistent framework for comparing governance mechanisms across the international reference cases and Hat Yai and for identifying mechanisms with potential for context-sensitive adaptation.

Data analysis

The literature and interview transcripts were analysed using a combined inductive-deductive thematic approach. Initially, both data sources were coded inductively to identify recurring concepts related to flood recovery governance, including institutional coordination, financing mechanisms, spatial planning, communication, community participation, and household adaptation. These preliminary themes were then compared across the literature and interview data to identify common governance patterns and contextual differences.

Subsequently, the inductively derived themes were deductively mapped onto the five governance dimensions of the integrated analytical framework: (1) institutional anchoring and coordination, (2) integration of recovery with spatial planning and exposure management, (3) financing mechanisms and incentive alignment, (4) participation, communication, and protection of vulnerable groups, and (5) governance learning and institutional review. This process enabled a structured comparison between governance mechanisms identified in the international reference cases (Japan and the Netherlands) and recovery experiences in Hat Yai.

The comparative synthesis was then used to examine recovery orientation along a continuum from restoration-focused approaches to risk-reducing, Build Back Better-aligned recovery, and to identify governance design principles with potential for context-sensitive adaptation to Hat Yai. Interview data were analyzed to explore how governance arrangements were experienced and

implemented in practice, including perceived implementation gaps, informal recovery practices, communication challenges, and community responses. These findings were used to contextualize, rather than verify, the governance mechanisms identified through the literature synthesis.

The comparative synthesis was subsequently interpreted using the operationalised concept of transferability to identify governance mechanisms that could be contextually adapted for Hat Yai rather than directly replicated. To enhance the trustworthiness of the analysis, findings were triangulated across the literature and interview data through iterative comparison and interpretation. Coding and theme development were undertaken iteratively, with analytical decisions documented throughout the process to maintain transparency and consistency. Selected interview quotations were included to illustrate the key themes and provide contextual evidence supporting the comparative analysis.

Ethical considerations

The study was approved by the Human Research Ethics Committee of Faculty of Medicine, Prince of Songkla University (REC.68-560-9-1). Informed consent was obtained from all participants, and the study was conducted following the principles of the 1964 Declaration of Helsinki and related guidelines.

Results

The comparative analysis identified differences in how post-disaster recovery was institutionally embedded across the international reference cases and Hat Yai. Five interrelated governance dimensions emerged: institutional anchoring and coordination; financing and incentive alignment; integration of recovery with spatial planning and exposure management; participation, communication, and protection of vulnerable groups; and governance learning and institutional review. Across these dimensions, the analysis identified areas where governance mechanisms were more strongly institutionalized in the international

reference cases and where they remained less developed or informal in Hat Yai, providing the basis for assessing their potential for context-sensitive adaptation (Table 1).

Institutional anchoring and governance coordination

The comparative literature synthesis identified institutional anchoring and cross-level coordination as key governance mechanisms in the international reference cases. In Japan, flood risk management has evolved through repeated policy adjustments following catastrophic flood events, urbanization, and increasing economic exposure. Recovery is integrated with basin-scale planning, periodic revisions of design standards, and structured public investment frameworks that link post-disaster reconstruction with long-term planning^{15,16}. In the Netherlands, flood governance is embedded within a legally defined delta governance system characterized by constitutionally anchored safety responsibilities, legally binding protection standards, and stable financing through the Delta Fund^{17,18}. Recovery is incorporated within broader flood risk governance, with increasing integration of multilayer safety and adaptive risk management alongside structural flood defence¹⁸.

In Hat Yai, participation in the Asian Cities Climate Change Resilience Network (ACCCRN) supported the adoption of a resilience-oriented approach emphasising multi-stakeholder coordination, preparedness, and early warning¹⁹. Municipal case studies also describe participatory governance arrangements and network-based coordination structures²⁰. Comparative governance studies further indicate that Hat Yai has stronger preparedness and emergency coordination capacity than many other Thai municipalities because of its repeated flood experience⁶. Recovery activities, however, remain centred on emergency coordination and infrastructure restoration (Table 1).

