

## REVIEW ARTICLE

<https://doi.org/10.46488/NEPT.2026.v25i04.D1934>

## OPEN ACCESS

# From Water Scarcity to Resilience: A Policy-Oriented Framework for Community-Based Drought Management in Southeast Asia

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## ARTICLE HISTORY

Received: 19-04-2026

Revised: 05-06-2026

Accepted: 08-06-2026

## KEYWORDS

Drought management  
Water governance  
Community-based water management  
Water resilience  
Adaptive governance  
Policy-oriented framework

## CITE THIS ARTICLE

Pinmongkhonkul, S. and Panyopo, T., 2026. From water scarcity to resilience: A policy-oriented framework for community-based drought management in Southeast Asia, *Nature Environment and Pollution Technology*, 25(4), D1934. <https://doi.org/10.46488/NEPT.2026.v25i04.D1934>

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## ABSTRACT

Drought has evolved into a persistent governance challenge across Southeast Asia. Its impacts cannot be attributed to climatic variability alone. Rather, they emerge from the interaction between climate change, fragmented institutional arrangements, and intensifying competition over water resources. Together, these dynamics undermine long-term water security and disproportionately affect rural livelihoods. Although a growing body of scholarship has explored adaptive governance and community-based water management, much of this work remains compartmentalized across disciplinary and administrative scales. As a result, research often examines connections between national policy frameworks, intermediary institutions, and local water practices too little, limiting the applicability of existing research for integrated drought resilience planning. To address this gap, this study undertakes a policy-oriented integrative review of interdisciplinary literature on drought governance and community-based drought management in Southeast Asia. Drawing on peer-reviewed research from environmental governance, water policy, and sustainability studies, the review examines how policy design, institutional coordination, and community participation interact in practice. Rather than treating these dimensions as discrete variables, the analysis considers their relational dynamics. The study uses a thematic synthesis approach to identify recurring governance mechanisms, enabling conditions, and structural barriers that shape drought management outcomes across contexts. Building on this synthesis, the study proposes a Policy-Oriented Community Drought Resilience Framework. The framework conceptualizes drought resilience not as a fixed condition, but as an emergent outcome of multi-scalar governance interactions. It foregrounds policy coherence and institutional alignment as foundational elements, while recognizing the operational role of community-based water management organizations. The framework also emphasizes knowledge integration and iterative learning processes, highlighting feedback loops that connect drought experiences to institutional adjustment and policy reform over time. Theoretically, this review extends adaptive and polycentric governance perspectives by underscoring the importance of coordination quality, institutional learning, and cross-scale linkages. It argues that resilience is less about the proliferation of governance actors and more about how effectively their roles are aligned. From a policy standpoint, the findings point toward practical pathways for shifting from reactive, crisis-driven responses to proactive and community-centered drought governance strategies. Although grounded in the Southeast Asian context, the analytical insights developed here apply to other climate-vulnerable regions confronting intensifying water scarcity.

## 1. INTRODUCTION

Drought has become one of the most expensive and extensive catastrophes, affecting millions of people worldwide, posing a significant water-management challenge in Southeast Asia, and its importance is not limited to climatic variability (Kulkarni & Sawada 2025, Rahman et al. 2025). Across the region, prolonged drought interacts

with fragmented institutional arrangements, competition among water-use sectors, and inconsistent management responses (Asian Development Bank 2020, Franzetti et al. 2017). Its effects extend beyond reduced agricultural output to water security, local livelihoods, ecosystems, and social stability, including land use/land cover (LULC) (Apraku et al. 2022, Drury et al. 2023, Hurlbert et al. 2019, Thanh et al. 2023, Anand et al. 2018). Because drought is a slow-onset hazard with prolonged recovery, it exposes weaknesses in coordination, policy development, and long-term planning (Augustijn et al. 2025, Kampragou et al. 2011). Therefore, drought is better understood not solely as a hydrological event but as a test of governance capacity (Aartsen et al. 2018).

In Southeast Asia, especially in northeast Thailand, structural conditions can exacerbate drought vulnerability, while rapid economic growth increases water demand across agriculture, industry, and urban areas, including deforestation without commensurate development of allocation mechanisms or institutional coordination (Frisvold & Konyar 2012, Fasting et al. 2021, Khadka et al. 2024, Kukuntod & Wijitkosum 2025, Lu & Talamini 2024, Sattraburut et al. 2024). In rural and urban areas, ineffective water management and unequal access to resources create additional barriers to adaptation (Aguilar et al. 2021, Saguansap et al. 2025, Matimolane & Mathivha 2025).

