

SPECIAL ISSUE ARTICLE



WILEY

Responding to transboundary water challenges in the Vietnamese Mekong Delta: In search of institutional fit

Thong Anh Tran^{1,2,3} | Cecilia Tortajada^{4,5}

¹Asia Research Institute, National University of Singapore, Kent Ridge Crescent, Singapore

²Fenner School of Environment and Society, College of Science, The Australian National University, Canberra, Australia

³Fulbright School of Public Policy and Management, Fulbright University Vietnam, Ho Chi Minh City, Vietnam

⁴School of Interdisciplinary Studies, University of Glasgow, Glasgow, United Kingdom

⁵Institute of Water Policy, Lee Kuan Yew School of Public Policy, National University of Singapore, Singapore, Singapore

Correspondence

Thong Anh Tran, Asia Research Institute, National University of Singapore, Kent Ridge Crescent, Singapore.

Email: thong.tran@anu.edu.au

Funding information

Ministry of Education; the Social Science Research Council

Abstract

The operations of large hydropower dams in the Mekong basin, while posing detrimental transboundary effects downstream, are not fully recognised in Vietnamese government policies, especially at the regional scale. This study adopts the concept of institutional fit to investigate policy gaps in addressing the transboundary water challenges characterised by falling floodwater flows and accelerating saltwater intrusion in the Vietnamese Mekong Delta. Based on interviews with key stakeholders (including central and provincial government officials, environmental experts, and academics) as well as desk reviews of policy documents, we argue that, while the transboundary water repercussions are increasingly evident on the ground, they are not adequately factored in water policies and strategic development planning for the delta. This study suggests that failure to incorporate co-evolving effects of climate change and Mekong-wide hydropower dynamics into local water governance will cause institutional constraints to tackle water stressors (too much or too little water) over the long term. Achieving institutional fit will therefore help align the national water policy framework with local development strategies and reduce policy-practice gaps at the delta scale. To this end, two key aspects need to be considered: first, how, and in which forms, innovative management decisions and water governance policies can be effectively undertaken towards securing the living delta and its resilience to present and future environmental risks; and second, how reframed water policy and development agendas can holistically capture and resolve the transboundary hydrological problems, while leveraging the Vietnamese government's policy engagement at higher levels to address related impacts.

KEYWORDS

climate change, hydropower development, institutional fit, transboundary environmental impacts, Vietnamese Mekong Delta

1 | INTRODUCTION

Climate change and development processes in the Anthropocene era have dramatically shifted human–environment relations, producing

unexpected change (Nicholls et al., 2020). This presents challenges in formulating effective institutional responses to address emergent environmental circumstances. Unplanned responses could lead to lock-in effects in environmental governance and policy development

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial License, which permits use, distribution and reproduction in any medium, provided the original work is properly cited and is not used for commercial purposes.

© 2022 The Authors. *Environmental Policy and Governance* published by ERP Environment and John Wiley & Sons Ltd.

(Santos & Dekker, 2020). Deltas are seen as hotspots of poverty, climate change and development, especially in Africa and Asia (de Souza et al., 2015). In transboundary river delta basins, extended periods of climatic variability (e.g. El Niño), together with increasing pressures from development (e.g. hydropower development), have exposed riparian states to critical water stresses (Eckstein et al., 2019; Munia et al., 2016; Zeitoun et al., 2013). Yet, these challenges represent a window of opportunity for institutional change to better tackle future impacts.

Transboundary water challenges have become severe in the Mekong region under the accelerating impacts of climate change and hydropower development. These have faced downstream countries, including Vietnam, especially in the Vietnamese Mekong Delta (VMD), with unprecedented risks. The past few years have witnessed dramatic transboundary hydrological alterations evidenced by disruptive flood pulses in relevance to operations of upstream massive hydropower schemes, threatening the seasonal water-dependent livelihoods of most of the rural inhabitants in the floodplains and coastal areas of the delta (Arias et al., 2019; Hoang et al., 2019; Khong et al., 2020; Smajl et al., 2015; Trung et al., 2020). While the transboundary water effects are happening at a wider scale, how well the VMD can withstand such risks depends largely on institutional capacity (Santos & Dekker, 2020), and on how policies are functionally aligned with local expectations.

The uncertainty of water regimes in the VMD is growing with hydropower development and climatic impacts in the Mekong region. Critical environmental events characterised by fluctuations of water flows, erratic rainfall, and prolonged droughts have caused water scarcity at a wider scale (Hecht et al., 2019; Hoang et al., 2019; Tran et al., 2021). While in situ climatic impacts such as drought, sea level rise, and saltwater intrusion are prominent in national development rhetoric, the transboundary repercussions of upstream hydropower operations and climate dynamics directly threatening the VMD are not adequately discussed in central Vietnamese policies. The prevailing institutional processes taking place at the central-provincial interface provide a useful context for situating transboundary water discourses within efforts to achieve institutional fit to address water challenges at the delta scale.

This paper examines institutional gaps in the context of state failure to address transboundary water challenges in the contemporary water governance framework and development strategy in the VMD. These domains, while having practical significance to climate-resilient and development strategies in the delta, are poorly understood from the institutional and policy perspectives. Here, we critically analyse a recent government policy, Resolution 120, to explore: (1) relative institutional gaps in policy formulation, (2) processes of translating this policy into practice at the local (provincial) scale, and (3) ongoing efforts to achieve institutional fit towards resolving the transboundary water problems at the delta scale. Using discourse analysis, we unpack the contested policy-practices interface in connection to past and present transboundary water complexities encountered in study areas, and ways to move forward. To this end, we address the following questions:

1. How are transboundary water challenges characterised in the VMD?
2. How are institutions responding to the transboundary water impacts?
3. What is the policy-practice dynamics in responding to transboundary water challenges?
4. How have the government's efforts towards institutional fit been implemented at the delta scale?

Drawing on empirical insights from qualitative data gathered from four provinces in the VMD, An Giang and Dong Thap in the floodplains and Kien Giang and Ben Tre in the coastal zones, we argue that, while transboundary water challenges are increasingly evident on the ground, they are largely overlooked in contemporary water management arrangements and strategic development planning for the delta. Failure to incorporate the combined impacts of climatic and hydropower development in the Mekong region into local water governance makes it difficult to deal with changing water dynamics. The study reveals an ongoing policy shift from the floodplains to coastal areas, with more resources and capacity devoted to sealing off the coastal estuaries with large-scale sluice systems. We point out that a search for institutional fit to address transboundary water challenges demands consideration of two key aspects: first, how, and in which forms, innovative management decisions and water governance policies can be effectively undertaken towards sustaining the living delta and its resilience to present and future environmental risks; and second, how the reframed water policy and development agendas can holistically capture the transboundary water complexities, while ensuring the government's sustained engagement in decision-making processes at the higher level to tackle related impacts. The policy implications of this study could be applicable to the broader institutional and environmental contexts in the Mekong region and beyond.

The rest of the paper is structured as follows. In Section 2, the literature review considers transboundary environmental scholarship across various institutional contexts, and how it treats the process of achieving institutional fit. Section 3 gives a contextual description of the study areas and describes the data collection and analysis. Drawing on the case studies, Section 4 demonstrates how transboundary water change is understood in the institutional context of water governance in the VMD. It also elaborates on institutional responses to transboundary water challenges through the policy-practice dynamics at the central and provincial levels. We conclude with a summary of the findings, and policy recommendations for improving institutional capacity to curb transboundary water impacts in the delta.

2 | CONCEPTUAL FRAMEWORK

2.1 | Transboundary water challenges

Transboundary water challenges have been often framed as problems associated with transboundary commons at the river basin scale (Braunschweiler & Pütz, 2021; Gerlak & Schmeier, 2014;

Miller et al., 2019). The increasing recognition of transboundary environmental commons in contemporary studies is well aligned with the growing literature on climate change and water politics revolving around hydropower development (de Stefano et al., 2017; Gerlak & Schmeier, 2014; Green et al., 2013; Milman et al., 2013; Suhardiman & Middleton, 2020; Timmerman et al., 2017). Many studies have focused on contested discourses regarding how transboundary common resources, such as water, can be equitably utilised and shared in a variety of political and geographical contexts (Linell et al., 2019; Miller et al., 2019; Munia et al., 2016; Paisley & Henshaw, 2013). The co-evolving effects of climate change and infrastructure development indicate that transboundary water challenges associated with these compounding processes have become a 'wicked' (i.e. nearly intractable) problem that does not exist within jurisdictions, nations but extends across geographical borders (Miller, 2020; Miller et al., 2020). Here, a question arises as to how such transboundary water complexities could be fully understood and addressed at varying scales of governance (Milman et al., 2020; Sneddon & Fox, 2006), especially at the local scale. In the Mekong region, a particular attention needs to be placed on how governance could be created or (re)framed to respond to emerging environment events confronting riparian states, for example, the VMD that is situated in a disadvantaged position (downstream) and suffers the most from accumulative environmental impacts.