Survivor interviews described recovery experiences characterised by reliance on official information during

Table 1 Comparative recovery governance patterns and transferable mechanisms for Hat Yai, Thailand

Governance dimension	Reference case mechanism	Hat Yai evidence	Implementation considerations	Context-sensitive adaptation
Institutional anchoring and coordination Financing and incentive alignment	Legally mandated recovery coordination	Recovery remains emergency-led with fragmented responsibilities	Fragmented mandates across agencies	Formalise recovery responsibilities and cross-boundary coordination
	Long-term resilience-linked funding	Relief-oriented compensation with limited mitigation incentives	Limited municipal fiscal autonomy	Introduce resilience-linked recovery funding where feasible
Spatial planning and exposure management	Recovery integrated with hazard-informed spatial planning	Reconstruction often reproduces flood exposure	Limited integration of planning and disaster management	Embed flood-risk information into reconstruction and planning decisions
Participation and communication	Institutionalised stakeholder participation and targeted communication	Participation largely informal; generic communication	Strong community networks but weak institutional mechanisms	Formalise inclusive participation and area-specific risk communication
Governance learning and institutional review	Routine post-disaster evaluation linked to planning and budgeting	Learning rarely translated into institutional reform	Review processes focus on emergency response	Institutionalise post-flood review within planning and budgeting

Context-sensitive adaptations were derived by interpreting governance mechanisms identified from the international reference cases alongside evidence from Hat Yai, considering their relevance to local governance challenges and compatibility with existing institutional and administrative arrangements.

the early stages of flooding, followed by uncertainty regarding institutional responsibilities as the situation intensified. One participant recalled, *“At that time, we still believed they could manage the water”* (Interviewee 4). Participants also reported fragmented communication and uncertainty over administrative responsibilities, particularly in neighbourhoods located near municipal boundaries. As one participant explained, *“It cuts between Kho Hong and Hat Yai...we thought it belonged to one area, but it was another”* (Interviewee 5). Several participants described being redirected between administrative jurisdictions when requesting assistance, while others reported limited visibility of municipal authorities in affected neighbourhoods. Informal community networks were frequently described as providing more immediate support than formal government organisations during the recovery period.

Financing mechanisms and incentive alignment

The comparative literature synthesis identified long-term financing and incentive alignment as key governance mechanisms supporting flood recovery in the international reference cases. In Japan, flood governance is supported by structured public investment cycles and special budgetary arrangements that provide continuity for long-term flood protection funding^{15,16}. Major flood events have been followed by revisions to design standards, while financing continuity has enabled incremental adaptation within a stable institutional framework¹⁵. Existing compensation mechanisms operate within a broader prevention-oriented governance system. In the Netherlands, the Delta Act and Delta Fund provide predictable long-term financing aligned with legally defined protection standards^{17,21}. Investment decisions are embedded within programme-based planning cycles that link funding to safety standards and spatial adaptation measures¹⁸.

In Hat Yai, documentary evidence indicates that post-flood financing is primarily implemented through short-term compensation and relief mechanisms. Economic

vulnerability has been identified as a major component of urban flood vulnerability, with livelihood disruption and asset loss representing important challenges during recovery²². Property market analyses further demonstrate persistent reductions in housing values within flood-prone areas, reflecting continued long-term economic exposure²³. However, available documentation does not indicate that recovery assistance is formally linked to mitigation measures such as property elevation, flood-proof retrofitting, or relocation from high-risk areas.

Survivor interviews described post-flood financing as providing immediate financial assistance while leaving households responsible for much of their recovery expenditure. Participants reported that compensation payments and aid distribution were perceived as uneven, time-sensitive, and sometimes administratively confusing. Financial support was generally described as standardised and not linked to household-level mitigation measures. Consequently, participants reported undertaking adaptive actions (elevating household belongings, relocating vehicles, and modifying buildings) using their own resources. As Interviewee 2 explained: *“We had to use our emergency savings for repairs. The government only provided that fixed amount (referring to the 9,000-baht compensation).”*

Integration of recovery with spatial planning and exposure management

The comparative literature synthesis identified the integration of recovery with spatial planning as an important governance mechanism in the international reference cases. In Japan, structural flood protection is complemented by hazard mapping, evacuation planning, and land-use considerations¹⁵. Recovery policies have evolved alongside revisions to flood protection standards and compensation mechanisms^{15,16}. In the Netherlands, the *Room for the River* programme integrates flood safety with spatial quality, ecological restoration, and river widening¹⁷. A multilayer safety framework further links flood protection, spatial

planning, and crisis management, supported by spatial modelling tools that inform land-use decisions²⁴.