Although governments have increasingly adopted drought policies and integrated climate adaptation with water resources management, many interventions remain reactive and sector-specific. Emergency water allocation and infrastructure expansion are necessary, but they cannot address the deeper governance challenges that shape long-term resilience (Sin-Ampol et al. 2025).

Recent research has emphasized adaptive governance, policy integration, and community-based water management as important elements of effective drought response. These studies show that technical solutions alone, such as reservoir construction, irrigation expansion, and early warning systems, are insufficient when institutional roles are unclear, and local participation is inadequately considered. Therefore, effective drought response depends on interactions across multiple governance levels. Policy coherence, institutional alignment, and community participation are not secondary considerations; they are central to adaptive capacity (Holman & Knox 2023).

Despite this growing body of work, the literature remains conceptually fragmented. Policy-oriented research often concentrates on institutional design and coordination mechanisms at national or basin scales. In contrast, community-based studies focus on local practices and

collective action, sometimes without fully accounting for regulatory and policy constraints. What is less developed is an integrative perspective that systematically links policy frameworks, intermediary institutions, and community-level water management within a single analytical lens. This gap is particularly consequential in Southeast Asia, where overlapping mandates, customary water practices, and varying degrees of decentralization complicate governance arrangements (Duc et al. 2024).

Without such an integrative framework, translating advances in drought management into practical strategies remains difficult. Policymakers may recognize the value of participation or adaptation planning, but clear guidance on how these elements should work together across governance levels is often lacking. Similarly, community initiatives can produce local benefits but remain constrained by broader institutional inconsistencies (Moridi et al. 2025).

To address this issue, this study conducts a policy-oriented review of drought governance and community-based drought management in Southeast Asia. It synthesizes empirical findings, conceptual debates, and policy analyses to examine how governance mechanisms operate across levels. Rather than treating institutional policy and community management as separate issues, the analysis investigates their relationships. On this basis, the study develops a Policy-Oriented Community Drought Resilience Framework that integrates policy coherence, institutional coordination, knowledge integration, and iterative learning within a unified conceptual structure.

This review has three aims. First, it analyzes the literature to clarify how drought resilience is defined and managed from a governance perspective. Second, it identifies institutional and policy factors that affect the effectiveness of community-level drought responses. Finally, it presents a framework intended to advance theoretical discussion and provide practical guidance for drought management and adaptation (Zipper et al. 2017).

## 2. MATERIALS AND METHODS

### 2.1. Review Design and Scope

This study uses a policy-oriented integrative review approach to synthesize interdisciplinary knowledge on community-based drought management and water governance in Southeast Asia. Unlike systematic reviews that primarily emphasize quantifying intervention effects, an integrative review can consolidate empirical findings, conceptual frameworks, and policy analyses from diverse fields of study, including environmental governance, hydrology, development studies, and public policy (Milhorange et al. 2022). This method is

particularly appropriate for examining drought resilience, which is shaped by complex institutional, sociopolitical, and environmental interactions (Kaiss et al. 2025).

The review focuses on identifying policy-relevant mechanisms that link drought governance, institutional arrangements, and community participation to develop a conceptual model for improving long-term drought resilience in water-scarce regions.

## 2.2. Review Questions

The review was preceded by the following research questions:

1. How is drought management conceptualized and operationalized in policy and governance literature related to Southeast Asia?
2. What institutional and governance factors influence the effectiveness of community-based drought management?
3. How do policy frameworks interact with local institutions and community organizations to shape drought resilience outcomes?
4. What lessons can be drawn to inform future drought governance and policy design in climate-vulnerable regions?

## 2.3. Literature Search Strategy

A structured literature search was conducted using Scopus and Web of Science as the main databases because of their comprehensive coverage of peer-reviewed journals in environmental science, policy studies, and sustainability research. Moreover, relevant studies were identified through backward and forward citation tracking of important articles.

The search was performed using combinations of keywords related to drought, water governance, policy, and community participation, including but not limited to:

“drought management”, “water governance”, “community-based adaptation”, “drought resilience”, “water user organizations”, “policy integration”, “adaptive governance” and “Southeast Asia”.

Search terms were applied to titles, abstracts, and keywords. Only articles published in peer-reviewed journals were considered to ensure academic rigor (Shah 2021).

