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Water Governance and Environmental (In)justice in Bang Ban Floodplain Areas, Phra Nakhon Si Ayutthaya Province, Thailand

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[*Abstract*]

This study examines water governance and environmental justice in the Bang Ban floodplain area of Phra Nakhon Si Ayutthaya Province, Thailand. The Bang Ban floodplain, a critical natural flood retention area, plays a significant role in mitigating flood risks and supporting local agriculture, particularly rice cultivation. However, state-managed water policies have led to continuous flooding, environmental degradation, and economic challenges for local residents and farmers. The research focuses on the distributive and procedural justice aspects of water governance, highlighting the inequitable distribution of environmental impacts and the lack of genuine local participation in decision-making processes.

The findings reveal that centralized water governance policies have resulted in significant environmental injustice.

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Residents and farmers in Bang Ban face recurrent floods and water shortages, disrupting their agricultural cycles and livelihoods. The study also pinpoints a deficiency in procedural justice, given the exclusion of local communities from significant involvement in water management decisions. The adverse effects include economic losses, reduced biodiversity, and increased vulnerability to environmental hazards. The research underscores the need for more inclusive and equitable water governance strategies that address both environmental justice and sustainable development.

Keywords: environmental justice, water management, Bang Ban Floodplain, flood retention area, Thailand

Ⅰ. Introduction

Bang Ban, located in Phra Nakhon Si Ayutthaya Province, is a wetland area that plays a crucial role in water management and sustaining the ecosystem in central Thailand. Covering over 30,000 Rai, Bang Ban acts as a natural floodplain that helps prevent and reduce flood risks in low-lying areas. Due to the geography of the Chao Phraya River, when water levels rise, the excess water is diverted into low-lying floodplains such as Chiang Rak, the left bank of the Chai Nat-Pasak Canal, and Tha Wung. During the flood season from September to December, the average water level is 30-40 centimeters and remains for about 10-15 days in 111 villages (Yodsurang and Uekita 2015). This role highlights the importance of water resource management closely linked to the economy, culture, and sustainability of life in the Bang Ban community.

However, Bang Ban is facing environmental threats, including recurring floods and droughts that affect people, the economy, and the environment. The recurring floods in Bang Ban, which acts as a floodplain for the Chao Phraya River, have caused significant damage to local farmers' fields multiple times, such as in 1978, 1983, 1988, 1992, 1995, 2002, 2006, 2010, and most severely in 2011. These floods have led to a loss of biodiversity. If these issues worsen, the local population and farmers will face food shortages, economic

decline, and severe environmental degradation. Conversely, during droughts, Bang Ban suffers from water shortages, preventing local farmers from engaging in agriculture due to the loss of water sources for farming and consumption. Consequently, Bang Ban loses vital food sources and income from eco-tourism (Yokying and Promkhambut 2024).

After the flood in 2006, the government studied the potential of Bang Ban as a floodplain or "monkey cheek" project to manage and reduce flood risks. During the great flood of 2011, the Bang Ban project was implemented to protect key economic areas and reduce damage to nearby communities, such as industrial estates in Pathum Thani Province. The Bang Ban floodplain can store approximately 89.63 million cubic meters of water at a depth of 3 meters, with compensation of about 37.21 million baht per year, which is considered the best option (Trakuldit and Faysse 2019).

In 2017, the Thai government under the National Council for Peace and Order (NCPO) established the National Water Resources Office (NWRO) as a central organization for unified and efficient water management in the country. The NWRO is responsible for recommending policies, creating strategic plans, and monitoring and evaluating the overall water management system under the Office of the Prime Minister (National Water Resources Office 2024a). The Bang Ban "monkey cheek" project is part of the state's water resource management policy, which directly impacts the livelihoods of local farmers. This has led to complex local conflicts and raised questions about environmental justice, such as inadequate compensation for recurring flood damage.

In addition to the core environmental justice framework, this study engages with wider Southeast Asian and global scholarship on water governance. Scholars working on the Mekong region have highlighted how centralized hydraulic projects often marginalize rural and indigenous communities, echoing the situation in Bang Ban (Dore, Lebel, & Molle 2012; Armitage, De Loë, Morris, Edwards, Gerlak, Hall, & Wolfe 2015). Research in Vietnam and Cambodia similarly reveals distributive injustices where smallholder farmers face disproportionate burdens from state-directed flood control

policies (Nguyen, Sebesvari, Souvignet, Bachofer, Braun, Garschagen, & Hagenlocher 2021; Nguyen-Van-Quoc, Turhan, & Holzhacker 2023). Beyond Southeast Asia, studies from South Korea on floodplain relocation demonstrate how compensation frameworks and relocation schemes often inadequately consider cultural attachments to land (Han and Kuhlicke 2021). Moreover, comparative studies in the United States and Europe also emphasize how levee politics and flood retention decisions reproduce inequalities (Dottori, Mentaschi, Bianchi, Alfieri, & Feyen 2023; Wing, Lehman, Bates, Sampson, Quinn, Smith, & Kousky 2022).