Much relevant work relevant to transboundary environmental governance has examined how the concurrent drivers of development and climate change stimulate institutional processes that inform the development of innovative governance approaches to deal with the new forms of vulnerability. These have been found particularly salient in the water domain for transboundary river basins. Miller et al. (2019) and Suhardiman and Middleton (2020), for instance, provide conceptual and empirical insights of how the hybrid governance of transboundary commons facilitates governance processes in response to changing ecological systems in mainland Southeast Asia. Studies on transboundary governance also focus on the conceptualisation and effects of hydrosocial rupture in the context of transboundary environmental change, concerning how cascading disruptions in human–water connections occurred under accumulative environment-development pressures, exposing negative impacts to proximate water-dependent communities (Miller et al., 2021). To address unpredictable drivers of change in the face of transboundary water complexities, Akamani and Wilson (2011) advocated that the adaptive governance approach is essential for supporting the good governance of transboundary water resources. Yet, while extensive literature has focused on technical approaches undertaken to deal with negative transboundary water impacts at the regional scale of governance (Hecht et al., 2019; Lauri et al., 2012; Räsänen et al., 2017; Trung et al., 2020), there remains a scant attention to institutional and policy processes in responding to transboundary water complexities at an individual state level.

There are salient knowledge gaps in policy agendas regarding transboundary water challenges. In the geopolitical context of the Mekong region, these are deemed to be attributed to power asymmetries and insufficient policy attention to the disruptions of the Mekong's water regime, as well as policy fragmentation among riparian countries in tackling the complexities (Middleton & Dore, 2015; Zeitoun et al., 2013).

Nested within these complex social, environmental, and political geographies, such lacunae are poorly acknowledged in the national water governance framework. Here, transboundary hydrological understandings of the Mekong region have not been adequately captured in policy-making processes, especially at the central and provincial levels, on delta's environment and development strategies in short- and longer terms.

Transboundary water challenges give substantial significance to institutions, and the roles they play across governance scales. In the existing literature of environmental governance, studies refer to the concept of institutional fit to consider institutional efforts towards achieving desirable outcomes (Cox, 2012; Epstein et al., 2015; Sternlieb et al., 2013; Wandel & Marchildon, 2010). However, most have examined the concept in developed contexts (Olsson et al., 2007; Slade & Carter, 2016), with the limited knowledge of how it is used in a developing world (Uda et al., 2020), especially in the Mekong region. The following section will elaborate on how it is defined, and how it is linked to the transboundary water challenges in the VMD.

2.2 | Institutional fit

Institutional fit is defined as institutional arrangements designed to match 'the defining features of the problems they address' (Young, 2008, p. 20). In this sense, institutional fit is closely associated with the process of diagnostic analysis, whereby attributes of a problem are examined to achieve desirable governance outcomes (Cox, 2012). The concept has been operationalised in several environmental governance studies. For example, Uda et al. (2020) critically analysed institutional fit between Indonesian regulations associated with peatland use and the characteristics of peatland users. In particular, they focused on the degree of fit to assess how peatland management was respectively undertaken by rule creators and adopters. Ekstrom and Young (2009) reflected on how the institution/ecosystem fit could be quantified in the context of ecosystem-based management. They pointed out that the functional misfit could be due to the lack of institutional provision for a social-ecological system component, subsequently causing the deterioration of ecosystem services. Truly, while ecosystems are seen as dynamically variable systems (Folke et al., 2007) that are highly exposed to externalities, it is important to expand the empirical knowledge of how institutional arrangements could fully reflect on these processes, and what governance approaches should be developed to address such challenges.

Institutions have become a key component in environmental governance (Biermann, 2021). Functionally, they mediate 'roles, interactions, and practices of state, private, and civil society actors' in a given problem area (Patterson et al., 2019, p. 361). However, decisions that are made to tackle the problems are not always successfully implemented. Here, problem of fit is brought forward as a matter of inquiry since institutions in place are unable to match the spatial or temporal scales of environmental processes (Ekstrom & Young, 2009; Folke et al., 2007). Concerning such misfits, "problems inevitably arise either in the social institutions that are responsible for management or in the ecological systems that are being managed" (Cookey et al., 2017, p. 643). These theoretical underpinnings speak directly to the transboundary water complexities facing the VMD,

where existing governance arrangements have failed to diagnose and capture evolving environmental challenges in policy-making processes to resolve them. These institutional misfits are particularly illustrated by the deterioration of local ecosystems in the wake of unusual climatic events that have resulted in reduced rainfall, droughts and rising temperature together with hydropower operations in the Mekong region.

This paper will shed lights on governmental efforts in searching for institutional fit by investigating the underexplored problem of fit in the prevailing transboundary water challenges of the VMD. By looking into the dimension of 'spatial fit' proposed by Wandel and Marchildon (2010), we examine how the geographical extent of transboundary water effects in the Mekong region is spatially delineated at the delta scale, and how it sparks efforts towards institutional modifications across governance scales (central and provincial) to better address the stressors. Figure 1 presents a conceptual framework, sketching the dynamics between central policy and local (provincial) practices associated with environment and development, and ways to move forward. As demonstrated, the transboundary water challenges in the delta form the new environmental stressors (e.g. disruptions of flood flows in upper zones and saltwater intrusion in coastal zones). Yet, while the

exposure of these compounding effects has become increasingly conspicuous, they have not been adequately factored in water governance and development strategies at the delta scale. This paper puts a particular emphasis on Resolution 120 that aims to guide climate resilient and sustainable development strategies in the VMD by looking into policy-practice dynamics in putting the policy document (Resolution 120) into practice across selected case studies. It also examines the Three-Pillar Building Framework that is designed to tackle environment-development challenges in the delta (see Section 4.4), and how it contributes to filling institutional gaps identified from the policy-practice processes so as to enhance institutional capacity to address coupled environment-development challenges in the delta over the long term.

3 | RESEARCH METHODS

3.1 | Contextual description of the study areas

The VMD occupies 12% of Vietnam's land area and is home to nearly 18 million people (GSO, 2020). The region is a key economic pillar of

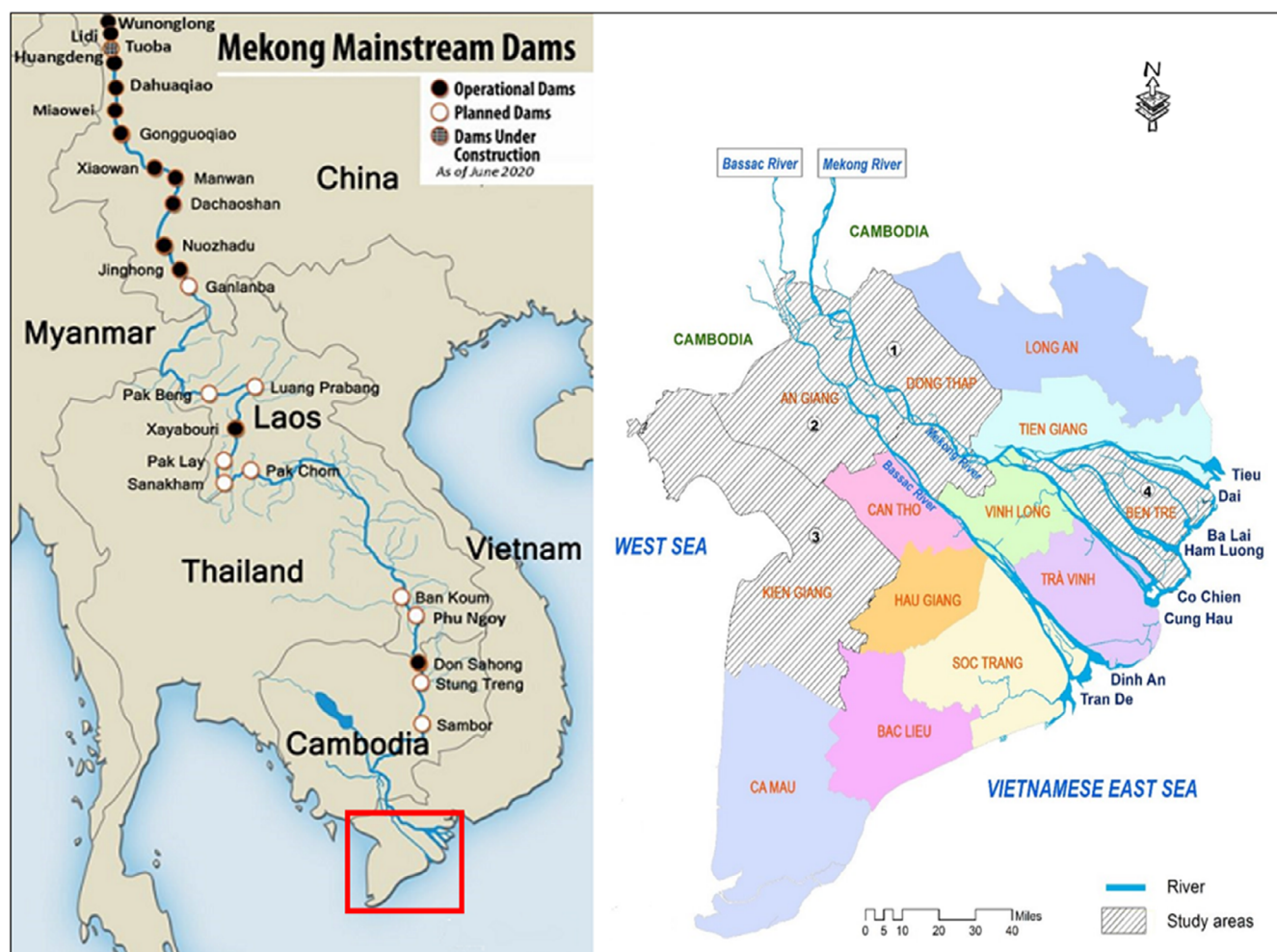


FIGURE 1 The Mekong Basin (left) and the VMD with four study areas (right): (1) Dong Thap, (2) An Giang, (3) Kien Giang, and (4) Ben Tre. Source: Base map (left) adapted from Eyler and Weatherby (2020) [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]