## 2.4. Inclusion and Exclusion Criteria

To ensure relevance and consistency, research studies were selected based on the following criteria:

### 2.4.1. Inclusion Criteria

- Peer-reviewed journal articles published primarily

between 2010 and 2025

- Studies addressing drought, water scarcity, or drought-related water management
- Explicit discussion of governance, policy, institutional arrangements, or community participation
- Empirical, conceptual, or review studies with clear policy implications
- Studies conducted in Southeast Asia or providing transferable insights relevant to the region

### 2.4.2. Exclusion Criteria

- Technical or engineering-focused studies lacking governance or policy dimensions
- Unpublished documents, reports, and publications that have not undergone peer review.
- Studies focusing solely on flood management without relevance to drought
- Articles with limited relevance to the community or the institutional point of view of water management

## 2.5. Analytical Framework and Synthesis

Selected studies were analyzed using a thematic synthesis method. The studies were iteratively coded and organized into key thematic domains reflecting governance dimensions of drought resilience, including:

1. Policy frameworks and institutional consistency
2. Multi-level governance and coordination mechanisms
3. Community participation and local water user organizations
4. Knowledge integration, learning, and adaptive ability
5. Obstacles and conditions conducive to policy implementation.

Rather than focusing on specific case outcomes, the synthesis highlighted institutional dynamics, cross-cutting patterns, and policy trade-offs. Through this process, a policy-oriented conceptual framework connecting community-based resilience mechanisms with drought governance structures was developed by integrating insights from various contexts (Nagel & Pierre 2020).

## 2.6. Review Process

### 2.6.1. Imposing Boundaries and Defining Inclusion Criteria (Scoping Phase)

This first method establishes the rules and boundaries for the review. It involves defining the study’s specific scope, such as the geographic focus on Southeast Asia, the topic of community-based drought management, and the timeframe.

By setting clear inclusion and exclusion criteria, researchers ensure that only highly relevant studies are considered, filtering out unrelated or low-quality literature from the outset.

### ***2.6.2. Systematically Documenting Search and Study Selection (Literature Search Phase)***

This step involves conducting a structured, transparent literature search using major academic databases, especially Scopus and Web of Science. Researchers document every step of the process, including the specific keywords used, the number of records identified, and how studies were screened, such as removing duplicates, reviewing titles and abstracts, and assessing full texts. This helps make the review transparent and reproducible and supports adherence to academic standards, including the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

### ***2.6.3. Thematic Synthesis and Analytical Coding of Governance Dimensions (Analysis Phase)***

In this analytical method, information gathered from the selected studies was coded and classified. Analytical coding involves identifying specific concepts, patterns, and features within the literature. Thematic synthesis involves grouping these codes into overarching themes related to governance dimensions, such as policy structures, stakeholder participation, institutional capacity, and community resilience. This step reduced a large volume of text to organized core findings.

### ***2.6.4. Development of an Integrative Policy-Oriented Framework and Operationalization (Framework Development Phase)***

The final step translates the academic findings into practical application. Using the themes and dimensions identified in Step 3, researchers construct an integrative framework that connects the various elements of drought governance. Crucially, this framework is policy-oriented, meaning it goes beyond theory to outline actionable policy pathways and operational guidelines that policymakers and practitioners can use to improve community-based drought management.

This approach enables the systematic integration of policy, institutional, and community-level viewpoints to examine drought governance and community-based drought management in Southeast Asia. The review design and analytical approach are summarized in Fig. 1.

## **2.7. Limitations**

This study is an integrative review rather than a quantitative assessment of drought-management interventions. It emphasizes conceptual integration and policy relevance. Although efforts were made to identify and analyze

relevant studies systematically, some specialized studies or non-English publications may not have been included. Nevertheless, the review provides an analytical basis for understanding drought governance challenges and informing future policy design.

## **3. RESULTS AND DISCUSSION**

### **3.1. Overview of the Reviewed Literature**

The integrative review indicates a marked expansion of scholarship on drought governance and community-based drought management, particularly in the past decade. This growth appears closely linked to intensifying concerns over climate change and recurring water scarcity across the region. The literature spans diverse disciplinary traditions, including water governance, environmental policy, sustainability science, and socio-hydrology. While governance and institutional dimensions dominate the field, attention to community-based adaptation and participatory water management has gradually increased, signaling a shift toward more locally grounded perspectives (Zokirov et al. 2025).

Geographically, research is concentrated in drought-prone areas of Southeast Asia, with Thailand, Vietnam, and the Mekong Basin featuring prominently. These case-based studies are complemented by comparative and conceptual analyses that extend beyond specific national contexts and offer broader analytical insights. Taken together, the literature reflects a growing acknowledgment that drought impacts cannot be explained by climatic variability alone. Instead, they are shaped by governance structures, institutional capacity, and the alignment or misalignment between policy frameworks and local water management practices.