In Hat Yai, documentary evidence indicates that flood management emphasises preparedness, interagency coordination, and emergency response, while post-disaster recovery remains largely focused on infrastructure restoration¹⁹. Resilience-oriented initiatives, including participation in the ACCCRN, have strengthened planning capacity and stakeholder coordination, primarily through preparedness planning and risk awareness activities¹⁹. Spatial and economic studies also identify persistent flood exposure within the urban landscape, with concentrations of economic activity and residential development located in flood-prone areas^{22,23}. However, the available literature provides limited evidence that post-disaster recovery is systematically linked to zoning reform, relocation strategies, or risk-sensitive redevelopment.

Survivor interviews highlighted uncertainty regarding evacuation routes, designated safe areas, and the interpretation of flood information during the event. Although participants considered real-time monitoring platforms, such as Hatyai Climate, useful for monitoring water levels, decisions about evacuation often relied on personal experience rather than formal guidance. As one participant explained: *“We didn’t know which way was safe to go. We just waited to see how high the water would rise.”* Participants also described unexpected variations in flooding across neighbourhoods, with some areas flooding more severely than anticipated while others experienced less flooding than expected. These experiences contributed to uncertainty regarding local flood conditions and evacuation decisions during the event.

Participation, communication, and protection of vulnerable groups

The comparative literature synthesis identified institutionalised participation, coordinated communication, and protection of vulnerable groups as important

governance mechanisms in the international reference cases. In Japan, stakeholder dialogue in the Abukuma River Basin facilitated post-disaster consensus on integrated flood management, while formal cross-level coordination supported recovery following repeated flood events^{15,25}. In the Netherlands, recovery governance involves coordinated participation among water authorities, spatial planners, and social welfare organisations within established institutional arrangements^{18,26}.

In Hat Yai, documentary evidence indicates that repeated flood exposure has strengthened community preparedness networks and multi-stakeholder collaboration.⁶ Through participation in the ACCCRN, municipal authorities and civil society organisations strengthened preparedness planning and stakeholder coordination¹⁹. Studies have also reported initiatives to support vulnerable populations, including training Community Health Leaders to assist older adults and mobility-impaired residents²⁷ and developing vulnerability databases²⁸. However, available documentation provides limited evidence that these initiatives are routinely incorporated into formal post-disaster recovery planning.

Survivor interviews indicated that communication during flooding relied heavily on Facebook, LINE groups, neighbours, and real-time platforms such as Hatyai Climate, rather than formal municipal communication channels. Participants described official warnings as general rather than location-specific. As Interviewee 6 explained: *“It was just said there was flooding overall... but it didn’t tell us whether it was near my house yet.”*

Similarly, Interviewee 4 reported: *“We got the message when the house was already flooded.”*

In the absence of detailed local guidance, participants described relying on neighbours and community networks to obtain information and coordinate assistance. One participant recalled: *“Everyone came out of their houses... we helped each other move cars to higher ground.”*

Participants also reported that interpreting water-level information depended largely on previous flood

experience. As Interviewee 6 stated: *“If someone has never been flooded before, they won’t know what that level means.”*

Several participants described providing care for older or mobility-impaired family members during evacuation. One participant, caring for a 94-year-old bedridden relative, explained: *“We carried my grandmother upstairs... the water kept rising step by step.”* Participants reported that assistance for vulnerable household members and post-flood support, including access to medicines and collection points, was perceived as variable across neighbourhoods.

Governance learning, policy windows, and institutional anchoring

The comparative literature synthesis identified governance learning and institutional review as important mechanisms supporting long-term recovery in the international reference cases. In Japan, repeated catastrophic flood events have been followed by revisions to safety standards, basin-level coordination, and stakeholder dialogue that informed subsequent flood management planning^{15,16}. In the Netherlands, the Delta Programme incorporates adaptive management through programme-based governance and cross-project learning^{17,18}. Post-flood evaluations are embedded within legislative, planning, and budgetary processes, enabling experience from flood events to inform subsequent policy and investment decisions.

In Hat Yai, documentary evidence indicates that repeated flood events have strengthened preparedness, early warning systems, and interagency coordination^{6,20}. Participation in the ACCCRN also supported the incorporation of resilience concepts and multi-stakeholder coordination into municipal planning^{19, 20}. However, available documentation provides limited evidence of routine post-disaster evaluation processes linked to formal planning, regulatory revision, or recovery governance.