the country, contributing 50% of Vietnam's total rice output, 65% of aquacultural products, and 70% of fruit (World Bank, 2020). Its tropical monsoon climate has a wet season from June to November and a dry season from December to May. Each year, in the wet season, floods cover much of the floodplains, including the Plain of Reeds and the Long Xuyen Quadrangle; in the dry season, saltwater intrusion is a major threat to coastal areas. Over the last few decades, the VMD has experienced drastic environmental transformation, largely through the transboundary water alterations of the Mekong River and local land use dynamics for agricultural production. The latter has entailed the proliferation of a wide range of water infrastructure systems (e.g. dikes, canals, and sluices) to support flood control and drainage, to supply irrigation, and to prevent saltwater intrusion (Wassmann et al., 2019).

Four provinces which represent the floodplains and the coastal zones of the VMD were selected for this study: Dong Thap, An Giang, Kien Giang, and Ben Tre (Figure 1). This selection was based on two interrelated environment-development factors: (1) extreme environmental events, for example substantial decline in floodwater flows in Dong Thap and An Giang and saltwater intrusion in Kien Giang and Ben Tre (Tran et al., 2021); and (2) large-scale water infrastructure investments (e.g. flood control, irrigation supply and sluice systems) by central and local governments (Benedikter, 2014; Tran et al., 2020). Table 1 provides a general description of the study areas.

3.1.1 | Flooding zones

Dong Thap Province is in the high flood zone of the Plain of Reeds, which covers much of the upper floodplains. This ecological condition

allows the proliferation of various forms of seasonal livelihoods, from wild fish capture to fish/prawn farming (People's Committee of Dong Thap Province, 2019). However, the province has been highly vulnerable to reduced Mekong River flows (Hoang et al., 2019). This has caused acute freshwater shortages for household consumption and for small and large-scale agricultural production.

An Giang Province, in the upper part of the Vietnamese Mekong floodplains, is also subject to annual flooding. Wild fish capture, agriculture and aquaculture are the economic pillars of this province. Rice production is fostered by a diverse array of high-dyke systems, enabling two or three crops per year. The North Vam Nao scheme, which regulates seasonal floods and provides year-round irrigation for rice production, is considered a policy success (Tran et al., 2020). Like their counterparts in Dong Thap, the rural inhabitants of An Giang are substantially affected by the disruption of flood flows. These events make it difficult for farmers to arrange cultivation schedules (for rice, prawn farming, etc.) and harness flood-based resources (fish, aquatic vegetables, etc.), which subsequently adds greater hardship to their lives.

3.1.2 | Salinity zones

Kien Giang is the largest of the coastal provinces in the VMD. It has a total land area of about 6349 km², of which roughly three-quarters (4629 km²) is devoted to agricultural production. Located on the west side of the delta, the province is subject to the diurnal tide effects from the West Sea (amplitude about 0.8–1.0 m) and is annually exposed to saltwater intrusion (Pham et al., 2020). The economy of the province is largely dependent on agricultural and aquacultural

TABLE 1 Description of the selected study areas

Categories	Study areas			
	Dong Thap	An Giang	Kien Giang	Ben Tre
General information	Total land area: 3384 km ²	Total land area: 3537 km ²	Total land area: 6349 km ²	Total land area: 2395 km ²
	Agricultural land area: 2601 km ²	Agricultural land area: 2826 km ²	Agricultural land area: 4629 km ²	Agricultural land area: 1405 km ²
	Population: 1,693,300	Population: 2,164,200	Population: 1,810,500	Population: 1,268,200
	Population density: 501 per km ²	Population density: 612 per km ²	Population density: 285 per km ²	Population density: 530 per km ²
Location	Upper delta floodplains (Plain of Reeds)	Upper delta floodplains (Long Xuyen Quadrangle)	Coastal area of Long Xuyen Quadrangle, bordering the West Sea	Coastal area, bordering the Vietnamese East Sea
Ecological conditions and primary farming systems	Freshwater	Freshwater	Brackish and saline water	Brackish and saline water
	Rice production	Rice production	Integrated shrimp–rice farming	Integrated shrimp–rice/ shrimp–forest farming
	Wild fish capture	Wild fish capture	Intensive shrimp farming	Intensive shrimp farming
	Aquaculture	Aquaculture	Rice production	Rice production
Immediate environmental effects	Disruption of natural water flows from the Mekong River	Disruption of natural water flows from the Mekong River	Saltwater intrusionDiurnal tide effects from the West Sea (Gulf of Thailand)	Saltwater intrusionSemi-diurnal tide effects from the Vietnamese East Sea
Typical water infrastructure systems	Flood control works (largely low dykes) and irrigation systems	High dykes with flood control and irrigation systems (e.g., North Vam Nao irrigation scheme)	Large-scale sluice systems (e.g., Cai Lon–Cai Be sluice)	Large-scale sluice systems (e.g., Ba Lai sluice)

Notes: Author's fieldwork (2019); GSO (2020); Pham et al. (2020).

production, with much land allocated to integrated rice–shrimp farming (Poelma et al., 2021). The Cai Lon–Cai Be sluice, which has been completed, is seen as a major water scheme that helps control saltwater intrusion from the West Sea (the Gulf of Thailand) and provides freshwater for local agricultural production (CSI, 2019; MONRE, 2021).

Ben Tre is located in the low terrain of the VMD, bordering the Vietnamese East Sea on the east side. The province is made up of three islets divided by four distributary channels: My Tho, Ba Lai, Ham Luong, and Co Chien. Overall, Ben Tre has a flat topography, with mean elevation only 1–2 metres above sea level (Le et al., 2014). Similar to Kien Giang, Ben Tre is seriously affected by saltwater intrusion (Nguyen et al., 2019). The Ba Lai sluice is a key component of the Ba Lai Irrigation Project, which covers the northern part of the province, including Ben Tre City and four districts: Chau Thanh, Giong Trom, Binh Dai, and Ba Tri (Hoang et al., 2009). It demonstrates the political mandate of the Ben Tre government to freshen the local coastal areas for agricultural production.

3.2 | Data collection

This study employed qualitative research as the primary strategy of inquiry: interviews with recognised institutional stakeholders, who were representatives of government agencies at the central and the provincial levels, and with climate change and environmental scientists and hydrology and ecosystem experts on the Mekong region (see Table A1 in the Appendix for details). The interview questions covered themes relevant to climate change and hydropower development in the Mekong region, their transboundary impacts on the VMD, and institutional processes at both central and delta levels in response to environmental change. During the interviews, the concept of institutional fit was operationalised with reference to the current transboundary water complexities (e.g. recurrent disruptions of floodwater) facing the VMD. This sought to assess the ways in which institutional arrangements (e.g. Resolution 120) are formulated and exercised by national and local governments and examine institutional capacity to address the water problems at hand. Each interview lasted for about an hour. While most were done in person, three were conducted virtually (over Skype), and one via email. All interviews were audio recorded, except one where permission was refused, and we used direct note-taking. Pseudonyms are used to keep the informants' information confidential. Overall, the data collection was undertaken by the first author during his field visits in February and April 2019, over Skype in December 2020, and via email in March 2021.

In addition to these primary data, we used secondary data and information relevant to the geographical, socio-economic, political, and institutional context of climate change and hydropower development, as well as their consequences for riparian countries in the lower Mekong region and the VMD. This brings light to how transboundary water effects are understood from the policy perspective, and how they have occurred and shaped the delta waterscapes over time, as well as their ecological and livelihood significance for rural populations. The resources reviewed included government policy

documents, academic journals, news outlets (in both English and Vietnamese), and other grey literature.

3.3 | Data analysis

This paper draws on the theoretical and methodological underpinnings of discourse analysis of environmental policies, informed by Leipold et al. (2019), to shed light on underlying meaning patterns related to policy making and to guide the data analysis. Here, 'discourse' is defined as an ensemble of ideas, concepts, and categories which is produced and reproduced through an identifiable set of practices, and through which meaning is given to physical and social realities (Hajer & Versteeg, 2005). In this study, discourse analysis draws upon text from the collected data. The data were analysed to illuminate the understanding of (1) transboundary water complexities facing the VMD in relation to hydropower operations and extreme climatic events (e.g. prolonged droughts, sea level rise) in the Mekong region; (2) strategies deployed by central and provincial governments in responding to the transboundary impacts; and (3) policy-practice dynamics associated with the implementation of Resolution 120 on the ground. Responses from the institutional stakeholders were verified by corroborating or contrasting with one another to obtain validity and credibility for the study (Azihoni et al., 2017).