### **3.2. Thematic Synthesis of Drought Governance Dimensions**

The thematic synthesis identifies five interrelated governance dimensions that consistently influence drought resilience outcomes across the reviewed studies.

### **3.3. Policy Frameworks and Coherence**

Numerous studies examine the role of national and local policy frameworks in shaping drought management. Several studies report that fragmented sectoral policies, particularly across water resources, agriculture, drought-risk reduction, and climate-change adaptation, undermine effective drought preparedness (Cejudo & Trein 2023, Tchinda & Talbot 2023). Conversely, policy coherence and integration support clearer planning, more defined institutional boundaries, and more consistent implementation

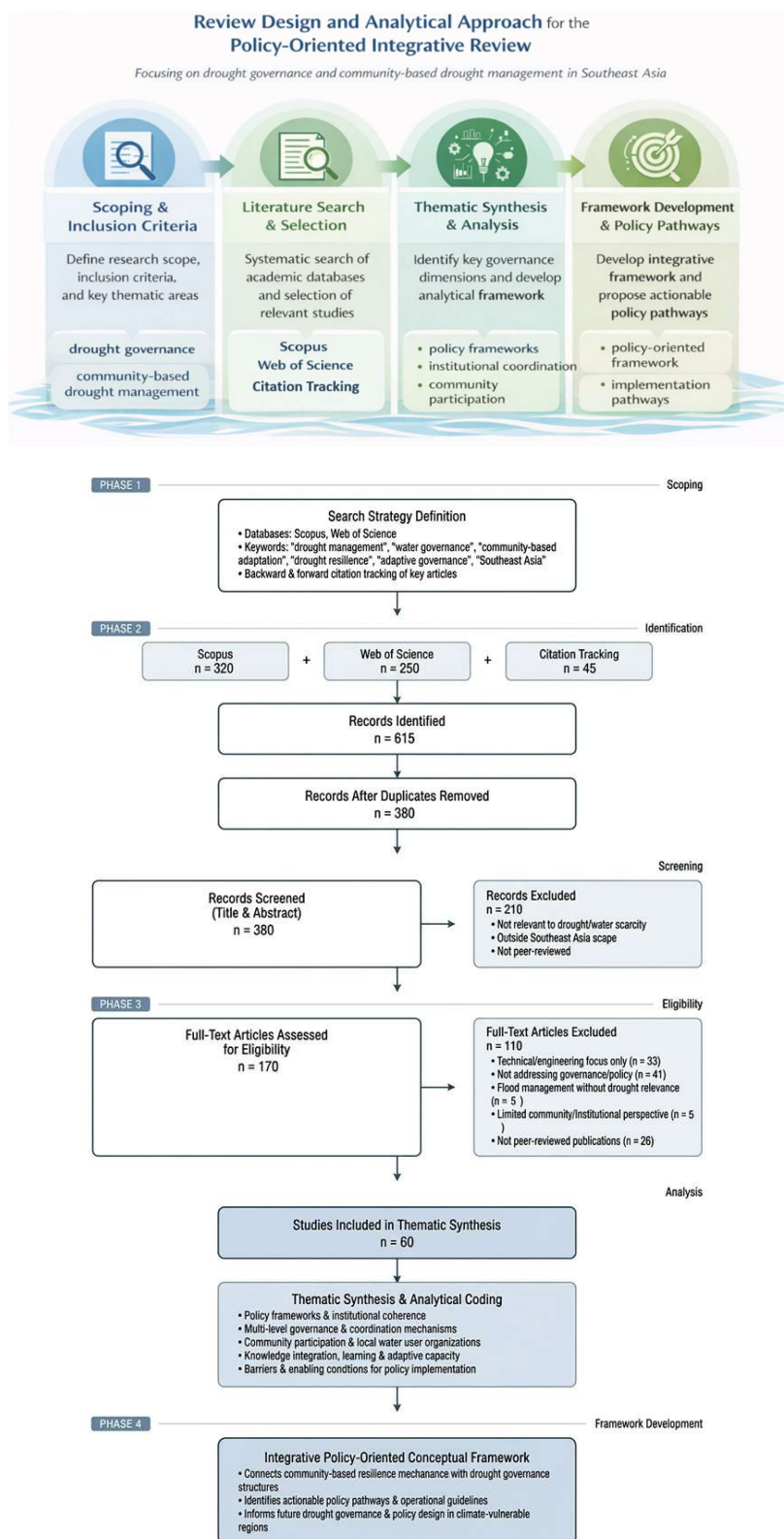


Fig. 1: Review design and analytical approach adopted in this policy-oriented integrative review.

during drought periods (Nelson et al. 2008, Sánchez et al. 2025).

