PARLIAMENTARY CENTRE OF ASIA
Strengthening Parliamentary Capacity

Training of Trainers on Briefing Note Writing

Research Paper

Enhancing Climate Resilience and Disaster Preparedness: The Case of Flooding in Thailand

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1. Introduction

Southeast Asia is one of the region most vulnerable to climate change, with its countries facing extreme weather events, rising sea levels, and ecosystem degradation. Thailand, characterized by its extensive coastlines, urbanized areas, and rural communities reliant on agriculture, is especially susceptible to climate risks, making it prone to floods, droughts, and tropical storms [1]. These challenges are particularly acute in flood-prone regions such as Northern Thailand, which suffered widespread devastation in September 2024. The socio-economic impacts of the flood have been substantial, affecting critical infrastructure, disrupting livelihoods, and increasing the vulnerability of marginalized communities, underscoring the urgency of evaluating legislative frameworks and policies that address climate resilience and disaster preparedness.

Despite Thailand's comprehensive climate-related legal frameworks and policies to address flooding, their effective implementations were hindered by several major factors including fragmented disaster management systems, weak enforcement and compliance, limited coordination across ministries and local authorities, insufficient funding, and inadequate climate data integration and technology [2].

The objective of this parliamentary research is to contribute to strengthening national legislative frameworks and policies aimed at prioritizing and integrating climate-related enforcement mechanisms, adaptation strategies centered around ecosystems, sufficient funding, inter-agency and regional cooperation, and technology and data systems for broader, long-term climate resilience and effective disaster preparedness.

This research paper seeks to address four research questions:

- *What are the key vulnerabilities and socio-economic impacts of climate risks, particularly flooding, on critical sectors (e.g., agriculture, infrastructure, and health)?*
- *What are the existing legislative, institutional, and policy frameworks on climate risks, particularly flooding, in Thailand?*
- *What are the barriers to disaster preparedness and environmental sustainability of Thailand?*
- *What role can the Thai Parliament play in addressing policy gaps, leveraging comprehensive climate adaptation laws and promoting cross-sectoral coordination to build a more climate-resilient and disaster-prepared future for Thailand?*

2. Causes and Impacts of Flooding in the Northern Provinces of Thailand

Flooding in northern Thailand is considered a normal occurrence during the monsoon season, with the heaviest rains typically occurring between June and September. While flooding is expected annually in certain regions, the scale and impact of the floods in 2024 were notably more severe than in typical years. Key factors include exceptionally heavy and prolonged rainfall,

urban expansion blocking natural drainage paths, deforestation and conversion to monoculture agriculture[1] reducing soil water retention, and topography of mountainous regions leading to flash floods and high-water levels in the Mekong River and its tributaries slowing drainage [3].

The above-mentioned factors have resulted in more frequent, intense and long-lasting floods, affecting areas that are rarely flooded and causing significant damages across multiple provinces. According to the Department of Disaster Prevention and Mitigation, the flooding in 37 provinces, mostly in the North and Northeast, impacted 181,870 households between August and September. The natural disaster also killed 49 people and injured 28 others [4]. The widespread impact of the floods on households, agriculture, industry, and tourism have contributed to a slowdown in the economy. Krungsri Research projects that the economic losses from flooding this year could be as high as 46.5 billion baht, or about 0.27% of the country's gross domestic product [5].

3. Thailand's Existing Legislative, Institutional, and Policy Frameworks

In Thailand, disaster risk management (DRM) is based on a solid legal foundation, supported by a comprehensive policy framework which outlines the roles and responsibilities of the DRM landscape among administrative levels [6] including legislative, institutional and policy frameworks, as will be further discussed in this paper.

1. Legislative framework: Disaster Prevention and Mitigation Act, B.E. 2550 (2007) serves as Thailand's primary legislation for disaster risk management (DRM), outlining the roles and responsibilities of various agencies in disaster prevention, preparedness, response, and recovery [7]. The National Disaster Prevention and Mitigation Plan of 2015 describes a set of strategic objectives to guide the operationalization of DRM, aligned with the 4 Priority Actions of the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030, including inclusive disaster risk reduction; integrated emergency management; effective recovery and resilience building; and strengthened international cooperation, adopting multi-agency and multi-sectoral approaches [8].

   Moreover, Thailand is a signatory to both the Paris Agreement on climate change and the Sendai Framework for Disaster Risk Reduction, actively participating in international efforts to combat climate change and minimize disaster risks by implementing strategies aligned with these frameworks within its own policies and practices.

