



FACTORS INFLUENCING FLOOD PREPAREDNESS BEHAVIOR OF GOVERNMENT AGENCIES IN THE PING RIVER BASIN, CHIANG MAI

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Abstract

This study had the objective to study the factors related to knowledge, attitudes, perceived risk, and experience that influence the flood preparedness of government agencies in the Ping River basin, Chiang Mai Province and to develop policy recommendations for disaster management. A mixed methods approach was employed. Quantitative data were collected from 209 government agencies selected through stratified random sampling, using a questionnaire with a reliability coefficient of 0.98. Qualitative data were gathered through open-ended questions and in-depth interviews with 5 key informants. Data were analyzed using descriptive statistics (mean and standard deviation) and content analysis to ensure consistency with the research objectives.

The findings showed a behavioral paradox, reflecting that government agencies demonstrated the highest level of knowledge on flood preparedness (mean = 4.27) and a positive attitude towards flood preparedness (mean = 4.00). However, practical flood preparedness behavior was significantly lower (mean = 3.42), particularly in the resource management (mean = 3.29). This is in line with factors related to a moderate level of experience and perceived risk. Qualitative data also showed that the main problems were not personnel but structural failures, namely separate work processes and inflexible budgetary regulations across administrative areas. A new knowledge found is the “institutional knowledge trap,” showing that knowledge and paper plans did not accurately reflect practical disaster response capabilities. Therefore, the researchers proposed a reform of disaster management towards an area-based management, changing from administrative assumptions to hydrological management and simulation drills to enhance proactive simulation experiences for personnel in the area.

Keywords: Flood Preparedness Behavior, Government Agencies, Ping River Basin, Area-based Management, Chiang Mai

Introduction

Under the National Strategy and the framework for sustainable development, the Thai government has prioritized natural resource and environmental management to promote eco-friendly growth. In particular, 'water resource management' is regarded as a strategic priority that directly impacts economic and social security. However, this policy direction continues to face challenges from climate change, necessitating the integration of water management with disaster prevention and mitigation to address increasingly volatile and unpredictable natural disasters.

The limitations in macro-level water management were clearly reflected in the 2024 flood crisis in the Ping River Basin. Characterized as a 'double-hit disaster' (September–October 2024), the water level at the P.1 monitoring station (Nawarat Bridge) reached a record 5.30 meters, the highest in over 50 years. This catastrophic event impacted approximately 141,075 households across Chiang Mai and resulted in local economic losses estimated at over 2,000 million Baht (Provincial Office of Natural Resources and Environment Chiang Mai, 2024; Thai PBS, 2024). This flood did not only affect property, but it also significantly affected the operations of government agencies within the area. This situation reflected the need for more effective flood warning systems and response plans, including integrated cooperation among government agencies at all levels (Kosonkittumporn et al, 2020). In public sector disaster management, preparedness is a key element in the disaster management cycle. This includes concepts, namely the disaster preparedness framework, risk perception and decision making, and disaster management competency (Wichaipa, 2020). However, the public operations in the Ping River basin are often criticized for their inefficiency in integrating and putting policy into practice. While personnel and agencies may learn theoretical understanding and disaster plans, practical preparedness behavior is frequently inconsistent, particularly in resource management and emergency response drills, which often fall below the standards set in paper plans. This preparedness behavior of individuals and organizations can be explained by Lindell & Perry's (2012) Protective Action Decision Model (PADM). However, if risk perception is low or experience is limited, preparedness behavior may not be fostered even with a high level of knowledge (Perry & Lindell, 2003).

However, based on a public management perspective, disaster preparedness is not only an emergency plan, but also complicated support systems based on the United Nations Office for Disaster Risk Reduction (UNDRR) (2015) and United Nations Office for Disaster Risk Reduction (UNDRR) (2020), consisting of four main dimensions: 1) planning, 2) training and exercises, 3) resources and equipment, and 4) early warning and communication. Past studies revealed that the preparedness behavior of government agencies mostly had varying levels of intensity in each dimension. The planning was often the most actively implemented due to a mandated government responsibility, while resources and equipment were a weakness due to budgetary limitation and public procurement processes. This prevents government

agencies from acquiring maximum outcomes in preparedness behavior. These issues show a research gap that has not been deeply explored in the context of the complicated strategic Ping River basin.