The procedures for analysing the data are guided by Bazeley and Jackson's (2013) approaches, which align with the discourse analysis strategies. These analytical approaches help construct hierarchical structures of themes that are subsequently linked to demonstrate patterns and relationships (Maxwell, 2005) and link discursive categories to practices, structures, and institutions (Runhaar et al., 2013). The analysis was assisted with the application of NVivo software (version 11).

4 | RESULTS AND DISCUSSION

4.1 | Transboundary water challenges in the VMD

Central to the analysis in this study, from the outset, is the understanding of how transboundary water challenges are characterised, and how they interact with in situ socio-environmental dynamics. Our analysis identified various drivers of transboundary water implications (i.e., reduction of flood flows), varying from operations of hydropower dams upstream, notably cascading Lancang mainstream dams in China (Dang et al., 2019; Geheb & Suhardiman, 2019; Hecht et al., 2019; Kuenzer et al., 2013; Pokhrel et al., 2018; Räsänen et al., 2017), to climatic factors (Keskinen et al., 2010; Hoang et al., 2019), as well as adverse effects of local water-engineering infrastructure such as dykes built over the past few decades (Nguyen et al., 2017). These compounding drivers, while leading to the observed transformation of the delta waterscapes in both flooding and salinity zones, pose challenges to water-dependent livelihood activities and exercise of water governance arrangements at the local level. The Mekong development expert, for example, noted that.

Although there are no accurate data on which driver is more dominant, I believe that the reduced water flows of the Mekong River facing the VMD over the past few years are attributable to two key factors: extreme droughts and hydropower projects (Interview notes, December 2020).

The paper, drawing on Young's (2010) conceptualisation of institutional stresses, demonstrates how transboundary water challenges are literally defined by endogenous and exogenous stressors. The former (endogenous stressor) delves into the interface in which water governance is shaped by economic growth objectives spearheaded by the Vietnamese government since the post-Doi Moi (Renovation) period. Practically, this political mission attempts to turn the VMD into a highly productive agricultural area to support national food security and export demands (Chu et al., 2014; Demont & Rutsaert, 2017) assisted by the investment in large-scale water engineering systems, such as dikes and sluices, both in floodplain and coastal zones of the delta (Benedikter, 2014; Cosslett & Cosslett, 2014). Despite multiple efforts in ramping up the implementation of climate-resilient sustainable development policies in the VMD (e.g., Resolution 120, see the Section 4.2), the intention of the Vietnamese government to maintain agriculture as a cornerstone for economic growth remains unchanged.

Exogenous stressors refer directly to the co-evolving environmental effects of climate change and hydropower development. These effects have strongly influenced flood patterns – for instance – significant alterations of flood peaks on the Tien (Mekong) River that have occurred over the past decades. Figure 2 shows changes in flood peaks in 2000–2020 (a) and saltwater intrusion processes (2016 vs. 2020) in the delta (b). As posited by Young (2010), there are two major reasons that, more often, can be given for the severity of the problems: inadequate diagnosis of the problems, and sketchy knowledge of the problem dynamics. In the case of the VMD, these assumptions speak directly to institutional gaps associated with the contemporary transboundary water problems that need to be addressed, including attempts to gain better understanding of the problems and meaningfully incorporated this knowledge into policy and decision-making processes at both national and local governance scales.

4.2 | Institutional responses to transboundary water impacts

Historically, the VMD has been immensely exploited. The exploitation processes took place some three decades ago, when the governments began to deploy pre-emptive policy solutions for agriculture-based development (Quan et al., 2018; Tran, 2020). Most of these solutions entailed the undertaking of structural measures (dykes and sluices) to control and regulate flood and saltwater intrusion. At present, this policy has also served as a means to address climatic impacts (as stipulated in the Prime Minister's

Decision No. 1397/QĐ-TTg (The Prime Minister of The Vietnamese Government (2012)). However, when realising that these conventional approaches have failed to deal with emergent water complexities in the Mekong region, the government developed a long-term development strategy for the delta, known as an integrated regional master plan or Resolution 120 (The Vietnamese Government, 2017). This flagship policy includes an overarching development agenda concerning central government's planning strategies, with long-term visions, objectives, overall solutions, and concrete tasks, to improve the economic development of the delta while prioritising adaptation as a key approach to deal with climate change. Overall, this central-level policy attempts both to accelerate the delta economic development and to address climate-related effects, especially saltwater intrusion increasingly threatening the coastal zones of the delta.

Our data analysis revealed the lack of engaging provincial government agencies in the initial stage of formulating Resolution 120 that guide policy implementation at the local level. This raises critical concerns that the conventional top-down approach has still been exercised in the current water governance systems (Waibel et al., 2012) and that if this approach remains appropriate to tackle emerging transboundary water complexities in the VMD. This could be assumed that these, to some extent, will have immense impacts on local institutional performance as well as capacity in addressing the transboundary water impacts.

In parallel with recent scientific evidence of the downstream transboundary effects of hydropower dams (Binh et al., 2020; Eyler, 2019; Hecht et al., 2019; Kuenzer et al., 2013; Räsänen et al., 2017), transboundary effects are well articulated by local governments, especially those in the Mekong floodplains such as Dong Thap and An Giang provinces. These are concerned with recurring disruptions of water flows of the Mekong River. Reflecting on this emerging environmental phenomenon, a senior government official in the An Giang Department of Natural Resources and Environment said:

Basically, building of hydropower dams drives substantial impacts on the VMD, especially on its riverine ecosystems and water flows. We have recently experienced extreme variations in water flows, which go up and down very rapidly. (Interview notes, February, 2019).

Despite local governments' perception of such transboundary impacts, the issue is not adequately addressed in policy documents and mainstream media. Although there is an underlying recognition of transboundary effects in Resolution 120, relevant understanding of drivers, processes, and impacts in the broader complex climate and hydropower development contexts of the Mekong region is not well captured. Figure 3, for example, presents the visualisation of word frequency in Resolution 120, indicating that 'development' is the most frequent term. In this document, tackling climate change seems to be the central government's primary focus for delta climate and development solutions (The Vietnamese Government, 2017). This also implies that approaches to deal with transboundary environmental impacts have remained elusive. According to a report by

VNRC (2020), disastrous saltwater intrusion events in 2015–2016 and 2019–2020 were largely ascribed to in situ El Niño effects, which included extended droughts, erratic rainfall, and sea level rise, with scarce reference to upstream climatic and hydropower development dynamics.

Our data reveal several reasons for the central government's minimal reference to transboundary water effects in Resolution

120. As mentioned by one of the Mekong experts, this is inextricably linked to the ongoing contentious politics revolving around the investment of a Vietnamese company (i.e. Petro-Vietnam) in the Luang Prabang hydropower project and other related projects in Laos (Fawthrop, 2019). This decision enables the Vietnamese government to seek plausible excuses for their decision to continuously get involved in the project, while fending off the public