Importantly, Bang Ban serves as a significant case study in public policy, exploring the balance between water resource management to promote the macroeconomic system and preserving local livelihoods and biodiversity. The failure to comprehensively manage water resources leads to ecosystem degradation, loss of biodiversity, and economic and social inequality (Dovers & Hussey 2013; Hamel & Tan 2022). While the primary goal of public policy is sustainability, the government must consider justice in water resource management and balance economic benefits with ecological security. This includes listening to local community feedback to ensure that policies support sustainability in all dimensions: environmental, social, and economic (Iyer & Reczek 2017).

Prior studies document flood-risk governance and environmental justice in Southeast Asia and beyond, but few examine state-designated retention areas where agricultural calendars are structurally synchronized with flood releases. By situating Bang Ban within these debates, this research aims to study the characteristics of state-managed water systems in Bang Ban and their impact on environmental justice for local residents, reflecting the true water usage, hardships, and lifestyles of the people in the area. This research demonstrate how Thailand's flood retention policies fit into broader patterns of environmental injustice that affecting health, well-being, culture, and lifestyles (Biswas 2022), while also underlining the unique dynamics of rice-based agrarian livelihoods and the role of the "monkey cheek" project in Southeast Asia. Finally, this paper contributes by (1) identifying concrete

distributive and procedural justice mechanisms in a live retention landscape; and (2) proposing an actionable governance model (co-decision, rights-based compensation, participatory monitoring) that can be institutionalized at local level.

Ⅱ. Research Objectives

This research aims to study

2.1. The characteristics of water governance in the Bang Ban floodplain.

2.2. The impact of water governance on environmental justice for the residents of the Bang Ban floodplain.

Ⅲ. Research Methodology

This research employs a qualitative research method through a case study of the Bang Ban floodplain, involving 31 participants. The research methodology includes the following steps:

3.1. Data Collection

Fieldwork was conducted between March and September 2023 in Bang Ban District. A total of 31 participants were engaged through purposive and snowball sampling.

3.1.1. Document Review: The researcher reviewed literature and documents related to water management policies in the Bang Ban floodplain, such as reports from the Royal Irrigation Department, the National Water Resources Act, and other relevant documents. This document review helped us understand the context and policies affecting water governance in the area. Document analysis included reports from the Royal Irrigation Department, provincial announcements, ONWR policy documents, Thailand's Water Resources Act B.E. 2561 (2018), and other relevant documents. Online sources such as official maps and flood management plans were accessed in February and

September 2024, with access data clearly reported in references.

3.1.2. In-depth Interviews: The researcher conducted in-depth interviews with key informants. The sample included 15 in-depth interviewees in the Bang Ban floodplain (8 males, 7 females), ranging in age from 34 to 72, consisting of 5 community leaders such as village headman and headwoman, 5 local researchers and experts, and 5 government officials. These interviews provided comprehensive information on the impact of water governance policies on the daily lives of residents.

3.1.3. Focus Group Discussions: Two focus groups were organized with 16 participants in total (9 female, 7 male), including younger farmers and villagers under 40 and senior farmers and villagers above 60, to capture in-depth information on the impact of water management policies and environmental justice in intergenerational perspectives. Recruitment criteria included direct involvement in rice farming, water user groups, or local leadership positions. The data provided an overview of the opinions and experiences of different groups of residents.

3.2. Data Analysis

The researcher used content analysis to analyze the data obtained from interviews and focus group discussions, focusing on issues related to water governance and environmental justice. Content analysis helped researchers to identify key issues and trends emerging from the collected data.

To ensure trustworthiness, interview and focus-group transcripts were openly coded and then axial-coded to derive themes aligned with distributive and procedural justice. Coding was performed by two researchers and discrepancies were resolved by discussion. Data triangulation combined interviews, focus-groups, and policy documents. We conducted brief member-checking with local key informants to validate interpretations. The sample reached thematic saturation when no new codes emerged.

Ⅳ. Ethical Approval

This research received ethical approval under the human research ethics number KUREC-SSE66/40 on February 27, 2023.

Ⅴ. Concepts and Theories

5.1. Environmental Justice

Environmental justice is a principle that focuses on the fair distribution of environmental impacts, ensuring that no single group bears a disproportionate burden or risk compared to others (Middleton 2012). It aims to distribute environmental benefits and burdens within society in a just and equitable manner, regardless of race, class, background, or income. This principle emphasizes the right of every individual to live in a clean and healthy environment and to have equal access to natural resources, environmental protection, and decision-making processes (Mohai, Pellow, & Roberts 2009). Environmental justice includes the following key principles (Middleton 2012):

5.1.1. Distributive Justice: This principle calls for the fair distribution of environmental impacts, for example, distribution of flood risks, water allocation, and compensation across groups (e.g., upstream/downstream, pump owners/non-owners). The distributive justice ensure that no group with more power or resources benefits more than those with less power or resources (Middleton 2012).