### 3.4. Institutional Coordination and Multi-Level Governance

Institutional coordination emerges as a key factor determining effective drought-management outcomes. The reviewed literature identifies challenges associated with overlapping institutional mandates, weak interorganizational communication, and coordination across governance levels (Makaya et al. 2020, Sifundza et al. 2019). Studies also show that river-basin and intermediary governance structures can play an important role in adaptive decision-making when clear coordination mechanisms are in place (Ferraro & Failler 2024, Augustijn et al. 2025, Lima et al. 2024).

### 3.5. Community Participation and Local Water Institutions

Community-level water-management organizations, including water user organizations and agricultural groups, often play an important role in responding and adapting to drought (Babel et al. 2024, Chuenchum et al. 2024, Forni et al. 2021). According to the reviewed studies, community involvement improves the legitimacy, compliance, and contextual alignment of drought-management strategies. Nevertheless, formal recognition, institutional support, and alignment with higher-level policy frameworks are necessary for local institutions to be effective (Villamayor-Tomás et al. 2020), and to support adaptation strategies for agricultural resilience in a changing climate (Veisi et al. 2025).

### 3.6. Knowledge Integration and Learning Processes

The integration of local experiential knowledge with scientific knowledge, such as drought monitoring, climate forecasting, and early warning systems, is emphasized as crucial for adaptive decision-making throughout the evaluated studies (Adla et al. 2023, Chengot et al. 2025). Knowledge integration promotes readiness and enables institutions and communities to respond to uncertainty more adaptively. Sustained resilience is frequently shown to be facilitated by learning methods, such as iterative planning and participatory monitoring (Sutcliffe et al. 2024).

### 3.7. Adaptive Capacity and Feedback Mechanisms

The literature emphasizes the significance of adaptive capacity supported by feedback mechanisms that connect institutional learning and policy to drought outcomes (Tran et al. 2024). Governance systems that incorporate monitoring, evaluation, and policy adjustment are better suited to transition from reactive crisis management to proactive and

resilience-oriented approaches (Smith et al. 2016, Hashemy Shahdany & Rahparast 2025). Drought responses are often reactive and short-lived in the absence of such feedback systems.

### 3.8. Development of the Policy-Oriented Community Drought Resilience Framework

Synthesizing these thematic insights, the review results in the development of a Policy-Oriented Community Drought Resilience Framework. The framework conceptualizes drought resilience as an emergent outcome of interactions across three governance levels: policy and regulatory frameworks, institutional coordination mechanisms, and community-based water management practices.

At the policy level, coherence and integration across sectors provide the enabling environment for effective drought governance. At the institutional level, coordination and adaptive governance mechanisms translate policy objectives into operational decisions. At the community level, participation, local institutions, and knowledge integration shape context-specific adaptive responses. Feedback loops connect outcomes at the community and institutional levels back to policy learning and adjustment, reinforcing adaptive and transformative governance pathways.

### 3.9. Mapping Literature to Framework Components

The reviewed literature was systematically mapped onto the components of the proposed framework, demonstrating strong alignment between empirical and conceptual studies and the identified governance dimensions. Policy-oriented studies primarily inform the framework's policy coherence and institutional coordination components, while community-based studies substantiate the roles of participation, local institutions, and knowledge integration. This mapping confirms that drought resilience is not driven by isolated interventions but by the interaction of governance mechanisms across scales.

The proposed framework conceptualizes drought resilience as an outcome of dynamic interactions across policy, institutional, and community levels, rather than as the result of isolated technical interventions. It reflects insights synthesized from the reviewed literature and responds to the fragmented nature of drought governance commonly observed in Southeast Asia.

#### 3.9.1. Policy and Regulatory Level

At the macro level, national and local policy frameworks establish legal rules, resource-allocation mechanisms, and strategic priorities for drought management. Nevertheless, the review indicates that fragmented sectoral policies

across agriculture, water resources, disaster management, and environmental protection frequently result in inconsistent implementation during drought. Therefore, the framework must account for these critical system-level conditions.