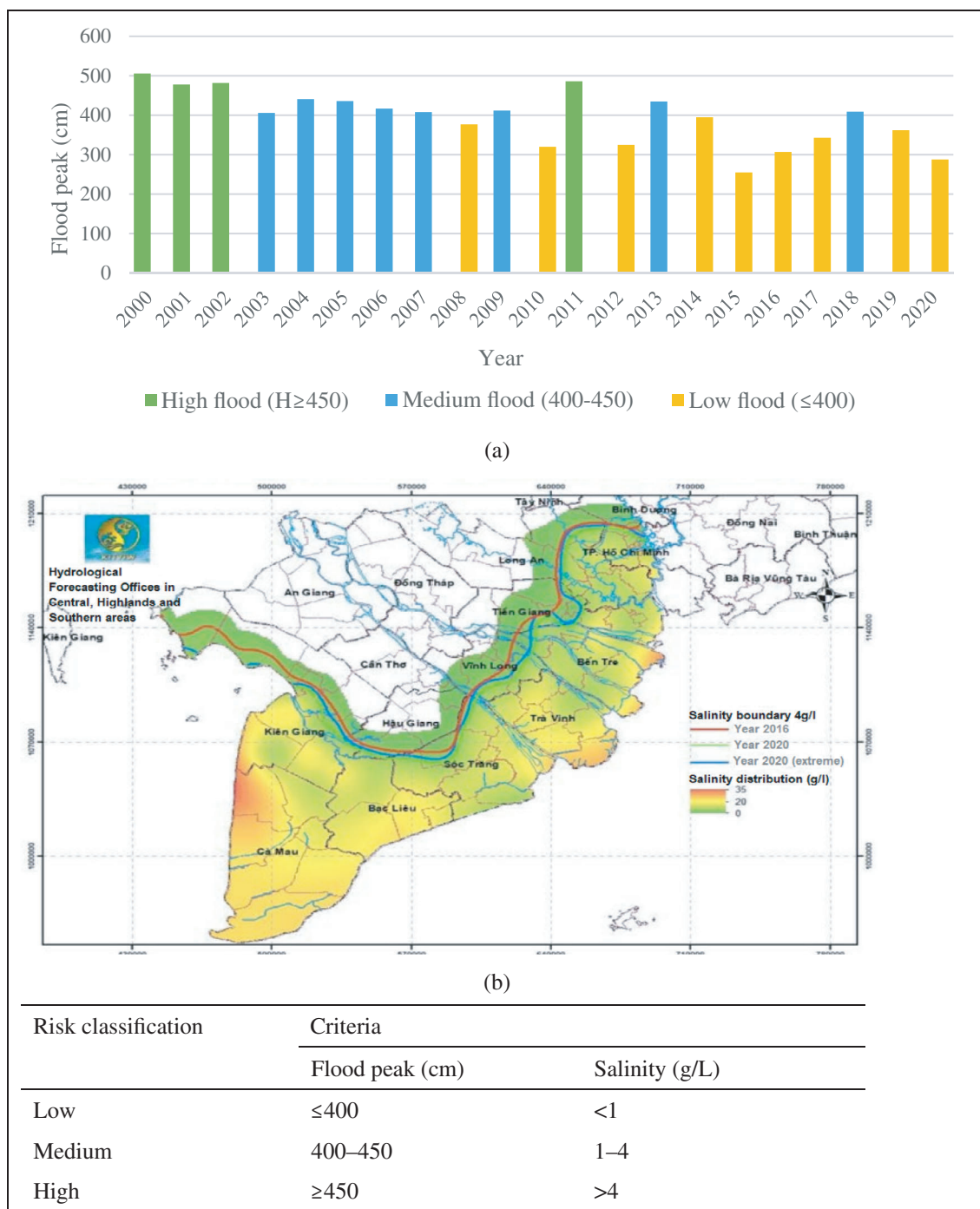


FIGURE 2 (a) Changes in flood peaks at Tan Chau station on the Tien (Mekong) river, 2000–2020; (b) saltwater intrusion in the VMD in 2020; (c) classification of risks (based on flood peaks calculated at Tan Chau station in An Giang, and salinity risk in Kien Giang). Sources: Adapted from MRC (2014); Le (2020); VNRC (2020) [Color figure can be viewed at [wileyonlinelibrary.com](https://onlinelibrary.wiley.com)]



FIGURE 3 Word cloud visualisation of word frequency in the English version of resolution 120 (The Vietnamese Government, 2017) [Color figure can be viewed at wileyonlinelibrary.com]

outcry over adverse impacts on the VMD and its population. He pointed out that.

There is a political intention behind the Vietnamese government's decision in this regard.... If Vietnam did not engage in the project, another developer (China) would jump in. However, this will put Vietnam in an advantageous position that it can play a part in Lao hydropower development as well as monitor operations of a series of hydropower dams on the lower main-stream Mekong River. (Interview notes, December, 2020).

This move, however, brings some drawbacks. As noted by the senior environmental scientist, Vietnam has weakened its own position by going against the hydropower development in the Mekong mainstream it has long pursued. More seriously, he claimed that Vietnam would be 'shooting itself in the foot' if it ventured into this high-risk endeavour. (Interview notes, February, 2019). In light of Resolution 120, these transboundary narratives occurred beyond the policy spectrum of the document, which limits its focus on environment and development geographies of the VMD.

4.3 | Policy and practice interface at the provincial level

Our analysis indicated that Resolution 120 has come to be 'negotiated' between the central and provincial governments. This was attributed to two main reasons. First, the fact that Resolution 120 was stipulated in a top-down manner made it fail to sufficiently take account of development dynamics that has been taken place on

the ground. In our interviews, provincial government officials revealed that, given its prevailing development contexts, the VMD should no longer bear sole responsibility for national food security; instead, it should make its own ways in seeking new development opportunities to move forward. This stance corresponds to a report from the VCCI (Vietnam Chamber of Commerce and Industry), suggesting that the gross regional domestic product of the VMD provinces dropped from 22% of the national average in 1990 to less than 20% at present (VCCI, 2020, p. 24). From the policy perspective, this needs to be seriously taken into account. Second, since the 1990s, the development campaign led by the central government, known as Rice Everywhere (Biggs et al., 2009), and its associated land-use policies, in attempts to improve the productivity of the delta, has turned it into a homogeneous waterscape (freshwater) in support of rice cultivation. This policy failed to take into consideration of the delta's ecological diversity and ecological services it provides.

While these state-led policies are devoted to intensify rice production (Chu et al., 2014; Nguyen et al., 2016), realities demonstrate that such mandates are not obligingly fulfilled. Table 2 provides a summary of policy-practice dynamics, demonstrating how these processes have occurred at the central-provincial interface. While provincial governments ostensibly aligned their policy agendas with Resolution 120, they attempt to manoeuvre their strategies in hopes of achieving their pre-planned development targets rather than proactively adjusting the policy implications to fit the local development contexts or work best for their localities. Concerning this, the Mekong ecosystem expert noted:

Overall, provincial leaders in the VMD do not fully understand the core spirit of Resolution 120, and how it contributes to local economic development. In progress reports, they tend to highlight work that, to some degree, speaks to the resolution, to demonstrate desirable outcomes. This, for me, is somewhat misleading. (Short communication, March, 2021).

Resolution 120 attempts to link socio-economic development strategies in the VMD to climate responses. In theory, this policy is praised by environment and development experts for its strategic vision towards a nature-based adaptation approach (*sống thuận thiên*) and steering sustainable development trajectories in the delta (MONRE, 2021). However, while put in place in local contexts, it presents several shortcomings. The most notable point to make here is the imposition of the conventional water management approach (infrastructure-based approach) in the delta does not take account of emergent transboundary compounding effects of climate change and upstream hydropower dynamics (i.e. disruptions of water flows and saltwater intrusion). Obviously, this poses critical challenges to water governance and water-related livelihoods of the majority of agrarian communities in the VMD, who have never experienced such extreme events before (see also Figure 4).

The analysis suggests some conceptual ambiguity in the core idea of 'adaptation' in Resolution 120. Implied in the term 'nature-based

TABLE 2 Summary of policy-practice dynamics in the implementation of resolution 120 across the study areas

Level	Policy	Practices	
		Flooding areas(Giang–Dong Thap)	Salinity areas(Ben Tre–Kien Giang)
Central	Promulgation of Resolution 120/NQ-CP on Climate-Resilient and Sustainable Development of the VMD in 2017. Primary policy considerations: <ul style="list-style-type: none"> • Living with nature (moving from living with to proactively living with flood and salinity environments) • Restructuring of agricultural production towards aquaculture-fruit-rice 		
Provincial	Policies/decisions to implement Resolution 120 in harmony with local environmental conditions and development priorities	<ul style="list-style-type: none"> • Self-organisation of farming production and water management to meet local needs • Policy shift from the floodplains to coastal zones • Institutional mismatches: (1) policy on climatic impacts bound narrowly to the geographical scale of the delta; (2) restructuring into aquaculture-fruit-rice production; (3) technical support not available for restructuring 	
	Policy actions	Living with flood environment	Living with salinity environment
		Moratorium of constructing high dykes for intensive rice production	Sealing off coastal estuaries to prevent/control salinity (e.g., Ba Lai sluice in Ben Tre and Cai Lon–Cai Be sluice in Kien Giang)
		Promoting nature-based water management approaches (e.g., storing water in wetlands and unprotected flood-prone areas)	Adopting hybrid approach (i.e., control approach in water management led by governments to prevent salinity and to protect/supply freshwater for crop production at coastal estuaries [outside/ large-scale] versus adaptation approach in farming [inside/small-scale] led by farmers
		Storing floodwater in flooded compartments for shared irrigation/flood control purposes	Storing water resources to support community water consumption (e.g., Kenh Lap reservoir in Ben Tre)
		Promoting innovative farming systems towards nature-based adaptation	Innovative farming systems led by farmers (e.g., integrated rice–shrimp farming)

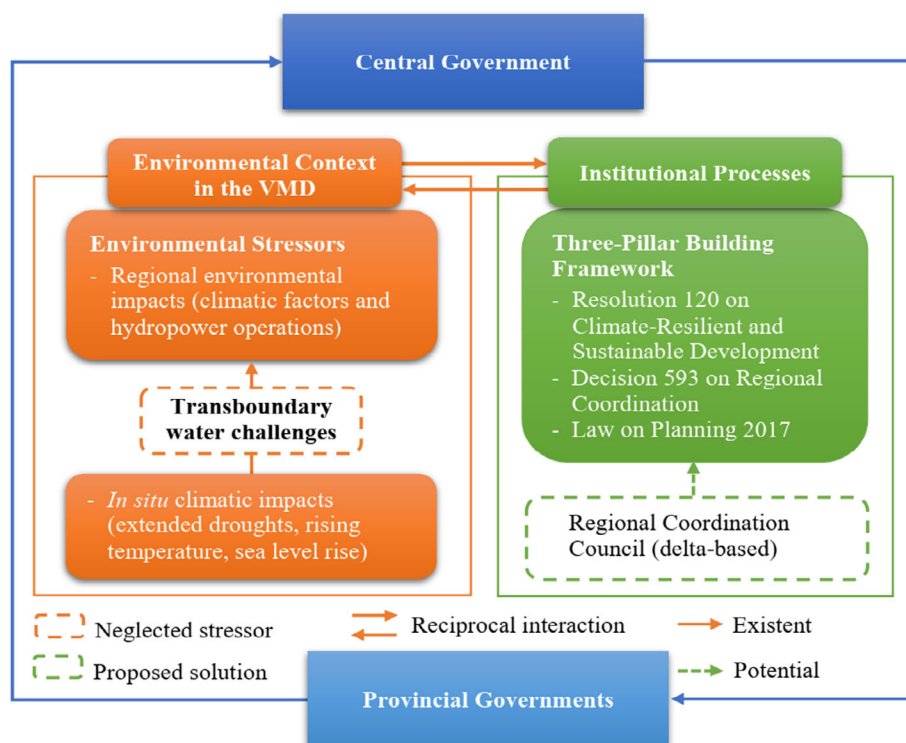


FIGURE 4 Emerging environmental context in the VMD and policy processes at the central and provincial levels in search of institutional fit [Color figure can be viewed at wileyonlinelibrary.com]

adaptation' developed by the Vietnamese government (MONRE, 2021), it is used to describe redirecting adaptation pathways in the VMD by strengthening human–nature relationships. This may sound like free adaptation, that is, living with nature (Tran, 2020); but when used with 'proactively', it conveys the underlying connotation of shifting towards a hybrid control–adaptation rather than depending solely on control approach. Point 4 of the Overall Solutions section of Resolution 120 (p. 6) clearly articulates that:

The new master plan [Climate-Resilient and Sustainable Development of the Mekong Delta] shall have the phrase *sống chung với lũ* [living with floods] replaced with *chủ động sống chung với lũ, ngập, nước lợ, nước mặn* [**proactively** living with floods, brackish water and saltwater] according to the master plan for integrated management of natural resources by the river basin; effectively, economically and sustainably water resources, **proactively** provide freshwater for the people and brackish water and saltwater economic zone; properly extract brackish water and saltwater in coastal areas to serve socioeconomic development. (English version of Resolution 120, emphasis added).

Our data indicated an ongoing policy shift from the floodplains to coastal areas. In this sense, coastal populations are becoming more vulnerable to the accelerating processes of saltwater intrusion, sea level rise, and land subsidence (Brown et al., 2014; Fischer, 2018). We find that the governments of Ben Tre and Kien Giang Provinces, in responding to these complexities, have put more resources and capacity towards sealing off the coastal estuaries with large-scale sluice systems, such as Ba Lai in Ben Tre and Cai Lon–Cai Be in Kien Giang (CSI, 2019; MONRE, 2021). A Mekong development expert said that 'comparatively, dyke-supported freshwater ecosystems in the floodplains are more controllable and manageable under the evolving environmental circumstances. Meanwhile, people who live in saline areas are more likely to experience higher risks'. (Interview notes, December 2020). Recognising this enables coastal governments to keep on 'cementing' the delta estuaries, while simultaneously promoting a shift towards a nature-based adaptation approach to accommodate local conditions (The Prime Minister of The Vietnamese Government, 2020a). Commenting on this innovative adaptation strategy, a Mekong development expert expressed:

The living-with-nature approach does not necessarily mean that we entirely entrust Heaven with our lives. We cannot do this while the climate is changing. For the Vietnamese Mekong Delta, we do need judicious structural interventions to make it better. (Interview notes, December 2020).

The accelerating processes of environmental change resulting from infrastructure development (i.e. hydropower development) and climate change in the Mekong region have been far outpacing the

capacity of rural societies to adapt (VDMA, 2020). This is the case across the study areas, where the local governments remained sluggish in their response, thus failing to keep pace with new transboundary water conditions. In An Giang and Dong Thap Provinces, for instance, the abrupt change in flood flows in the Mekong River has dramatically transformed the bio-physical landscapes of the delta and deprived rural populations of their means of livelihood. In this sense, it can be assumed that if these transboundary water complexities are not immediately translated into policy solutions at the provincial level, desired outcomes in addressing such problems would be far to be attained.

With its narrow focus on climatic impacts within the geographical scale of the delta, Resolution 120 presents a serious mismatch between the contemporary water governance framework and transboundary environmental implications. This problem of fit therefore hampers the development of strategic policy solutions that can address the compounding effects of upstream development (e.g. hydropower) and climate change at local and national scales. It will definitely leave the delta's population exposed to associated transboundary water risks and jeopardise the stability of the delta over the long term. The finding echoes Azhoni et al.'s (2017) view that the ability of management institutions to respond to new and changing environments largely depends on how the decision-makers within such institutions perceive and interpret risks, from which actions are taken.

We also identified a mismatch between the central government's policy shift towards aquaculture-fruit-rice production mandated by Resolution 120 and local practices, as well as motivations behind this momentum. First, the government's prioritisation of aquacultural production over the other two sectors (fruit and rice production) does not take account of existing water-engineering systems. Following the Rice Everywhere strategy as mentioned above, dykes and canals are mainly designed and constructed to support rice production. Second, technical resources required for this policy shift, such as providing equipment and hands-on knowledge to farmers, are not always available. This points to the shortage of capable human resources faced by most local extension agencies (Interview notes, December 2020). Third, the farming habit of farmers is another constraint. It is difficult to persuade rice farmers, for example, to get rid of their traditional practice (rice farming) and shift to an alternative one (e.g. fish farming). It was because, for the most part, they are not familiar with new farming patterns and impossible to gain full access to financial resources. Farmers also found it hard to access markets (preferably international markets) to sell out their agro-products. Over the past few years, farmers have experienced recurring fluctuations of market price, and many have incurred big loss due to stagnation. Taken together, these constraints have slowed down momentums for change in compliance with Resolution 120 at the local scale.

4.4 | Seeking institutional fit: Ways forward

Over the past few decades, water policy solutions for the development of the VMD have been seen as experiments that involved

adaptive learning processes (Tran et al., 2020). Given the evolving environmental complexities in the Mekong region, a critical question arises as to whether the existing water governance approach will be continuously used to deal with such challenges. It prompts concerns about how much longer such policy experiments will last before they give way to an alternative governance system that can better capture and tackle new environmental conditions (Ananda et al., 2020). This calls for an urgent need to reframe contemporary water governance arrangements in connection to transboundary water complexities. Young's (2008, p. 20) stressed that 'to be effective, institutional arrangements need to be well-matched to the defining features of the problems they address'.

Improving institutional fit requires the profound engagement of hydropower development together with climate change in policy communication and formulation. Hydropower dams are inextricably linked to climate change, and together will threaten the delta (Hecht et al., 2019; Hoang et al., 2019). According to Hanasz (2018, p. 42), more dams imply more risk associated with climate change. This is crucial in the Mekong region and particularly in the VMD, where extreme changes in transboundary water flows have already taken place. These abnormal conditions are presaged to become 'normal' under more intensive water impoundments for hydropower operations by upstream countries, especially China, in the coming years (Eyler, 2019). Effective environmental management must match policy to the social-ecological contexts of environmental problems (Epstein et al., 2015).

Although there are no accurate data on which driver is more dominant, I believe that the reduced water flows of the Mekong River facing the VMD over the past few years are attributable to two key factors: extreme droughts and hydropower projects (Interview notes, December 2020).

To pursue institutional fit to secure sustainable development in the VMD, we not only focus on the dynamics of environmental change but also multiple facets, scales and interdependencies of environmental problems (Agrawal & Lemos, 2007). This means reframing or retrofitting the contemporary governance mechanisms to better diagnose transboundary environmental dynamics (climate change and hydropower) at the Mekong scale and translate this knowledge into water governance approaches at the delta scale. In doing so, it is essentially important to reconfigure institutional architectures and leadership roles to enhance institutional capacity. Interestingly, there is an ongoing effort to craft the Three-Pillar Building Framework by bringing together Resolution 120 on Climate-Resilient and Sustainable Development, the Law on Planning 2017 (Law No. 21/2017/QH14), and Decision 593/QD-TT on Regional Coordination into an action plan to resolve environment-development challenges in the delta (The Prime Minister of The Vietnamese Government, 2016) (Figure 4). This implied that the implementation of Resolution 120 alone has so far failed to address the transboundary water challenges that have co-evolved and augmented to a greater scale but provided essential momentums to deal with them. In seeking institutional fit to address

the problems, this integrated framework forms a holistic governance approach to steer sustainable and climate-resilient development strategies at the delta scale, while rectifying national policies to better accommodate local contexts. Most notably, this new institutional structure promotes cross-scale interactions and coordination among government agencies and related stakeholders. It is hoped that this nuanced governance system will bring about realistic solutions to the evolving environment-development challenges in the delta.

There is an ongoing shift from command-and-control to process-oriented and from reactive to proactive approaches while seeking institutional fit. It is evidenced by the recent organisation of two government-level plenary conferences, bringing central and provincial government agencies, environmental experts, and relevant stakeholders into how Resolution 120 has been implemented since it was issued (MONRE, 2019, 2021). The events were seen relatively open for critical discussions among the stakeholders with directions for policy change. While this shift is crucial, achieving institutional fit would need to tackle persistent policy mismatches identified at the central-provincial intersection. This study suggests that the central issues should be placed on institutional endeavours in dealing with transboundary environmental challenges, and that Resolution 120 has failed to adequately reflect on and address the situation on the ground. Our data reveal that these constraints are largely driven by competing interests between local and central governments, which mainly refer to contestations over environment versus development priorities. Possible solutions to these complexities need to be contextualised in the broader geographies of the Mekong region, which connects directly to adverse effects of climate change and hydropower development, in negotiation with local development strategies, as well as potential risks that the VMD will confront in the future.