5.1.2. Procedural Justice: This principle emphasizes the participation of the public in environmental decision-making processes, including access to information, voice in rule-setting, involvement in planning, fairness of grievance redress and transparency in various processes (Middleton 2012).

Environmental justice seeks to address historical and systemic inequalities, including the disproportionate environmental burdens faced by marginalized or low-income communities. These communities often bear the brunt of environmental hazards and

pollution, racial and class-based environmental discrimination, and environmental colonialism (Walker 2012). It also encompasses the idea of equal access to environmental decision-making and the acceptance and respect for alternative environmental worldviews (Di Chiro 2016).

The goal of environmental justice is to ensure that everyone has the right to live in a good and safe environment without discrimination or neglect in decisions that affect their lives and health (Middleton 2012). Environmental justice is integrated into various disciplines, including environmental law, sociology, and political science to create international justice and achieve sustainability. Recognizing environmental justice is crucial for addressing the root causes of ecological crises and promoting scientific development and sustainable societies (Walker 2012).

In the Bang Ban context, distributive justice refers to the (mal)distribution of flood risks, water allocation, and compensation across groups (e.g., upstream/downstream, pump owners/ non-owners). Procedural justice refers to the degree of access to information, voice in rule-setting, and the fairness of grievance redress. These constructs guided data collection and coding.

5.2. Water Resource Management in Thailand

The National Water Resources Office has established The National Water Resources Management Master Plan (2018-2037), according to the 20-year Master Plan for Water Resources Management. The plan aims to ensure that every village has access to clean water for consumption, maintain water quality standards, and achieve sustainable water governance through balanced development and participation from all sectors. The plan is divided into six key areas as follows (National Water Resources Office 2024b)

5.2.1. Water Supply Management: The goal is to provide clean water for consumption in every village, urban community, tourist destination, and special economic zone. This includes securing backup water sources in areas lacking sufficient water resources, improving drinking water standards at reasonable prices, and promoting water conservation.

5.2.2. Water Security for Production: This focuses on developing new water storage and distribution systems, as well as securing water for rain-fed agricultural areas to increase opportunities and restructure water use in production systems.

5.2.3. Flood and Disaster Management: The emphasis is on enhancing water drainage efficiency, establishing flood prevention systems, managing flood-prone areas, and slowing down water flow to reduce risks and damages. This also includes increasing productivity and restructuring water use.

5.2.4. Water Quality Management and Conservation: This involves developing wastewater collection and treatment systems, recycling wastewater, preventing and reducing wastewater at the source, and conserving water resources nationwide.

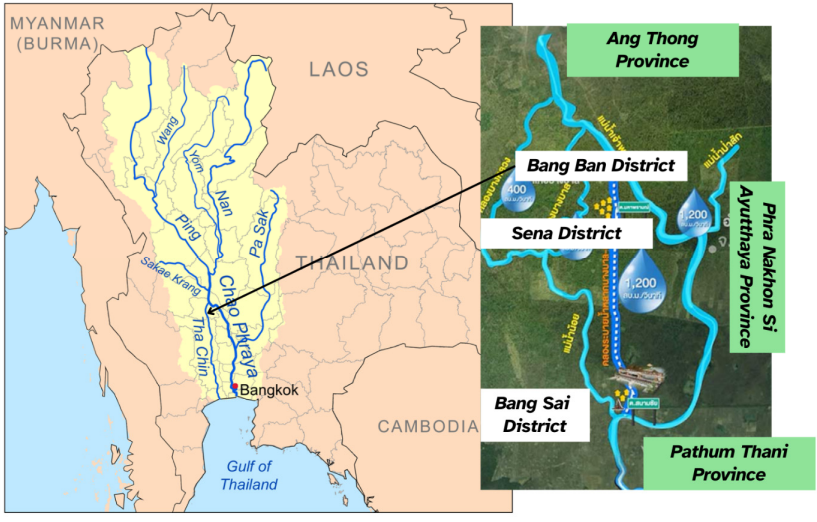
5.2.5. Watershed Conservation and Restoration: The focus is on conserving and restoring degraded watershed areas and preventing soil erosion in watershed and slope areas.

5.2.6. Water Management Administration: The aim is to align operations with the National Water Resources Act of 2018 and the 20-year Water Resources Management Master Plan. This includes drafting supplementary laws, establishing river basin committees and organizations to create and implement plans at the river basin level, and promoting participation in water management (National Water Resources Office 2024b).

<Figure 1> Research Framework
Source: Researchers 2024

Ⅵ. Research Results

The Bang Ban floodplain, located in Bang Ban District, is situated in the northwestern part of Phra Nakhon Si Ayutthaya Province. The designated flood retention area covers a total of 27,450 Rai (43,920,000 square meters), encompassing several sub-districts within Bang Ban District, as illustrated in the map <Figure 2> below.