### 3.9.2. Institutional Coordination and Governance

The intermediate level of the framework focuses on institutional management and coordination mechanisms among government agencies, river-basin organizations, and local authorities. Effective drought resilience depends on the ability of these institutions to align authority and responsibilities, share information, and coordinate decision-making across administrative boundaries. Weak institutional linkages and overlapping authorities are identified as significant barriers that undermine water allocation during periods of scarcity.

### 3.9.3. Community Participation and Local Water Management

At the local level, community organizations such as water user organizations, farm households, and traditional water institutions play an important role in translating policy objectives into operational procedures (Pandey et al. 2007). The framework shows that meaningful community participation improves efficiency, contextual relevance, legitimacy, and compliance, especially in rural areas at risk of drought. Local institutions serve as important intermediaries linking policy directives with bottom-up adaptive responses.

### 3.9.4. Knowledge Integration and Adaptive Capacity

The framework emphasizes the integration of local and experiential knowledge with scientific information at all levels (e.g., drought monitoring, forecasting, and climate projections). This integration enhances community-level readiness and facilitates flexible decision-making. As a result, learning processes and information flows are viewed as cross-cutting components that support institutional capability and the efficacy of policies.

### 3.9.5. Feedback Loops and Transformative Learning

The heart of the framework is a feedback circuit that connects drought impacts and management outcomes back to institutional learning and policy modification. These loops reflect the need for iterative adaptation, enabling the governance system to change in response to growing climate uncertainty. These feedback systems facilitate the transition from reactive crisis management to proactive and transformative drought governance over time.

This study advances the literature on drought governance and offers a transferable analytical lens for creating resilient, community-centered drought management strategies in climate-vulnerable regions by combining policy coherence, institutional coordination, and community participation within a single conceptual framework (Tiepolo et al. 2017).

As shown in Fig. 2, the framework illustrates the multi-scalar interactions between national and subnational policy frameworks, institutional coordination mechanisms, and community-level water management practices in shaping

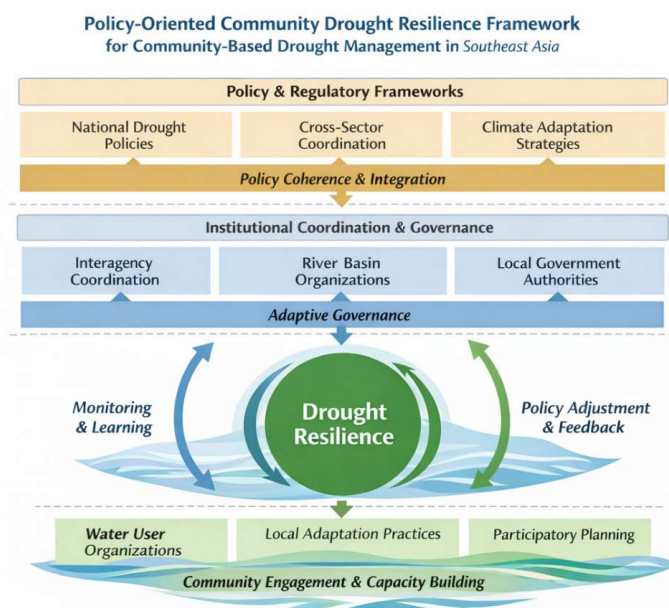


Fig. 2: Policy-oriented community drought resilience framework for community-based drought management in Southeast Asia.

Table 1: Mapping of reviewed literature to the components of the policy-oriented community drought resilience framework.

| Framework Component                            | Key Themes                                                                    | Representative Literature                                                                       | Key Insights for Drought Governance                                                                                                                           |
|------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Policy and Regulatory Frameworks               | Policy coherence, legal mandates, cross-sector integration                    | Nelson et al. (2008), Cejudo & Trein (2023), Tchinda & Talbot (2023), Sánchez et al. (2025)     | Fragmented sectoral policies undermine drought preparedness; integrated and coherent policy frameworks enhance anticipatory and preventive drought management |
| Institutional Coordination and Governance      | Multi-level governance, institutional fragmentation, coordination mechanisms  | Makaya et al. (2020), Sifundza et al. (2019), Ferraro & Failler (2024), Augustijn et al. (2025) | Weak coordination across agencies leads to inconsistent water allocation; aligned institutional mandates improve crisis response and long-term resilience     |
| Community Participation and Local Institutions | Water user organizations, collective action, legitimacy                       | Chuenchum et al. (2024), Forni et al. (2021), Villamayor-Tomás et al. (2020)                    | Community-based institutions enhance legitimacy, compliance, and context-specific adaptation, particularly in rural drought-prone areas                       |
| Knowledge Integration and Learning             | Scientific–local knowledge integration, information flows, learning processes | Adla et al. (2023), Sutcliffe et al. (2024), Chengot et al. (2025)                              | Combining climate information with experiential knowledge strengthens adaptive capacity and improves decision-making under uncertainty                        |
| Adaptive and Transformative Capacity           | Adaptive governance, resilience pathways, transformation                      | Nelson et al. (2008), Sánchez et al. (2025), Tran et al. (2024)                                 | Iterative learning and adaptive governance enable shifts from reactive drought response toward long-term resilience-building strategies                       |
| Feedback Loops and Policy Adjustment           | Monitoring, evaluation, institutional learning                                | Smith et al. (2016), Hashemy Shahdany & Rahparast (2025)                                        | Continuous feedback from drought outcomes supports policy refinement and institutional learning, reducing vulnerability over time                             |