Moreover, the area-based disaster management places an emphasis on inter-organizational coordination in the context of the hydrological boundary rather than administrative boundary. Based on the concept of crisis governance, government agencies during crisis often face silo mentality, which affects the integration of information and resources (Campbell et al., 2019). The fact that government agencies in the Ping River basin faced limitations through standard operating procedures (SOPs), budget allocation, and a vertical hierarchy of management as significant structural barriers that deteriorate maximum effectiveness of overall preparedness behavior.

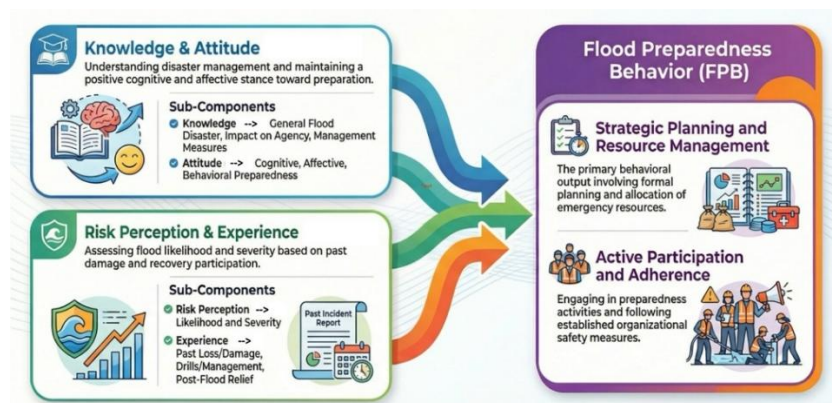


Figure 1: Conceptual framework

Source: Adapted from Lindell & Perry (2012) and UNDRR (2015)

Accordingly, this study focuses on analyzing factors influencing flood preparedness behavior of government agencies in the Ping River basin, Chiang Mai Province. The study includes dimensions of knowledge, attitudes, risk perception, and experience (Figure 1). In-depth analysis of obstacles in practices was conducted. The data obtained will reflect the current situation as a key data for proposing guidelines to improve the disaster management structure to have unity of command based on the actual problems. This can enhance resilience and ensure sustainable urban development for people in communities.

Research Objective

1. To examine the knowledge, attitude, risk perception, and experience factors influencing the flood preparedness behavior of government agencies in the Ping River basin, Chiang Mai.
2. To propose policy and practical guidelines for developing the flood preparedness of government agencies in the Ping River basin.

Methodology

1. Population and Sample

The population consists of 960 government agencies in the Ping River basin, Chiang Mai. Based on Hair et al. (2022), a sample of 209 agencies was selected via stratified random sampling. For qualitative phase, 5 key informants directly involved in regional flood management were selected through purposive sampling for in-depth interviews.

2. Instrument

The primary research instrument was a questionnaire developed from a comprehensive review of relevant theories and literature. It was divided into three sections. Section 1: Personal Information of respondents (7 items). Section 2: Core Variables, utilizing a 5-point Likert scale to measure: 1) Flood preparedness behavior, 2) Knowledge of flood disasters, 3) Attitudes toward preparedness, 4) Perceived risk, and 5) Flood experience. And section 3: Open-ended questions (6 items) regarding policy recommendations.

The instrument's content validity was confirmed with an IOC of 0.67–1.00, and internal consistency showed a Cronbach's Alpha of 0.98. A semi-structured interview guide was also used for qualitative data.

3. Data Collection

Quantitative data were gathered from 209 agencies via official postal mail and online platforms (Google Forms). For the qualitative phase, in-depth interviews were conducted with the 5 key informants to gain insights into institutional barriers and policy implementation.

4. Data Analysis

Quantitative data were analyzed through using descriptive statistics, including percentages, means, and standard deviations. And qualitative data were analyzed through content analysis from interviews and open-ended feedback, and then synthesized together with the quantitative results through triangulation to ensure consistency with the research objectives.

Results

The findings of this study are categorized into two sections according to the research objectives:

1. Analysis of factors influencing flood preparedness behavior

This section presents the quantitative analysis of 209 government agencies in the Ping River Basin. The sample consisted of local administrative organizations (19.1%), regional agencies (62.2%) and state enterprises (18.7%), mostly represented by department heads with 7–15 years of experience. The levels of key influencing factors are summarized in Table 1.