<Figure 2> Map of Water Flow through Bang Ban District
Source: Researcher adapted from Wikipedia 2024 (Accessed February 22, 2024)

6.1. Water governance in the Bang Ban Floodplain

Water governance in the Bang Ban floodplain is directly governed by the National Water Resources Office's policies and plans, operating under a state-controlled water system. This centralized approach grants the state full authority to make decisions and implement water management strategies without genuine participation from local residents or communities. Coordination among various agencies, such as the Royal Irrigation Department, local authorities, and water user groups, ensures efficient water governance. This coordination facilitates the smooth implementation of water management policies and plans.

The establishment of irrigation zones in the area gives the Royal Irrigation Department primary authority over planning, policy formulation, irrigation project implementation, water allocation, regulation enforcement, and providing information and education to residents in the Bang Ban floodplain. Additionally, the local irrigation office has established the “Bang Ban Water Users Group” to promote public participation in water management, information dissemination, problem-solving, and support for improving water management systems in the floodplain.

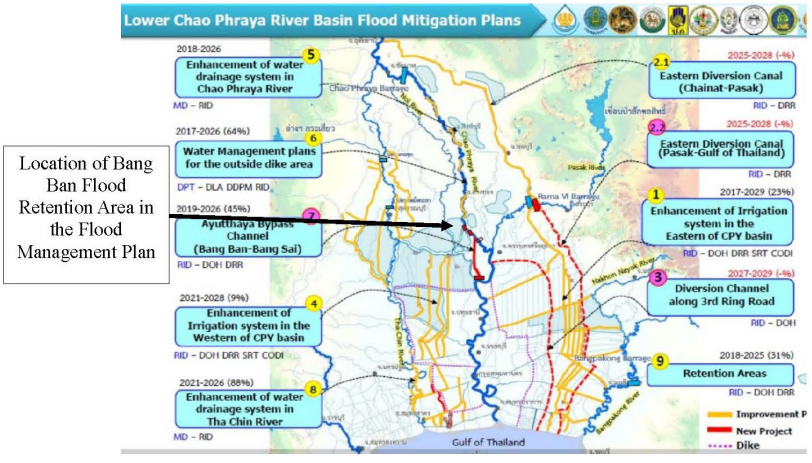
However, local participation remains limited due to the centralized nature of water management and the challenges faced by community groups. The enactment of the National Water Resources Act of 2018 restructured water management in the area, establishing the Chao Phraya River Basin Committee and local water user groups in Bang Ban District. Despite these mechanisms, their role in representing the public's voice remains unclear.

Flooding in the Chao Phraya River Basin occurs frequently and causes significant damage, particularly during the 2011 mega-floods, which severely impacted the industrial sector and investment in the country. Due to inefficient water governance, the government sought to mitigate flood problems in economic zones by designating the Bang Ban floodplain as a flood retention area to protect urban and industrial areas. Phra Nakhon Si Ayutthaya Province, a strategic area for water governance within the Chao Phraya River Basin, has implemented several key measures to strengthen flood management and water control (Chaiya 2019). These measures include reinforcing a 54-kilometer-long flood embankment along the Chao Phraya River, constructing two major floodgates, the Bang Luang Canal Floodgate and the Bang Ban Canal Floodgate, developing the Bang Ban-Bang Sai Drainage Canal, building the Phra Nakhon Si Ayutthaya Dam, and implementing the flood retention area project. Together, these initiatives aim to mitigate flood risks, regulate water flow, and enhance the province’s resilience to seasonal water fluctuations (Chaiya 2019).

The government's main water management strategy, “Prevent, Retain, Drain South” (Thai PBS 17/9/2022 1), aligns with the

National Water Resources Management Master Plan (2018-2037). This strategy aims to enhance water drainage efficiency, establish flood prevention systems, manage flood-prone areas, and slow down water flow to reduce risks and damages, while increasing productivity and restructuring water use (National Water Resources Office 2024b).

"Prevent" refers to preventing water from flooding the eastern industrial areas of the province, which house approximately 2,500 factories and serve as major production bases for large international companies <Figure 3>. In 2011, this area was heavily affected by floods, leading to a 10% reduction in investment value. To restore investor confidence, the government designated "Retain" areas, which are agricultural zones in the western part of Phra Nakhon Si Ayutthaya Province, to absorb floodwaters instead of urban and industrial areas, thereby stimulating the economy. "Drain South" involves the Bang Ban-Bang Sai Drainage Canal project and the construction of drainage canals to divert water away from industrial areas.



<Figure 3> Lower Cao Phraya River Basin Flood Mitigation Plan
Source: Researcher adapted from ThaiPublica 8/11/2023 (Accessed September 3, 2024)

Based on the map above, the National Water Resources Office has designated the Bang Ban floodplain as a "retention area" (arrow

on the map). The government has consistently pushed for policies related to the Bang Ban floodplain. For instance, in 2016, the government established three committees under the Ayutthaya Provincial Order on the staggered rice planting plan for Ayutthaya Province. These committees include the Committee for Coordinating Staggered Rice Planting, the Working Group for Planning Staggered Rice and Fisheries Cultivation and Water Allocation, and the Working Group for Organizing Public Forums on Rice Planting, Water Distribution, and Fisheries. Together, they play a crucial role in coordinating agricultural activities, ensuring equitable water distribution, and facilitating dialogue among stakeholders in the Bang Ban floodplain to promote sustainable and participatory water governance.