drought resilience outcomes. It emphasizes the role of policy coherence, stakeholder participation, and knowledge integration in enabling adaptive and transformative responses to drought. Feedback loops highlight the importance of continuous learning and policy adjustment to address increasing climatic uncertainty and water scarcity.

Table 1 synthesizes key thematic contributions from the literature and illustrates how empirical and conceptual studies collectively inform the proposed multi-scalar framework for community-based drought management.

The mapping demonstrates that drought resilience emerges from the interaction of policy coherence, institutional coordination, and community participation, supported by knowledge integration and adaptive learning processes. Rather than operating in isolation, these components form an interconnected governance system that shapes drought outcomes across scales.

### 3.10. Implications for Drought Governance Theory

This review advances drought governance theory by reconceptualizing drought resilience as an emergent property of multi-scalar governance interactions rather than the product of isolated technical or sectoral interventions. By bringing policy design, institutional coordination, and community-level practice into a single analytical frame, the proposed framework intervenes in ongoing debates on adaptive governance, policy integration, and community-based natural resource management (Lambelet 2023).

The synthesis reinforces key insights from adaptive governance scholarship while extending them in important ways. Adaptive governance is often associated with flexibility and responsiveness to environmental change (Nelson et al. 2008). However, the findings here suggest that adaptive capacity is contingent upon prior institutional conditions, particularly policy coherence and alignment across governance levels (Cejudo & Trein 2022, Sarti 2023).

In settings marked by fragmented mandates and overlapping authorities, local adaptive initiatives frequently encounter structural constraints. Flexibility at the community level cannot compensate for systemic misalignment at higher policy tiers.

The analysis also refines polycentric and multi-level governance perspectives. Rather than equating decentralization with resilience, the review demonstrates that what matters most is the quality of coordination among governance centers (Ziervogel et al. 2019, González et al. 2025). Interactions between national policy frameworks, intermediary institutions, and local water management organizations shape drought outcomes in practice. Clear role differentiation, information exchange, and shared problem framing appear more consequential than the mere proliferation of decision-making nodes. In this respect, the findings shift attention from structural complexity to functional integration in drought-prone contexts.

Community-based institutions emerge not simply as participatory actors, but as boundary organizations

that translate abstract policy objectives into operational water allocation decisions under conditions of scarcity (Sithirith et al. 2024). Much of the existing literature frames participation normatively; the present synthesis highlights its substantive governance function. Local organizations mediate between top-down regulation and bottom-up adaptation, thereby linking collective action to broader institutional arrangements. This perspective strengthens theoretical connections between community-based resource management and governance effectiveness.

The framework further contributes to theoretical discussions on knowledge integration by treating learning as a cross-cutting process rather than a discrete intervention. The integration of climate forecasts, drought monitoring systems, and experiential knowledge enhances both decision quality and institutional legitimacy. Importantly, knowledge co-production is shown to be particularly significant in contexts characterized by data scarcity and administrative complexity. Here, learning processes become central to sustaining governance resilience (Raza et al. 2026).

Finally, the emphasis on feedback loops and policy adjustment moves the discussion beyond incremental adaptation. By linking drought experiences to institutional learning and policy revision, the framework conceptualizes resilience as a dynamic and iterative process. Governance systems evolve through cycles of evaluation, recalibration, and reform. Resilience, in this sense, is neither static nor guaranteed; it depends on the capacity of institutions to learn from stress and adjust accordingly.