Survivor interviews described communication challenges, limited area-specific warning information, and uneven support for vulnerable households during the flood. Participants also reported that household adaptations following previous flood experiences included elevating household belongings, purchasing water pumps, preparing boats, and modifying storage practices to reduce future flood impacts. These adaptive actions reflected learning from previous flood events at the household level. However, participants did not describe structured opportunities for community experiences to be incorporated into formal post-flood evaluations or municipal policy revision.

Comparative synthesis of governance mechanisms

Across the five governance dimensions, the comparative analysis identified three recurring governance patterns distinguishing the international reference cases from Hat Yai (Table 1, Figure 1).

Institutionalisation of recovery governance

The comparative literature synthesis showed that recovery governance in Japan and the Netherlands is embedded within long-term institutional arrangements, including legally defined responsibilities, structured financing, and formal post-disaster review processes. Documentary evidence from Hat Yai indicated that recovery activities were primarily coordinated through emergency management structures, while survivor interviews described uncertainty regarding institutional responsibilities and reliance on informal community support during recovery.

Integration of financing and spatial risk management

The international reference cases demonstrated the integration of recovery financing with spatial planning and long-term risk reduction through stable investment frameworks and planning mechanisms. In Hat Yai, documentary evidence indicated that recovery financing was

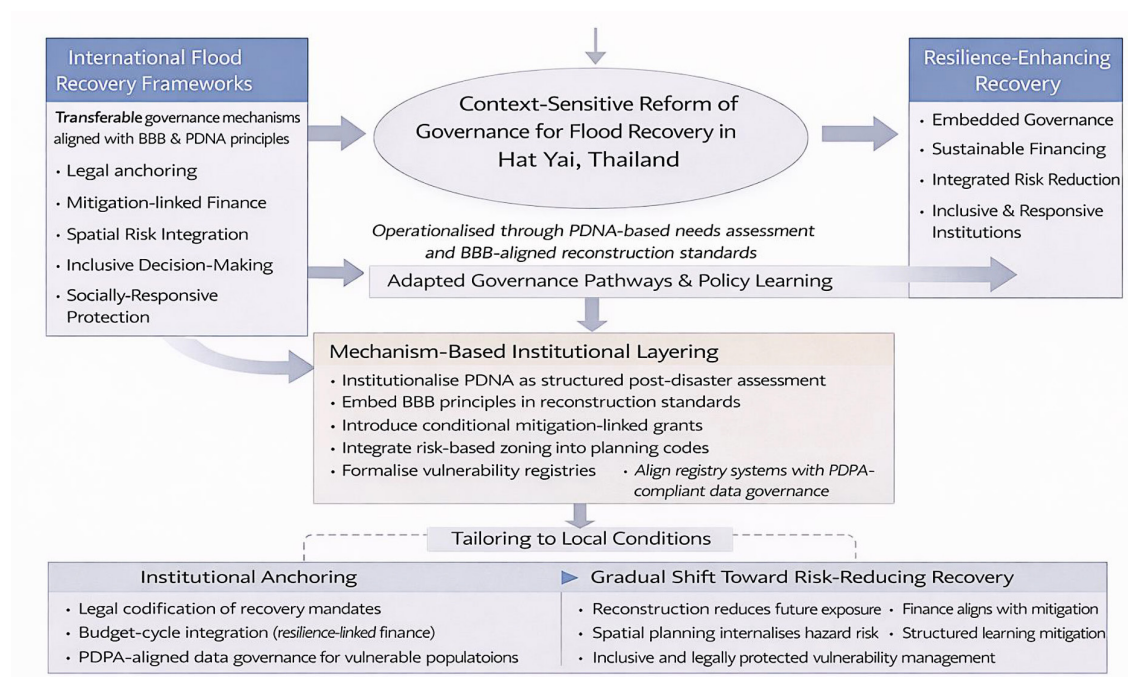


Figure 1 Transferring international governance mechanisms for context-sensitive flood recovery in Hat Yai, Thailand

primarily implemented through short-term compensation mechanisms, while interview participants described undertaking household-level adaptations independently. The literature also identified limited integration between post-disaster recovery and land-use planning despite continued exposure within flood-prone areas.