These committees, in collaboration with the Ministry of Agriculture and Cooperatives, issued the Ayutthaya Provincial Announcement on the staggered rice planting system. This policy aims to manage water in the Bang Ban floodplain by controlling the timing of rice planting to prepare the fields for floodwater during the rainy season. This helps mitigate flood problems for urban and industrial areas in the eastern part of Phra Nakhon Si Ayutthaya Province, as well as in Pathum Thani, Nonthaburi, and Bangkok (Ayutthaya Provincial Public Relations Office 2024).

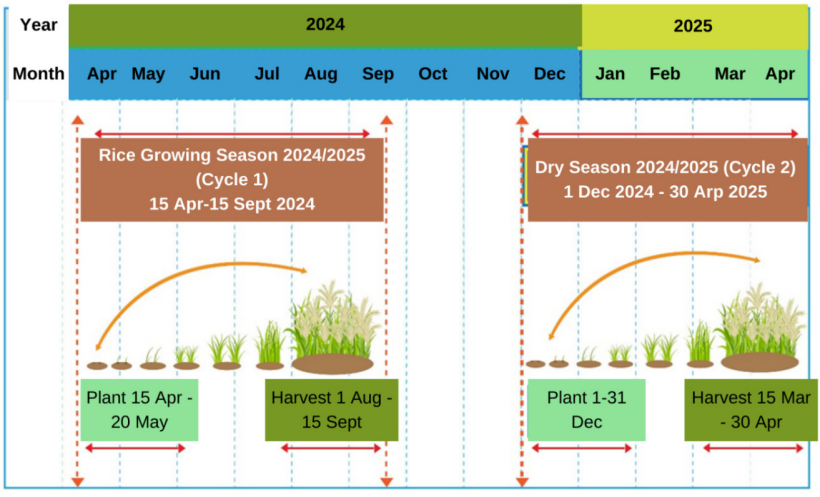
The Bang Ban floodplain policy divides water management into three main periods according to the Ayutthaya Provincial Announcement <Figure 4>:

- **First Rice Planting Period (May - September):** Farmers must start planting rice from May 1 and harvest before September 15. Water allocation for rice planting will be provided once the Meteorological Department announces the start of the rainy season.

- **Flood Season (September - December):** Farmers must complete their rice harvest before September 15, as the state will release floodwater into the fields during this period and retain the water for about three months.

- **New Rice Planting Period (December):** Farmers can start a new rice planting cycle from December 1-31 but must pay for the

electricity to pump water from the Chao Phraya River, costing approximately 100-150 baht per rai (Ayutthaya Provincial Public Relations Office 2024).



<Figure 4> Time-lapse Rice Planting in Phra Nakhon Si Ayutthaya Province, 2024-2025

Source: Research translated from Ayutthaya Provincial Public Relations Office 2024 (Accessed May 27, 2024)

The government asserts that, in addition to benefiting urban and industrial areas, the residents who sacrifice by accepting floodwater will also gain advantages from this policy. For instance, farmers will have easier access to water, be able to cultivate multiple crops, receive support for production inputs, benefit from tourism during flood seasons, and receive fair flood compensation (Suppaisan 2008; Royal Irrigation Office 10 2024). However, when the Bang Ban floodplain policy is implemented, it creates multiple impacts on the local population. These include bearing the burden of flooding, unequal access to water, issues of water rights ownership, and conflicts arising from inequitable water distribution.

6.2. Distributive Justice: The Impact of State Water governance

Residents of Bang Ban are closely connected to the flow of water, which influences their economic activities, cultural traditions, and

daily lives. Economically, villagers rely on water for various activities, following an agricultural cycle that aligns with natural patterns. They release water into the fields during the rainy season and store it during the dry season. However, transforming Bang Ban into a flood retention area has disrupted the residents' way of life and agricultural cycles, particularly for farmers who have had to adjust their cultivation practices. One farmer stated:

> Originally, Bang Ban District was a low-lying area that frequently flooded. Farmers primarily grew local floating rice varieties and could only plant once a year. Later, the Royal Irrigation Department built embankments around Bang Ban to prevent flooding in some years and constructed additional pumping stations to allow farmers to irrigate their fields during dry years with sufficient water resources. This enabled farmers to plant rice twice a year, transitioning to dry-season rice cultivation (Farmer A, Focus Group 2, September 19, 2023).

The lives of farmers and residents in the Bang Ban floodplain face distributive injustice due to state water management policies that unfairly distribute environmental impacts. The state's policy of diverting floodwater into fields and homes is inequitable, causing some groups to bear more risks and impacts. The staggered rice planting schedule, mandated by the water management committee to align agricultural cycles with floodwater release, forces farmers to adjust their planting schedules according to state policies. Farmers must plant rice earlier to prepare Bang Ban for floodwaters from the Bhumibol Dam during the flood season (Phuboonkong 2023).