Taken together, these insights suggest that drought governance should be understood as a relational and evolving system. Resilience emerges from coordination, shared learning, and cross-scale alignment. Grounded in the Southeast Asian context yet analytically transferable, the framework provides a conceptual bridge between region-specific empirical studies and broader debates in environmental governance theory.

### 3.11. Policy Implications and Pathways for Implementation

The synthesis also carries significant implications for policy design and implementation. Strengthening drought resilience requires more than expanding infrastructure or emergency response capacity. It entails shifting from fragmented, sector-specific interventions toward coordinated governance pathways that align policy, institutions, and community practice.

Policy coherence across water, agriculture, disaster risk reduction, and climate adaptation sectors is a foundational step (Tchinda & Talbot 2023). When mandates conflict or

remain siloed, implementation gaps widen during drought events. Embedding anticipatory measures, such as early warning systems, predefined allocation rules, and adaptive planning instruments, within integrated policy frameworks can reduce institutional contradictions and improve preparedness.

At intermediary governance levels, coordination mechanisms require particular attention. River-basin organizations and subnational authorities often occupy pivotal positions, yet their effectiveness depends on clear mandates, formalized collaboration platforms, and shared information systems (Makaya et al. 2020). Incentive structures that encourage interagency collaboration are especially important in administratively fragmented settings.

Community-based water management organizations play a decisive operational role. Formal recognition of their governance responsibilities, coupled with sustained capacity-building and financial support, can enhance their ability to implement equitable and context-sensitive allocation decisions. Without institutional backing, local initiatives risk remaining isolated or vulnerable to higher-level policy shifts.

Institutionalizing the integration of scientific and local knowledge is equally critical. Embedding climate services, participatory monitoring, and knowledge-sharing mechanisms within governance structures strengthens both adaptive decision-making and stakeholder trust. These mechanisms function not merely as technical enhancements, but as relational processes that build legitimacy.

Continuous monitoring, evaluation, and policy adjustment must be treated as ongoing components of governance rather than episodic reforms. Feedback mechanisms linking drought outcomes to policy revision enable systems to adapt to shifting climatic and socioeconomic conditions (Smith et al. 2016, Tran et al. 2024, Nasir et al. 2025). Over time, such iterative processes can support more transformative shifts in governance practice.

Collectively, these pathways point toward hybrid governance arrangements that combine strategic policy direction with meaningful community engagement. Implementing them requires political commitment, institutional flexibility, and sustained investment in both technical and social capacities. If operationalized effectively, these principles offer concrete entry points for transitioning from reactive drought response to proactive, equitable, and adaptive governance in water-scarce regions.

## 4. CONCLUSIONS

In conclusion, this research contributes a conceptual framework that bridges empirical insights from Southeast

Asia with broader theoretical debates in environmental governance. By grounding abstract governance theory in the lived realities of a climate-vulnerable region, the study yields several critical inferences. First, it demonstrates that effective drought governance cannot rely on centralized, top-down mandates; rather, it requires polycentric coordination that empowers local actors and integrates traditional ecological knowledge. Second, the study infers that adaptive capacity is fundamentally tied to inclusivity; when marginalized communities are excluded from decision-making, drought responses remain fragmented and inequitable. Third, the analysis clarifies that the shift from reactive crisis management to proactive resilience demands institutional flexibility, where governance systems are designed to learn and evolve alongside shifting climatic conditions.

Based on these findings, the study offers several targeted recommendations for policymakers and practitioners. Primarily, governance reforms must institutionalize cross-sectoral collaboration, actively dismantling the policy silos that typically separate water resource management, agricultural planning, and disaster risk reduction. Additionally, practitioners must move beyond superficial consultation to co-design drought interventions with local communities, ensuring that resilience strategies are contextually grounded and socially equitable. Furthermore, funding mechanisms must be restructured to prioritize preemptive, adaptive capacity-building over costly, post-disaster emergency relief.

Finally, while this framework provides both analytical clarity and practical direction for building more adaptive, inclusive, and resilient drought governance systems, empirical testing must continue. Future research should further explore how these governance principles operate across different sociopolitical contexts, particularly in regions with contrasting political economies or different historical legacies of resource management. Moreover, longitudinal studies are essential to assess the long-term impacts of integrated governance reforms on drought resilience, tracking whether these conceptual frameworks translate into sustained, on-the-ground reductions in socioecological vulnerability over time.

## 5. ACKNOWLEDGEMENT

The authors acknowledge the University of Phayao and the Thailand Science Research and Innovation for providing funding for this study (Fundamental Fund 2026, Grant No. 2291/2568).

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