Community participation and governance learning

The comparative literature identified institutionalised participation, coordinated communication, and structured policy learning as common governance mechanisms in the international reference cases. In Hat Yai, documentary evidence demonstrated established preparedness networks and stakeholder collaboration, while survivor interviews highlighted strong community support, reliance on informal communication channels, and household adaptation following previous flood experiences. Participants provided limited evidence that these experiences were routinely

incorporated into formal recovery planning or post-disaster policy review.

Discussion

This study examined how governance mechanisms identified from two international reference cases may inform context-sensitive flood recovery reforms in Hat Yai, Thailand. Rather than comparing national governance systems, the study compared governance mechanisms across five recovery dimensions and interpreted them using an integrated PDNA, BBB, and policy-learning framework. The findings indicate that although Hat Yai has strengthened preparedness, early warning, and emergency coordination following repeated flood events, post-disaster recovery remains only partially institutionalized within planning, financing, and governance systems. These findings suggest that governance transferability is best understood as the contextual adaptation of governance mechanisms rather

than the replication of institutional models developed in different political, administrative, and fiscal settings.

Institutional anchoring and governance coordination

The comparative analysis suggests that institutional anchoring is one of the principal distinctions between the international reference cases and Hat Yai. In Japan and the Netherlands, recovery responsibilities are embedded within stable legislative mandates, formal intergovernmental coordination arrangements, and structured post-disaster review processes that extend beyond emergency management. These institutional arrangements enable recovery to function as part of long-term flood risk governance rather than as a temporary extension of emergency response.

This interpretation is consistent with disaster governance literature emphasizing that transformative recovery depends on institutional embedding rather than crisis responsiveness alone^{29, 30}. Similar patterns have been documented following major flood and tsunami events in Japan, where revisions to safety standards and basin-level governance emerged through structured evaluation and coordinated planning rather than ad hoc policy change. Conversely, many middle-income settings demonstrate strong operational capacity during emergencies but more limited institutionalization of long-term recovery governance. The uncertainty regarding administrative responsibilities described by participants in Hat Yai is consistent with studies suggesting that decentralized implementation within centralized administrative systems may generate coordination challenges during major disasters²⁹. Rather than indicating inadequate technical capacity, these findings suggest opportunities to strengthen the formal integration of recovery responsibilities within existing municipal planning, disaster management, and climate adaptation frameworks.

Financing mechanisms and incentive alignment

The findings suggest that recovery financing in Hat Yai primarily functions as short-term financial stabilization rather than as a governance mechanism supporting long-term risk reduction. Although compensation provides important social protection following flooding, participants described financing household adaptation largely through personal resources, while documentary evidence indicated limited linkage between recovery assistance and mitigation measures.

This interpretation is consistent with evidence demonstrating that financing mechanisms linked to mitigation measures are more likely to reduce future flood losses than unconditional compensation^{31,32}. Similar financing patterns have been reported across many middle-income settings, where post-disaster assistance frequently prioritizes rapid household recovery over resilience-building. The findings therefore suggest that the effectiveness of recovery financing depends not only on funding continuity but also on how financing mechanisms are aligned with broader recovery objectives, including spatial planning and exposure reduction.

Integration of recovery with spatial planning

The comparative analysis indicates that post-disaster recovery remains only weakly integrated with long-term spatial planning in Hat Yai. Documentary evidence suggests that preparedness planning and emergency coordination have strengthened over time, whereas reconstruction continues to operate largely independently of land-use planning and risk-sensitive redevelopment. Survivor interviews further highlighted uncertainty regarding evacuation routes and interpretation of flood information, illustrating how households frequently relied on previous experience rather than formal spatial guidance.

These findings are consistent with previous research demonstrating that integrating recovery with spatial

planning remains one of the most challenging aspects of post-disaster governance³³. Even in the international reference cases, spatially informed recovery emerged gradually through repeated policy learning and institutional adaptation rather than immediate post-disaster reform. Conversely, rapidly urbanizing cities frequently continue to reproduce flood exposure because of development pressures and fragmented land governance. The findings therefore suggest opportunities to strengthen the linkage between post-disaster recovery, hazard information, and existing municipal planning processes, thereby improving the alignment between reconstruction and long-term risk reduction.