Harvesting crops before September 15 each year has altered the agricultural cycle of farmers and increased water demand in the area. Delayed water allocation often causes farmers to miss the optimal planting time or risk their crops being flooded due to state policies. One farmer stated:

> The requirement to harvest by September 15 each year conflicts with the natural agricultural cycle. Farmers may not be able to harvest their crops in time, forcing them to either harvest prematurely or risk not harvesting at all, hoping the government will not release floodwater into Bang Ban during dry years (Farmer B, Focus Group

1, September 18, 2023).

Distributive injustice leads to unequal access to water resources, with those living near rivers or possessing water pumps benefiting more than those residing farther from water sources or lacking such equipment. In the Bang Ban floodplain, farmers face persistent difficulties in obtaining water during the dry season due to several factors, including the need to wait for the Meteorological Department's announcement of the rainy season before planting, the uneven distribution of water through the irrigation system, state-imposed restrictions on rice cultivation, and intense competition among farmers for limited water supplies. Consequently, many farmers are compelled to seek alternative water sources to sustain their livelihoods, such as purchasing water from private suppliers, sharing or renting pumps, or collectively investing in irrigation equipment to ensure adequate access for cultivation. The imposed harvest schedule exacerbates water competition during the dry season, leading to conflicts among residents.

The release of floodwaters into Bang Ban is a result of state policies that have altered the natural flooding patterns. Flooding is not solely due to natural factors but also state policies that increase flood levels and duration, making it more difficult for residents to cope. Furthermore, flood compensation is often inadequate, as the impact does not match the compensation received (Phuboonkong 2023).

The 2024 flooding in Bang Ban has further exacerbated residents' hardships, as they face recurrent annual floods from northern waters retained in the area for months under state policies designating Phra Nakhon Si Ayutthaya as a flood retention area to protect key economic zones. Despite calls for justice from the "Ayutthaya-Ayutthaya Station" Facebook page, residents have not received sufficient compensation. Therefore, residents should have the right to demand justice, be protected like economic zones, and not face repeated hardships alone each year (Ayutthaya Station 2024)

It is evident that state policymaking does not align with the

local context, natural cycles, or river flow patterns. Although the state believes the policy benefits all stakeholders, including farmers who sacrifice by accepting floodwaters, the actual implementation results in residents bearing the brunt of unfair water governance. This reflects distributive injustice, where state water policies fail to equitably distribute environmental impacts, benefiting those with more power or resources over those with less (Middleton 2012). Consequently, Bang Ban faces additional issues such as conflicts and competition for water among farmers.

6.3. Procedural Justice: Voiceless Citizens

State water governance has rendered the residents and farmers of Bang Ban passive actors, feeling powerless in negotiations. They are forced to sacrifice their farmland to become a flood retention area. In other words, the residents of Bang Ban must accept their area becoming a “flood retention zone” instead of Bangkok and industrial zones, as seen during the 2011 mega-floods and other flood events (Khaikham and James 2019).

Due to its geography, Bang Ban is a large, low-lying floodplain covering approximately 27,000 Rai, surrounded by the Chao Phraya and Noi Rivers, acting as a natural floodplain capable of holding large volumes of water. Most of this area falls within irrigation zones. In 2011, the government sought the cooperation of residents to use Bang Ban as a flood retention area to mitigate flood problems without constructing new infrastructure (Phuboonkong 2023). The state claimed this policy would reduce damage to urban and industrial areas and generate income for local farmers, who could plant rice 2-3 times a year (Suppaisan 2008). Additionally, the state viewed Bang Ban as a potential tourist destination for urban residents to camp, boat, birdwatch, fish, and enjoy natural flora (Royal Irrigation Office 10 2024: 1).

However, residents face procedural injustice despite the government's attempts to create participatory mechanisms for policy-making process in Bang Ban. The state established working groups to organize public forums with stakeholders in the floodplain before implementing policies for rice planting, water distribution,

and fisheries. Nevertheless, these forums did not facilitate meaningful participation. They focused on providing scientific and hydrological information using technical language, bureaucratic methods, and limited communication channels, hindering residents' access to information. Interviews with local leaders revealed that, although officials provided information, residents could not clearly understand crucial details about water diversion, such as water volume, flood duration, and adaptation strategies, due to the formal language used (In-depth Interviews, April 18, 2023; September 25, 2023).

In 2011, the state sought residents' consent to temporarily use Bang Ban as a flood retention area to help the entire country. However, this consent was merely a request for cooperation, with residents having no power to negotiate or participate in water management decisions with the state (Focus Group 2, September 19, 2023). One resident stated, “Bang Ban has always received floodwaters. If there's excess water, it must come here” (In-depth Interview, April 18, 2023).