[1] Monoculture agriculture refers to the practice of growing a single crop over large areas, which depletes soil nutrients and reduces its organic matter. This leads to diminished soil structure and water retention capacity, making it more prone to erosion and drought.

2. Institutional framework: A key outcome of the Disaster Prevention and Mitigation Act, B.E. 2550 (2007), a cornerstone legal framework in Thailand for disaster risk management, marked the formal establishment of the Department of Disaster Prevention and Mitigation (DDPM) under the Ministry of Interior. The DDPM is responsible for overseeing disaster risk reduction initiatives, implementing early warning systems, and coordinating emergency responses during natural and man-made disasters. The department also plays a critical role in public education, community drills, and post-disaster rehabilitation [9].
3. Policy framework: Climate Change Master Plan (2015-2050) is designed to help Thailand achieve sustainable low carbon growth and climate resilience by integrating climate change considerations into national development planning in all sectors to ensure the country's adaptability to climate change [10]. Thailand's National Adaptation Plan (NAP) (2024) was developed to enhance resilience against climate change impacts by offering a framework for adaptation actions across six key sectors, including water resources management, agriculture and food security, tourism, public health, natural resources management, and human settlements and security. It aims to integrate climate adaptation into national policies and plans at all levels [11].

4. Legal and Policy Gaps in Thailand's Climate-Related Laws and Frameworks

Although Thailand has extensive climate-related laws and frameworks, it faces several significant legal and policy issues, which has led to challenges in effective enforcement and compliance and hindered progress towards achieving broader climate resilience and disaster preparedness in the country. These include 1) fragmentation of national climate frameworks and inadequate enforcement, 2) limited focus on ecosystem-based adaptation, 3) insufficient financial mechanisms, 4) inadequate climate data integration and technology, and 5) lack of transboundary coordination. These five legal and policy gaps in Thailand's climate-related laws and frameworks can be discussed as follows:

4.1. Fragmentation of National Climate Frameworks and Inadequate Enforcement

According to the Climate Action Tracker, among ASEAN countries, Thailand's current climate policies and commitments show limited progress and are not yet aligned with the targets of the Paris Agreement, highlighting significant room for improvement in implementing environmental laws [12]. Despite having multiple frameworks governing climate change and disaster risk management in place such as the Disaster Prevention and Mitigation Act (2007) and the Climate Change Master Plan (2015-2050), these frameworks often operate in silos, leading to duplication of efforts and gaps in coordination. Multiple agencies and ministries are involved in flood management, such as the Ministry of Natural Resources and Environment, the Ministry of Interior, and the Royal Irrigation Department. However, there is a lack of coordination and

integrated strategies between these agencies, which results in an ineffective implementation of policies and delays in emergency responses to flood events. The government bodies tasked with enforcing climate-related laws, particularly at the local level, often lack technical capacity, political will, and specialized knowledge on climate science, environmental protection, and the technical aspects of implementing laws. Additionally, the general public's limited awareness of climate-related issues and their role in enforcing laws can make it difficult to push for change. Without public demand or grassroots movements for climate action, there is less pressure on the government to enforce laws effectively.

4.2. Limited Focus on Ecosystem-Based Adaptation

Thailand's disaster management strategies predominantly focus on engineered infrastructure, such as flood walls and drainage systems, which, while effective in the short term, do not address long-term sustainability or ecological health. Ecosystem-based approaches, such as wetland restoration or forest conservation, which offer cost-effective, sustainable alternatives for disaster risk reduction and climate resilience, are often overlooked or underfunded. There is also a lack of a cohesive national framework to integrate nature-based solutions (NbS)[2] and ecosystem-based adaptation (EbA) [3] across various sectors. This fragmentation results in missed opportunities for synergy between ecosystem protection and disaster resilience efforts.

For example, in an attempt to reduce the risk and damages of flooding and drought, Thailand has, in the past, developed adaptation policies in the water sector, focusing on promoting integrated basin management, supporting community-based water resources management, encouraging more efficient use of water, and enabling more diversity in farming. However, most adaptation efforts focus on spending money on construction to protect against and reduce impacts, rather than exploring and using ecosystem-based solutions [13].