Participation, communication, and protection of vulnerable groups

The findings highlight the important role of community participation in supporting recovery, while also demonstrating the distinction between community resilience and institutionalized participation. Participants consistently described strong neighbourhood solidarity, informal communication networks, and mutual assistance during flooding. However, support for older adults, mobility-impaired residents, and other vulnerable groups remained largely dependent on household and community capacity.

This interpretation is consistent with previous studies showing that community networks frequently compensate for limitations in formal disaster management systems^{34,35}. International experience further demonstrates that participation contributes most effectively to recovery when embedded within formal governance arrangements through structured communication, coordinated stakeholder engagement, and clearly defined responsibilities for protecting vulnerable populations³². The findings therefore suggest opportunities to strengthen existing community capacities by integrating them more systematically into recovery planning and communication processes.

Governance learning and policy adaptation

The comparative analysis suggests that repeated flood events in Hat Yai have generated substantial operational learning, particularly in preparedness, early warning, and household adaptation. Participants described modifying their homes, purchasing pumps, preparing boats, and adjusting household practices based on previous flood experience. Documentary evidence likewise demonstrated improvements in preparedness planning and interagency coordination following repeated flood events.

However, the findings provide more limited evidence that these experiences are routinely translated into formal policy revision, regulatory change, or structured post-disaster review. This distinction reflects broader policy-learning literature differentiating operational (single-loop) learning, which improves existing practices, from institutional (double-loop) learning, which modifies underlying governance arrangements³⁶⁻³⁸. The international reference cases illustrate how formal post-disaster evaluation mechanisms facilitate cumulative policy learning by embedding recovery experiences within legislative, planning, and budgetary processes. These findings suggest that strengthening institutional learning may represent an important opportunity for enhancing long-term recovery governance in Hat Yai.

Theoretical and methodological contribution

Beyond its empirical findings, this study contributes to comparative disaster governance research by shifting the unit of comparison from national governance systems to governance mechanisms. Integrating the PDNA, BBB, and policy-learning perspectives enabled the governance mechanisms identified from the international reference cases to be interpreted alongside documentary evidence and survivor experiences within Hat Yai. Rather than evaluating institutional equivalence between countries, the study demonstrates how governance transferability can be

understood as the contextual adaptation of governance mechanisms within existing institutional, administrative, and fiscal constraints. This perspective extends conventional comparative disaster governance by emphasizing functional governance mechanisms rather than direct institutional replication.

Recent health-sector publications from Hat Yai offer complementary perspectives on these governance priorities. A reflective shelter case analysis describes cross-sector coordination and the translation of operational experience into an After-Action Review³⁹. A household financial-resilience framework proposes linking continuity of essential care with rapid household liquidity and livelihood recovery⁴⁰. A pharmacological preparedness review recommends decentralised medicine depots and medication-refill plans for people with chronic diseases⁴¹. These perspectives suggest that recovery governance should connect institutional learning and social protection with continuity of care.

Limitations

Several limitations should be acknowledged. First, the comparative literature synthesis was intentionally concept-driven rather than a systematic review because the objective was to identify the governance mechanisms relevant to comparative policy learning rather than synthesize all available evidence on flood recovery. Second, the eight survivor interviews were designed to contextualize community recovery experiences rather than directly evaluate institutional governance. The small, purposively selected sample limits the breadth of perspectives that can be captured and therefore the generalizability of the interview findings. Moreover, the absence of interviews with policymakers, municipal officials, disaster management agencies, and planning authorities limits direct examination of institutional decision-making and governance implementation. Finally, the study examined two

analytical reference cases selected to represent the well-documented examples of institutionalised flood recovery governance. The findings should therefore be interpreted as illustrating context-sensitive governance mechanisms rather than representing all international flood recovery systems. Future research incorporating institutional stakeholders and additional comparative cases would further strengthen understanding of governance transferability across diverse governance settings.

Conclusion

Overall, the findings suggest that major flood events alone do not produce transformative recovery. Rather, policy windows become opportunities for long-term reform when governance mechanisms supporting institutional coordination, financing, spatial planning, participation, and governance learning are embedded within existing administrative systems. For middle-income urban settings such as Hat Yai, context-sensitive adaptation of governance mechanisms appears more feasible than directly replicating the institutional models developed in high-income countries. By focusing on governance mechanisms rather than institutional equivalence, this study provides a practical framework for translating international recovery experience into locally appropriate recovery governance.

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Conflict of interest

There are no potential conflicts of interest to declare.

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