Efforts to achieve institutional fit stimulate the establishment of the Regional Coordinating Council (Decision 825/QD-TTg) in 2000, which plays an instrumental role in operating the Three-Pillar Building Framework. In particular, it emphasises policy orientations towards developing policy solutions and advocating development and climate change activities in the delta, as well as coordinating relevant operations at both horizontal (provincial-provincial) and vertical (central-provincial) levels (The Prime Minister of The Vietnamese Government, 2020b). In the existing mechanisms, however, as reflected by Soussan et al. (2019), there lack synergies and coordination across these scales. These institutional drawbacks need to be modified to better scaffold the 'twin' environment and development strategies in the delta.

We found that the establishment of the Three-Pillar Building Framework to assist policy solutions for the delta's environment and development is essential in the long run. However, seeking institutional fit to achieve these overarching goals needs to take account of political, socio-economic and environmental implications of the transboundary water challenges in the delta, as well as the accountability and commitment of the central government in addressing the problems. To this end, there needs meaningful engagements between central and provincial government agencies in policy-making processes in compromising local development priorities and national interest, while sufficiently articulating transboundary environmental perturbations in

the Mekong region that expose the VMD to vulnerability. Taking actions does not solely focus on the understanding of central-local dynamics of environmental governance within the narrow spatial geographies of the delta waterscapes; rather, it requires more profound and extended engagements and dialogues among the member countries of the Mekong River Commission, relevant institutions and beyond in voicing how evolving transboundary water challenges are exacerbating the delta's land- and waterscapes, population, and livelihoods. Badenoch's (2002) claim that decision-making processes to address transboundary environmental challenges should go beyond the borders of individual nation-states' discourses resonates well with this case. The claim raises a critical concern over how far the riparian countries have been and would be accountable for and committed to the spirit of the 1995 Mekong Agreement. This clearly affirms that the principles of cooperation for sustainable development and use of the water and related resources and environment of the Mekong River should be respected and acted upon.

5 | CONCLUSION

We identify a policy-practice mismatch in the implementation of Resolution 120 across the case studies. The mismatch is mainly concerned with: (1) scales of policy formulation and implementation to tackle coupled environment and development challenges largely bound to the narrow geographical boundary of the delta; (2) observed challenges in restructuring the aquaculture-fruit-rice production pattern due to the previously designed rice production-oriented irrigation systems; and (3) unavailability of necessary resources for enabling these processes. We also found that, while Resolution 120 promotes adaptation solutions (living with nature), governments in the coastal provinces have remained to resort to infrastructure (sluice systems) to withstand recurring water challenges, especially saltwater intrusion. The study presents evidence of institutional fit in terms of policy learning by local governments, indicating the shift from a predominant control to a hybrid control-adaptation approach. From the policy perspective, this new approach expectedly serves as a two-pronged pillar for the climate-resilient and sustainable development of the delta as emphasised in Resolution 120.

Our study suggests an ongoing shift in environment and development policies from the floodplains to the coastal areas due to the higher vulnerability of the latter to salinity impacts (e.g. saltwater intrusion). This presents the fragmentation in the Vietnamese government's priority to deal with situated climatic impacts, with more focus on policy solutions at the delta scale, rather than developing an overall strategy to tackle associated transboundary environmental effects across the Mekong region. This bias has hindered efforts in resolving the latter problem at present and in the future. Paradoxically, while there is much evidence of transboundary impacts at the local level, they are not sufficiently addressed with concrete solutions in central government's policy documents including Resolution 120. Development is about people (Tortajada, 2014), but this is often forgotten,

especially in the coupled environment-development complexities of the VMD. Overall, the present study suggests that this oversight, if continued, will have domino effects on the delta's environment and populations. Even worse, it will irrevocably disrupt the unique values, cultures, biodiversity, and ecosystems that have been built and sustained in the delta for more than 300 years.

The study presents ongoing shifts from command-and-control to process-oriented and from reactive to proactive approaches in attempts to achieve institutional fit. This involved formal interactions among central government agencies, provincial governments and relevant stakeholders in assessing the implementation of Resolution 120. This paves an important pathway for crafting and integrating the Three-Pillar Building Framework into policy-making processes, as well as setting up the Regional Coordination Council to coordinate environment and development strategies in the delta. Given the hierarchical governance system of Vietnam, this study raises a question as to how and to what extent this leadership would make meaningful contribution to coordinating activities among government sectors and levels to deal with transboundary water challenges, while securing the successful implementation of Resolution 120. It remains to be seen how this new mechanism helps achieve an institutional fit in walking through complex environment-development processes in the delta.

ACKNOWLEDGMENTS

This publication benefited from a grant from the Social Science Research Council of the Singapore Ministry of Education, "Sustainable Governance of Transboundary Environmental Commons in Southeast Asia" (MOE2016-SSRTG-068). Any opinions, findings, conclusions or recommendations are those of the authors and do not reflect the views of the Ministry of Singapore Education. We are deeply grateful to our key respondents for providing information for the study. We also thank Dung Duc Tran for his assistance in producing the Mekong map for the paper.

REFERENCES

- Agrawal, A., & Lemos, M. C. (2007). A greener revolution in the making? Environmental governance in the 21st century. *Environment: Science and Policy for Sustainable Development*, 49(5), 36–45.
- Akamani, K., & Wilson, P. I. (2011). Toward the adaptive governance of transboundary water resources. *Conservation Letters*, 4(6), 409–416.
- Ananda, J., McFarlane, D., & Loh, M. (2020). The role of experimentation in water management under climate uncertainty: Institutional barriers to social learning. *Environmental Policy and Governance*, 30(6), 319–331.
- Arias, M. E., Holtgrieve, G. W., Ngor, P. B., Dang, T. D., & Piman, T. (2019). Maintaining perspective of ongoing environmental change in the Mekong floodplains. *Current Opinion in Environmental Sustainability*, 37, 1–7.
- Azhoni, A., Holman, I., & Jude, S. (2017). Contextual and interdependent causes of climate change adaptation barriers: Insights from water management institutions in Himachal Pradesh, India. *Science of the Total Environment*, 576, 817–828.
- Badenoch, N. (2002). *Transboundary environmental governance: Principles and practice in mainland Southeast Asia*. World Resources Institute.
- Bazeley, P., & Jackson, K. (2013). *Qualitative data analysis with NVivo*. Sage Publications.