This request for cooperation with the government turned Bang Ban into a permanent flood retention area without the state providing compensation for the damage. Additionally, the process of gathering residents' opinions did not genuinely involve them. Residents only knew the rice harvest schedule before flooding and the water release plan, believing Bang Ban would be a temporary flood retention area without receiving complete information for decision-making (In-depth Interview, September 20, 2023). This indicates that the state did not allow residents to negotiate, claim their rights, or participate in water management decisions that directly affect their lives. Transforming Bang Ban into a flood retention area significantly impacts the community, as water scarcity prevents farmers from planting rice normally, and flooding risks crop loss.

Each year, the Royal Irrigation Department holds meetings with affected residents and farmers, claiming to advance mutual understanding between the state and residents about state policies and large projects. However, these meetings merely “inform”

residents about water release schedules, flood periods, and water volumes for Bang Ban, without genuine joint decision-making. Although the Royal Irrigation Department established committees to study and adjust agricultural cycles to align with state water policies, they did not allow residents to express their views on policies affecting their lives. Thus, these meetings are meaningless, as residents and farmers do not truly participate in decision-making (Focus Group 2, September 19, 2023; In-depth Interview, September 26, 2023).

This process reflects that residents cannot achieve procedural justice in state water management decisions. They do not receive complete information, do not participate in planning, and cannot monitor the transparency of government processes (Middleton 2012).

Ⅶ. Discussion

The research on water governance in the Bang Ban floodplain highlights several key points aligned with the research objectives:

7.1. Characteristics of State-Centralized Water Governance in Bang Ban

State water governance in the Bang Ban floodplain is highly centralized, with the state holding full authority over all water management decisions and actions. This centralized control excludes local residents and communities from meaningful participation in decision-making. The Royal Irrigation Department, empowered by the National Water Resources Act of 2018, plays a central role in planning and managing water resources in the floodplain. The establishment of the “Bang Ban Water Users Group” by the state aims to involve the public in water governance. However, local participation remains limited despite the group's efforts to promote community involvement in planning and decision-making. The Chao Phraya River Basin Committee and local water user organizations have not effectively represented the public's voice due to the centralized nature of water governance.

The restructuring of water governance under the National Water Resources Act of 2018 was established by the Chao Phraya River Basin Committee and local water user organizations in Bang Ban. These entities are responsible for planning and policymaking, coordinating with various agencies such as the Royal Irrigation Department and local authorities, and monitoring and evaluating water management policies and plans to address emerging issues.

7.2. Impact of Water governance on Environmental Justice in Bang Ban

7.2.1. Distributive Justice

Water governance in the Bang Ban floodplain has a profound impact on distributive justice. Residents experience environmental injustice as state policies unfairly divert floodwater into their fields and homes, exposing them to significant risks and adverse impacts. The state's authority to implement water management policies, such as reinforcing embankments, constructing floodgates, and creating drainage canals, is intended to prevent and mitigate flood problems in urban and industrial areas. However, these measures disproportionately affect Bang Ban residents, forcing farmers to alter their cultivation practices to accommodate floodwaters from the Bhumibol Dam.

The requirement for farmers to harvest crops before September 15 each year disrupts their agricultural cycle and increases water demand due to delayed water allocation. This policy forces farmers to either harvest prematurely or risk their crops being flooded, leading to economic losses and increased vulnerability.

Farmers in the Bang Ban floodplain face numerous challenges in accessing water during the dry season. These challenges include waiting for the Meteorological Department to announce the rainy season, uneven water allocation by the irrigation system, state-imposed bans on rice planting, and intense competition for water among farmers. These factors exacerbate the difficulties faced by farmers, highlighting the inequitable distribution of water resources and the environmental burdens placed on the local community.

7.2.2. Procedural Justice

State water governance has rendered the residents and farmers of Bang Ban passive actors, feeling powerless in negotiations. They are forced to sacrifice their farmland to become a flood retention area without their consent. Although the state attempts to create participatory mechanisms by organizing public forums for rice planting, water distribution, and fisheries planning, these forums do not facilitate meaningful participation. They focus on providing scientific and hydrological information using technical language, bureaucratic methods, and limited communication channels, hindering residents' access to crucial information. As a result, residents cannot clearly understand important details about water diversion, such as water volume, flood duration, and other relevant information, due to the formal language used by officials.

Additionally, flood compensation is often inadequate, as the impact does not match the compensation received. Despite the state's claim that the policy generates income for local farmers by allowing multiple rice crops per year, residents bear the brunt of unfair water governance. The centralized water management policy affects both distributive and procedural justice for Bang Ban residents. Therefore, the state's centralized water management policies impact environmental justice for the people in the Bang Ban floodplain, affecting both distributive and procedural justice. Residents have not received sufficient compensation and have not been genuinely involved in decision-making processes that affect their lives and properties.