4.3. Inadequate Financial Mechanisms

Thailand has received support from various international partners to facilitate climate actions in mitigation, adaptation, and enabling environment, including the preparation of Thailand's Fourth National Communication (NC4) and Forth Biennial Update Report (BUR4) to the United Nations Framework Convention on Climate Change (UNFCCC). From 2018-2022, Thailand has already received financial support of approximately 31 million USD (1.07 billion THB) from multilateral and bilateral partners for a total of 34 projects, entailing 18 mitigation projects and 10 adaptation projects for an approximate amount of 49 million USD (1.7 billion THB), and 6 enabling

[2] Nature-based solutions (NbS) refer to strategies that utilize natural processes and ecosystems to address environmental challenges, such as climate change and disaster risks.

[3] Ecosystem-based Adaptation (EbA) is a specific approach within NbS that focuses on using biodiversity and ecosystem services to help communities adapt to the impacts of climate change.

environment projects for an estimated 3.4 million USD (118 million THB) [14]. However, despite these financial supports, Thailand, like in many developing countries, still faces insufficient financial resources to allocate towards climate change mitigation and adaptation. The country requires significant investments to implement projects that can effectively address climate change challenges. While the government may allocate resources for immediate economic needs or large infrastructure projects, climate resilience and disaster preparedness are sometimes deprioritized, leading to inadequate funding. Inadequate financial mechanisms also stem from weak institutional capacity to manage climate funds effectively. This includes challenges with budgeting, monitoring the allocation of resources, and ensuring transparency in the distribution of funds. Without strong governance and oversight, funds may be misallocated or mismanaged, reducing their impact on disaster preparedness and climate resilience.

4.4. Inadequate Technology and Climate Data Integration

While Thailand has made strides in adopting digital technologies, the application of advanced technologies like Artificial Intelligence (AI), remote sensing, and machine learning in disaster management is still underdeveloped. In Thailand, disaster-related data, including hydrological, meteorological, and geospatial data, often exists in isolated silos. Different agencies, such as the Department of Disaster Prevention and Mitigation, the Thai Meteorological Department, and the Royal Irrigation Department, manage separate databases, making it difficult to create a unified, real-time picture of disaster risks. Early warning systems, although present, are often outdated, rely on limited data sources, or have poor coverage. This prevents communities from receiving timely alerts, and decision-makers from making data-driven responses. Flood forecasts may come too late or lack precision, leading to missed opportunities for evacuation or risk mitigation [15].

4.5. Lack of Transboundary Coordination

Flooding in northern Thailand highlights the need for stronger transboundary legal agreements on water resource management, particularly with upstream Mekong River countries. Thailand shares borders with several countries, including Myanmar, Laos, Cambodia, and Malaysia. Climate-related events, such as heavy rainfall and flooding, often transcend national borders. Without proper coordination and joint strategies, the response to flooding and other disasters remains fragmented. The lack of standardized data sharing between Thailand and its neighbors makes it difficult to predict and manage floods that originate from transboundary sources. Information on rainfall, river water levels, and flood forecasts are often collected separately, and there is no unified platform for sharing real-time data across borders.

While there are some initiatives in Southeast Asia aimed at addressing climate risks such as the ASEAN Agreement on Disaster Management and Emergency Response (AADMER), these efforts

often lack depth, enforcement mechanisms, and long-term commitment. As a result, Thailand's disaster response can become reactive rather than proactive, and countries may not act in unison to mitigate the worst impacts of climate disasters.

5. Role of the Thai Parliament in Enhancing Climate Resilience and Disaster Preparedness

Parliaments are not only well placed to scrutinize how governments are responding to national and international climate change issues, but can also hold their executives to account over their actions, or lack thereof. Furthermore, parliamentarians bridge the gap between constituents, governments and decisions made at the global level. To be credible, effective and legally enforceable, international agreements on climate change, such as the Paris Agreement and the Sendai Framework, must be transposed into national legislation, supported by appropriate budget allocation and robust oversight of government performance. This puts parliaments at the heart of the response to climate change [16]. The Thai Parliament can play a crucial role in enhancing climate resilience and disaster preparedness through its core functions of legislation, representation, oversight, and budget approval.

5.1. Legislation

In terms of legislation, Parliament is responsible for enacting laws and policies that promote sustainable development, climate adaptation, and disaster risk reduction. The legislative branch has responsibility for developing pertinent new legislation or updating existing normative frameworks, adjusting these based on international mechanisms and instruments, reforming institutional structures to allow for an adequate response to intensified climate phenomena, and strengthening national risk reduction systems. In order to harmonize fragmented legal and institutional frameworks, the Thai Parliament can enact an integrated climate legislation, building on existing national laws and establish independent oversight bodies to monitor compliance with climate-related regulations. Currently, Thailand is working on the Draft Climate Change Act, which will further strengthen climate adaptation measures, including investing in climate-resilient infrastructure, early warning systems, and disaster response plans [17]. At local level, the Parliament can amend laws to empower local governments with more authority and resources for implementing tailored climate and disaster preparedness plans.