Table 1: Descriptive Statistics of Flood Preparedness Behavior and Influencing Factors (n=209)

Factors	$\bar{X}$	S.D.	Result
1. Dependent Variable			
1.1 Flood Preparedness Behavior	3.42	1.19	High
1.1.1 planning	3.54	1.34	High
1.1.2 resource management	3.29	1.19	Moderate
1.1.3 participation in preparedness activities	3.33	1.05	Moderate
1.1.4 adherence to organizational measures	3.51	1.15	High
2. Influencing Factors (Independent Variables)			
2.1 Knowledge of Flood Disaster	4.27	0.66	Highest
2.1.1 general flood disaster	4.21	0.70	Highest
2.1.2 impact of flood on the agency	4.18	0.73	High
2.1.3 flood management measures of the agency	4.42	0.52	Highest
2.2 Attitude towards Flood Preparedness	4.00	0.73	High
2.2.1 cognitive	3.73	0.76	High
2.2.2 affective	4.10	0.63	High
2.2.3 behavioral	4.18	0.74	High
2.3 Flood Risk Perception	3.37	1.04	Moderate
2.3.1 likelihood	3.11	0.95	Moderate
2.3.2 severity	3.63	1.06	High
2.4 Flood Experience	2.86	0.88	Moderate
2.4.1 loss or damage from past flood	2.61	0.94	Moderate
2.4.2 participation in flood drills and management	2.86	0.88	Moderate
2.4.3 post-flood relief and recovery	3.13	1.02	Moderate
Overall Average of Influencing Factors	3.62	0.78	High

Table 1 reveals a behavioral paradox within the studied agencies. While the overall average of influencing factors was at a high level (Mean = 3.62), driven primarily by the highest level of knowledge (Mean = 4.27) and a high level of positive attitude (Mean = 4.00), the actual flood preparedness behavior remained at a lower relative level (Mean = 3.42). In-depth analysis shows that while planning achieved the highest behavioral score (Mean = 3.54), resource management was identified as the critical weak point (Mean = 3.29), reflecting a ‘paper-based’ readiness. Additionally, the moderate scores for flood risk perception (Mean = 3.37) and flood experience (Mean = 2.86) appear to be significant barriers that prevent high theoretical knowledge from being translated into robust practical action.

2. Policy and practical guidelines for developing flood preparedness

By synthesizing the qualitative data from open-ended questionnaires and expert interviews, the study proposes the following guidelines to address structural constraints:

2.1 Structural and budgetary reform: A critical transition from “Functional Budgeting” to “Risk-based Budgeting” is necessary to provide the required flexibility during

crises. Experts strongly suggested establishing a “Regional Disaster Fund” to bypass rigid procurement regulations that currently hinder cross-district resource allocation.

2.2 Integrated crisis governance: To eliminate “Institutional Silos,” the development of a “Single Data Database” is imperative. This platform would synchronize real-time hydrological data across administrative boundaries, ensuring a unified command structure.

2.3 Adaptive capacity building: The findings indicate a clear mismatch between theoretical knowledge and practical skills. Consequently, the focus must shift from lecture-based training to “Realistic Simulation Drills” to bridge the identified experience gap.

2.4 Proactive mitigation: Rather than reacting to seasonal threats, agencies should implement year-round waterway maintenance. Given the increasing unpredictability of disasters in the Ping River Basin, a proactive stance is essential for regional resilience.

Discussion

An analysis of the factors and the flood preparedness status of government agencies in the Ping River basin, Chiang Mai, about flood response measures, showed major issues that can be discussed to reflect the reality of management practices, as follows:

1. The behavioral paradox and the knowledge trap within structural limits: The findings reveal a significant gap between the high level of knowledge regarding flood disasters (Mean = 4.27) and the relatively lower level of practical preparedness behavior (Mean = 3.42). This reflects a “knowledge-practice gap” where high theoretical understanding does not fully translate into action. This is consistent with Lindell & Perry's (2012) Protective Action Decision Model (PADM), which suggests that transferring knowledge into organizational action requires strong mediators like perceived risk (Mean = 3.37) and direct flood experience (Mean = 2.86). In this study, since both risk perception and experience were only at moderate levels, it led to “administrative complacency.” Agencies tend to rely on existing “paper-based” plans while potentially neglecting the rigorous, field-based drills necessary for real-world crises.