7.3. A Practicable Model of Equitable Water Governance

Beyond the findings, this study proposes a practical model for equitable water governance based on comparative research. First, co-management should raise the Bang Ban Water Users Group from an advisory role to a co-decision-making body, with clear rights and duties written into basin-level bylaws (Hamel et al. 2022). Evidence from adaptive water governance shows that power-sharing that formalizes joint problem definition, scenario planning, and iterative rule revision supports social learning, effectiveness, and legitimacy (Thanvisitthpon 2017). In practice, the co-management requires: (1)

reserved voting seats for water-user representatives on the Chao Phraya River Basin Committee; (2) co-signed seasonal operating rules for flood retention; and (3) earmarked budgets for community-led mitigation and livelihood restoration.

Second, a rights-based compensation system should replace narrow loss accounting. In line with environmental-justice principles and international safeguards, compensation should recognize not only economic losses, but also cultural, ecological, and intergenerational values associated with land that is periodically submerged. We therefore propose a multi-criteria scheme consisting of: (1) crop and asset losses at market value; (2) payments for ecosystem services to reward flood-retention stewardship; (3) cultural-heritage stipends for sacred and communal sites; and (4) education and youth funds to address intergenerational impacts (National Human Rights Commission of Thailand 2024).

Third, participatory monitoring with strong transparency can reduce information asymmetries that weaken procedural justice. Community-based hydrometric stations, open dashboards for inflow/outflow forecasts, and citizen-science reporting of flood duration and depth can complement state hydrology and improve accountability. These tools should be supported by legal guarantees on access to information and time-bound grievance-redress mechanisms linked to the seasonal operating plan (Sangyuan, Arifwidodo, and Davivongs 2025).

Comparative lessons indicate that hybrid governance models, which balance state hydraulic expertise with community knowledge, deliver more legitimate and resilient outcomes. In Southeast Asia, polycentric and participatory approaches are linked to reduced vulnerability in flood-prone agrarian landscapes (Stockholm Environment Institute 2024). In Europe, the Netherlands' Room for the River project[1] demonstrates that negotiated spatial measures and ex-ante compensation can build durable consent (Verweij, Busscher, and van den Brink 2021). For Thailand, embedding these reforms in

[1] The Room for the River project is a Dutch nationwide program launched in 2005-2015 to enhance flood safety and landscape quality by giving rivers more space to manage high water levels.

the Chao Phraya River Basin Committee, by (1) mandating co-decision procedures, (2) adopting a rights-based, multi-criteria compensation code, and (3) establishing basin-wide participatory monitoring standards. This model offers a concrete path to advance both distributive and procedural justice in Bang Ban.

Ⅷ. Conclusion

Water governance in the Bang Ban floodplain is predominantly characterized by centralized state control, which significantly limits local participation. The state's water management policies have profound implications for environmental justice, affecting both distributive and procedural justice for the farmers and villagers of Bang Ban. As a result, they face both distributive injustice (unequal exposure to flood risks and costs) and procedural injustice (weak voice in decisions that affect their lives). Policies designed to protect urban and industrial areas shift environmental burdens to farmers and villagers without adequate compensation or meaningful consultation. These patterns are consistent with wider evidence from Southeast Asia and other regions.

Building on these findings, the paper proposes a practicable model of equitable water governance. First, co-management should move the Bang Ban Water Users Group from an advisory role to a formal co-decision-making body, with clear rights and duties written into basin-level bylaws. Second, rights-based compensation should replace narrow loss accounting. Compensation should recognize not only crop and asset losses, but also cultural, ecological, and intergenerational values linked to land that is periodically submerged. Third, participatory monitoring with strong transparency should reduce information gaps. Community hydrometric stations, open forecasts, and citizen reporting can complement state hydrology and strengthen accountability.

For Thailand, the most credible way to embed this model is through the Chao Phraya River Basin Committee. Three steps are actionable: (1) mandate co-decision procedures that reserve voting seats for water-user representatives and require co-signed seasonal

operating rules; (2) adopt a multi-criteria compensation code that includes payments for ecosystem services and cultural-heritage stipends; and (3) set basin-wide standards for participatory monitoring, including legal guarantees on access to information and time-bound grievance redress.

This study contributes to scholarship and policy by linking environmental-justice analysis to a concrete governance design. It shows how hybrid arrangements, such as combining state hydraulic expertise with community knowledge, can improve both legitimacy and outcomes in a flood-retention landscape. The proposed model directly targets the two justice deficits identified in Bang Ban. It rebalances impacts (distributive justice) and restructures decision-making (procedural justice). To address these issues, equitable water governance in Bang Ban requires shared authority, just compensation, and transparent monitoring. If these reforms are institutionalized at the basin level, water policy can better protect national economic assets and uphold the rights and livelihoods of communities who have carried a disproportionate share of flood risks. This is both a feasible and fair path forward.

However, the research has limits. It is a single qualitative case, focused on one floodplain and a defined field period. Future work should test the proposed model across other flood-retention areas, use longitudinal data to track policy effects over time, and apply mixed methods to quantify welfare gains from co-management, rights-based compensation, and participatory monitoring. Comparative studies, within Thailand and across the region, would also help identify which design features travel well to different institutional settings.

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