With regards to limited focus on ecosystem-based adaptation, the Thai Parliament can also aim to amend existing urban planning laws to mandate the inclusion of Nature-based Solutions (NbS) and Ecosystem-based Adaptation (EbA) strategies, to leverage nature and the power of healthy ecosystems to protect people, optimize infrastructure and safeguard a stable and biodiverse future, and strengthen national forest management regulation by explicitly including provisions for protecting and restoring ecosystems critical to flood resilience.

On the lack of integrated data systems and insufficient technological infrastructure, the Parliament can pass laws and policies that mandate the establishment of a centralized, publicly accessible climate data repository, ensuring real-time data sharing among agencies, enact legislation to fund the development and deployment of advanced flood forecasting and early warning systems and include legal provisions for ongoing training of officials and stakeholders on climate data interpretation and technology use.

Furthermore, in order to address the issue of transboundary coordination and improve Thailand's climate resilience and disaster preparedness, the Thai Parliament can work with its regional counterparts to enhance agreements and frameworks that promote joint disaster response and climate resilience, strengthen legal frameworks to support active participation in regional bodies like the Mekong River Commission, fulfill binding agreements on water sharing and flood management, and advocate for a regional ASEAN Climate Resilience Framework, ensuring a unified approach to transboundary climate risks.

5.2. Representation

In terms of representation, parliamentarians can advocate for the needs of local communities, especially those in disaster-prone areas, ensuring that their voices are heard in national policy discussions. By incorporating local perspectives into climate resilience policies, parliamentarians can help create more effective solutions that align with both local and national objectives.

5.3. Oversight

The oversight function allows the Parliament to hold the government accountable for the implementation of climate resilience initiatives, ensuring that disaster management policies are effectively executed. Parliament can monitor the implementation of disaster management plans and monitor the progress of cross-ministerial as well as local authorities' coordination. By holding regular hearings or inquiries, Parliament can encourage transparency and identify gaps or inefficiencies in the coordination efforts between DDPM and local governments, pushing for improvements where necessary.

5.4. Budget approval

Through budget approval, parliament can allocate necessary resources to support climate-related projects, disaster preparedness, and emergency response efforts, especially to communities in disaster-prone areas, ensuring that funds are appropriately directed toward strengthening the country's resilience to natural hazards. Budget allocations should further allow for the implementation of national disaster risk reduction strategies developed in compliance with the international climate frameworks, as well as foster better understanding of risk within vulnerable social and economic sectors. The Parliament can prioritize investments in

infrastructure that is resilient to climate change, such as flood barriers, water management systems, and green infrastructure like urban forests, which will reduce the long-term costs associated with disaster response and recovery, and develop public-private partnerships to provide affordable flood insurance, ensuring coverage for low-income households. Additionally, Parliament can prioritize investments in advanced technology, such as satellite-based monitoring systems, predictive modeling tools, and early warning systems, improve data collection and sharing, and train personnel in the use of new systems, all of which are crucial for timely, effective disaster risk management.

6. Conclusion

Southeast Asia, particularly Thailand, faces significant climate risks, with flooding as a recurring challenge exacerbated by heavy rainfall, urban expansion, and deforestation. Recent severe floods in Northern Thailand during August to September 2024 highlighted intensified socio-economic impacts, including infrastructure damage, economic losses, and impacts to the overall livelihood of the local communities, underscoring the urgency of legislative action. While Thailand has established numerous climate frameworks, like the Disaster Prevention and Mitigation Act (2007) and Climate Change Master Plan (2015-2050), fragmented enforcement, limited ecosystem-based adaptation, inadequate funding, limited data integration and technology, and lack of transboundary coordination hinder their effectiveness, ultimately limiting their ability to effectively implement necessary actions to enhance climate resilience and combat climate-related disasters. The Thai Parliament can play a critical role in addressing these gaps and ensuring long-term sustainability by institutionalizing climate resilience as a legislative priority, enacting integrated climate laws, promoting cross-sector cooperation, particularly between central and local authorities, strengthening ecosystem protections, fostering regional cooperation, enhancing technology use, and securing sustainable funding mechanisms for long-term resilience and disaster preparedness for future generations.

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