2. The regulatory and structural trap in resource management: When examining specific behaviors, resource and equipment management received the lowest score (Mean = 3.15), identifying a major weakness compared to the UNDRR (2015) standards. Expert interview results and open-ended data indicating that procurement and budget regulations were too strict during crises reflect that the preparedness problems of Thai government agencies were not caused by lack of knowledge, but rather from structural constraints that prevent them from achieving international standards in disaster resource management. This discussion stresses that the Thai government's budget structure was still functional budgeting rather than risk-based budgeting as indicated in the work. Furthermore, it clearly shows that the main obstacle was not personnel, but rather a bureaucratic system that emphasizes silo working

and adherence to administrative boundaries rather than hydrological boundaries, and delays in budget disbursement, often prioritizing recovery rather than proactive mitigation. This confirms that the current public administration structure was not resilient enough to cope with increasingly complicated and severe disasters.

3. Bridging the experience gap through simulated experiences: The fact that prior experience had the lowest mean score (Mean = 2.86) aligns with the qualitative findings from the sample's demands that lecture-based training was insufficient for effective skill development. This suggests that while flood preparedness behavior showed its highest mean score in the planning dimension (Mean = 3.54), it may primarily represent preparedness in terms of documentation to meet agencies' KPIs, rather than practical wisdom in crisis situations. As Sutton & Tierney (2006) argued, preparedness is not just about having a complete plan, but also about adaptive capacity. Therefore, shifting the preparedness approach toward simulation exercises is not merely an extra activity, but a fundamental basis for creating simulated experiences to compensate for the missing skill gaps among personnel in the Ping River Basin.

4. From functional management to area-focused management: The silo working and administrative boundary found through interviews and open-ended questionnaires, strongly align with Campbell et al. (2019)'s concept of Crisis Governance, which addresses institutional failures during crises due to silo mentality. This study demonstrates that despite effective planning by government agencies (Mean = 3.54), it was often sovereign planning, lacking real-time integration across the hydrological boundary during crisis. This is contrary to the concept of area-based management through the literature review by Quarantelli (1998) and Coppola (2006), showing that effective preparedness needed resource support and flexible risk management based on the geographical conditions of the area. This bottleneck hinders the unity of preparedness at the local agencies within the Ping River basin.

Body of Knowledge

This study discovered new knowledge that fills gaps in disaster management within the Thai government context. The key findings can be summarized as follows:

1. The structural paradox of preparedness model: This study highlights the phenomenon known as the knowledge-action gap, which reveals that the level of knowledge and attitudes of public personnel did not always indicate their actual operational behavior. This new understanding defined two layers of disaster preparedness in government agencies: 1. Intellectual readiness is enhanced through training and compliance-based planning, often leading to high scores due to its structural nature. 2. Operational readiness is limited by practical experience and access to resources, frequently interrupted by structural constraints. Therefore, readiness isn't about enhancing theoretical knowledge, but about breaking down structural constraints to translate knowledge into tangible behaviors.

2. The administrative vs. hydrological boundary conflict perspective shows a key new understanding that administrative boundaries become a more significant obstacle than budget or technology. Disaster management in the Ping River basin is limited within administrative boundaries, resulting in silo preparedness. Accordingly, this study proposes the concept of area-based seamless risk management, which must shift from administrative boundaries to hydrological boundaries.

3. For the shift from paper plans to practical wisdom, this study showed that simulated experience was more significant than lecture-based training. The finding that experience, which had the lowest mean value, is a key variable assessed by experts, led to a new academic proposal that disaster preparedness personnel development should focus on building experience and decision-making through realistic simulations to create intuitive responses to crisis.

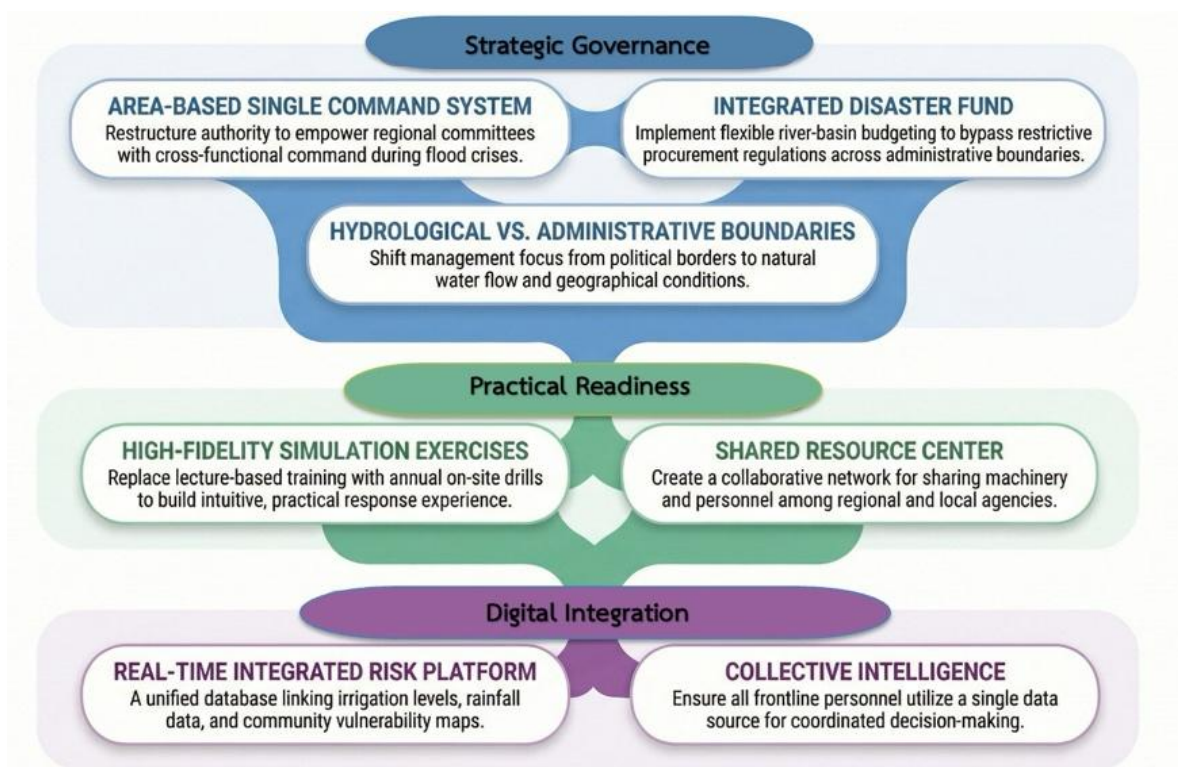


Figure 2: Shifting from administrative to hydrological management

Conclusion and Recommendations

Policy Recommendations

A shift in management from administrative to hydrological boundaries, as follows:

1. Area-based single command system: Authority is restructured to empower provincial governors or river basin committees with complete cross-functional authority during crises through a single data for decision-making.
2. Ping River Basin integrated disaster fund: The

ministry of interior and the budget bureau should consider a flexible budgeting method for the river basin to reduce the limitations of procurement regulations that prohibit the use of budgets across administrative areas. The emphasis should be placed on proactive budgeting for preparedness and mitigation, rather than solely on remediation.

Operation Recommendations

Experiential learning and simulation, as follows: 1. High-fidelity simulation exercise: Agencies should reduce lecture-based training and enhance practical simulation drills at least once a year, emphasizing on-site coordination between local and central governments. This compensates for limited experience and maintain a consistent awareness of risks for flood preparedness. 2. Shared resource center: A collaborative network should be developed for sharing resources, machines, and personnel among regional agencies, state enterprises, and local agencies in risk areas to handle the problem of low average resource management. 3. Technology and information: Collective intelligence, real-time integrated risk platform: A platform should be developed to link irrigation water level data, meteorological rainfall data, and community vulnerability maps from local agencies. This can facilitate frontline personnel to make accurate and coordinated decisions on preparedness.

Recommendations for Next Research

The key issues that should be looked at are as follows: 1. A comparative study of flood preparedness behaviors between the upper and lower Ping River basins should be carried out to analyze the political ecology that may affect the varying levels of resource access in each area. 2. Action research should be conducted to test integrated river basin management in pilot areas to verify and develop appropriate working models before putting them into the national level.

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