- Benedikter, S. (2014). Extending the hydraulic paradigm: Reunification, state consolidation, and water control in the Vietnamese Mekong Delta after 1975. *Southeast Asian Studies*, 3(3), 547–587.
- Biermann, F. (2021). The future of 'environmental' policy in the Anthropocene: Time for a paradigm shift. *Environmental Politics*, 30(1–2), 61–80.
- Biggs, D., Miller, F., Chu, T. H., & Molle, F. (2009). The Delta machine: Water management in the Vietnamese Mekong Delta in historical and contemporary perspectives. In F. Molle, T. Foran, & M. Käkönen (Eds.), *Contested waterscapes in the Mekong region – Hydropower, livelihoods and governance* (pp. 203–225). Earthscan.
- Binh, D. V., Kantoush, S. A., Saber, M., Mai, N. P., Maskey, S., Phong, D. T., & Sumi, T. (2020). Long-term alterations of flow regimes of the Mekong River and adaptation strategies for the Vietnamese Mekong Delta. *Journal of Hydrology: Regional Studies*, 32, 100742.
- Braunschweiler, D., & Pütz, M. (2021). Climate adaptation in practice: How mainstreaming strategies matter for policy integration. *Environmental Policy and Governance*, 31, 1–13.
- Brown, S., Nicholls, R. J., Hanson, S., Brunit, G., Dearing, J. A., Dickson, M. E., Gallop, S. L., Gao, S., Haigh, I. D., Hinkel, J., Jiménez, J. A., Klein, R. J. T., Kron, W., Lázár, A. N., Freitas Neves, C. F., Newton, A., Pattiaratchi, C., Payo, A., Pye, K., ... Wooff, C. D. (2014). Shifting perspectives on coastal impacts and adaptation. *Nature Climate Change*, 4(9), 752–755.
- Chu, T. H., Suhardiman, D., & Le, A. T. (2014). Irrigation development in the Vietnamese Mekong Delta: Towards polycentric water governance? *International Journal of Water Governance*, 2(2), 61–82.
- Cookey, P. E., Darnasawadi, R., & Ratanachai, C. (2017). Text mining analysis of institutional fit of Lake Basin water governance. *Ecological Indicators*, 72, 640–658.
- Cosslett, T. L., & Cosslett, P. D. (2014). *Water resources and food security in the Vietnam Mekong Delta*. Springer.
- Cox, M. (2012). Diagnosing institutional fit: A formal perspective. *Ecology and Society*, 17(4), 54.
- CSI (Enhancing Climate Services for Infrastructure Development) (2019). Final report: Climate risk analysis and assessment report for Cai Lon–Cai be sluice gate project based on the PIEVC protocol, CSI.
- Dang, V. H., Tran, D. D., Pham, T. B. T., Khoi, D. N., Tran, P. H., & Nguyen, N. T. (2019). Exploring freshwater regimes and impact factors in the coastal estuaries of the Vietnamese Mekong Delta. *Water*, 11(782), 1–19.
- de Stefano, L., Petersen-Perlman, J. D., Sproles, E. A., Eynard, J., & Wolf, A. T. (2017). Assessment of transboundary river basins for potential hydro-political tensions. *Global Environmental Change*, 45, 35–46.
- de Souza, K., Kituyi, E., Harvey, B., Leone, M., Murali, K. S., & Ford, J. D. (2015). Vulnerability to climate change in three hot spots in Africa and Asia: Key issues for policy-relevant adaptation and resilience-building research. *Regional Environmental Change*, 15(5), 747–753.
- Demont, M., & Rutsaert, P. (2017). Restructuring the Vietnamese rice sector: Towards increasing sustainability. *Sustainability*, 9(2), 325.
- Eckstein, D., Künzel, V., Schäfer, L., & Winges, M. (2019). *Global climate risk index 2020*. Germanwatch.
- Ekstrom, J. A., & Young, O. R. (2009). Evaluating functional fit between a set of institutions and an ecosystem. *Ecology and Society*, 14(2), 16.
- Epstein, G., Pittman, J., Alexander, S. M., Berdej, S., Dyck, T., Kreitmair, U., Rathwell, K. J., Villamayor-Tomas, S., Vogt, J., & Armitage, D. (2015). Institutional fit and the sustainability of social-ecological systems. *Current Opinion in Environmental Sustainability*, 14, 34–40.
- Eyler, B. & Weatherby, C. (2020). Mekong mainstream dams. Retrieved from <https://www.stimson.org/2020/mekong-mainstream-dams>.
- Eyler, B. (2019). *Last days of the mighty Mekong*. Zed Books.
- Fawthrop, T. (2019). Did Vietnam just doom the Mekong? Retrieved from <https://thediplomat.com/2019/11/did-vietnam-just-doom-the-mekong>.
- Fischer, A. P. (2018). Pathways of adaptation to external stressors in coastal natural-resource-dependent communities: Implications for climate change. *World Development*, 108, 235–248.
- Folke, C., Pritchard, L., Berkes, F., Colding, J., & Svedin, U. (2007). The problem of fit between ecosystems and institutions: Ten years later. *Ecology and Society*, 12(1), 30.
- Geheb, K., & Suhardiman, D. (2019). The political ecology of hydropower in the Mekong River basin. *Current Opinion in Environmental Sustainability*, 37, 8–13.
- Gerlak, A. K., & Schmeier, S. (2014). Climate change and transboundary waters: A study of discourse in the Mekong River commission. *The Journal of Environment and Development*, 23(3), 358–386.
- Green, O. O., Cosens, B. A., & Garmestani, A. S. (2013). Resilience in transboundary water governance: The Okavango River basin. *Ecology and Society*, 18(2), 1–15.
- GSO (General Statistics Office). (2020). *Socio-economic statistical data of 63 provinces and cities*. Statistical Publishing House.
- Hajer, M., & Versteeg, W. (2005). A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. *Journal of Environmental Policy and Planning*, 7(3), 175–184.
- Hanasz, P. (2018). Introduction. In *Transboundary water governance and international actors in South Asia: The Ganges-Brahmaputra-Meghna Basin* (1st ed.). Routledge.
- Hecht, J. S., Lacombe, G., Arias, M. E., Dang, T. D., & Piman, T. (2019). Hydropower dams of the Mekong River basin: A review of their hydrological impacts. *Journal of Hydrology*, 568, 285–300.
- Hoang, L. P., van Vliet, M. T. H., Kumm, M., Lauri, H., Koponen, J., Supit, I., Leemans, R., Kabat, P., & Ludwig, F. (2019). The Mekong's future flows under multiple drivers: How climate change, hydropower developments and irrigation expansions drive hydrological changes. *Science of the Total Environment*, 649, 601–609.
- Hoang, Q. H., Kubo, N., Hoang, N. G., & Tanji, H. (2009). Operation of the Ba Lai irrigation system in the Mekong Delta, Vietnam. *Paddy Water Environment*, 7, 123–133.
- Keskinen, M., Chinvarno, S., Kumm, M., Nuorteva, P., Snidvongs, A., Varis, O., & Västilä, K. (2010). Climate change and water resources in the Lower Mekong River Basin: Putting adaptation into the context. *Journal of Water and Climate Change*, 1(2), 103–117.
- Khong, T. D., Loch, A., & Young, M. D. (2020). Perceptions and responses to rising salinity intrusion in the Mekong River Delta: What drives a long-term community-based strategy? *Science of the Total Environment*, 711, 134759.
- Kuenzer, C., Campbell, I., Roch, M., Leinenkugel, P., Tuan, V. Q., & Dech, S. (2013). Understanding the impact of hydropower developments in the context of upstream-downstream relations in the Mekong River basin. *Sustainability Science*, 8(4), 565–584.
- Lauri, H., Moel, H. D., Ward, P., Räsänen, T., Keskinen, M., & Kumm, M. (2012). Future changes in Mekong River hydrology: Impact of climate change and reservoir operation on discharge. *Hydrology and Earth System Sciences Discussions*, 9(5), 6569–6614.
- Le, A. T. (2020). Analysis of flood and drought variability in the Mekong River Delta in the last 20 years. *Journal of Science and Technology*, 62(11), 22–27.
- Le, A. T., Le, V. D., & Skinner, T. (2014). Rapid integrated and ecosystem-based assessment of climate change vulnerability and adaptation for Ben Tre Province, Vietnam. *Journal of Science and Technology*, 52(3A), 287–293.
- Leipold, S., Feindt, P. H., Winkel, G., & Keller, R. (2019). Discourse analysis of environmental policy revisited: Traditions, trends, perspectives. *Journal of Environmental Policy and Planning*, 21(5), 445–463.
- Linell, A., Sjöstedt, M., & Sundström, A. (2019). Governing transboundary commons in Africa: The emergence and challenges of the Kavango-Zambezi treaty. *International Environmental Agreements: Politics, Law and Economics*, 19(1), 53–68.
- Maxwell, J. A. (2005). *Qualitative research design: An interaction approach* (2nd ed.). Sage Publications.
- Middleton, C., & Dore, J. (2015). Transboundary water and electricity governance in mainland Southeast Asia: Linkages, disjunctures and

- implications. *International Journal of Water Governance*, 3(1), 93–120.
- Miller, M. A., Alfajri Astuti, R., Grundy-Warr, C., Middleton, C., Tan, Z. D., & Taylor, D. (2021). Hydrosocial rupture: Causes and consequences for transboundary governance. *Ecology and Society*, 26(3), 1–13.
- Miller, M. A., Rigg, J., & Taylor, D. (2020). Governing transboundary commons in Southeast Asia. *Asia Pacific Viewpoint*, 61(2), 185–189.
- Miller, M. A., Middleton, C., Rigg, J., & Taylor, D. (2019). Hybrid governance of transboundary commons: Insights from Southeast Asia. *Annals of the American Association of Geographers*, 110(1), 297–313.
- Miller, M. A. (2020). B/ordering the environmental commons. *Progress in Human Geography*, 44(3), 473–491.
- Milman, A., Gerlak, A. K., Albrecht, T., Colosimo, M., Conca, K., Kittikhoun, A., Kovács, P., Moy, R., Schmeier, S., Wentling, K., Werick, W., Zavadsky, I., & Ziegler, J. (2020). Addressing knowledge gaps for transboundary environmental governance. *Global Environmental Change*, 64, 102162.
- Milman, A., Bunclark, L., Conway, D., & Adger, W. N. (2013). Assessment of institutional capacity to adapt to climate change in transboundary river basins. *Climatic Change*, 121(4), 755–770.
- MONRE (Ministry of Natural Resources and Environment). (2021). Report on evaluating three-year implementation of the Government's resolution 120/NQ-CP on “climate resilient and sustainable development of the Mekong River Delta,” Can Tho City, Vietnam, 13, 2021.
- MONRE (Ministry of Natural Resources and Environment). (2019). Report on results of implementing the Government's resolution 120/NQ-CP on “climate resilient and sustainable development of the Mekong River Delta,” Ho Chi Minh City, Vietnam, 18, 2019.
- MRC (Mekong River Commission). (2014). *Local demonstration projects on climate change adaptation – Final report of the first batch project in Vietnam*. MRC.
- Munia, H., Guillaume, J. H. A., Mirumachi, N., Porkka, M., Wada, Y., & Kummu, M. (2016). Water stress in global transboundary river basins: Significance of upstream water use on downstream stress. *Environmental Research Letters*, 11(1), 14002.
- Nguyen, H. H., Dargusch, P., Moss, P., & Tran, D. B. (2016). A review of the drivers of 200 years of wetland degradation in the Mekong Delta of Vietnam. *Regional Environmental Change*, 16(8), 2303–2315.
- Nguyen, H. Q., Korbee, D., Ho, H. L., Weger, J., Phan, T. T. H., Nguyen, T. T. D., Dang, M. H. L. P., Luu, T. T., Dang, H. P. T., Ngo, T. T. T., Hermans, L., Evers, J., Wyatt, A., Chau, N. X. Q., & Hoang, L. P. (2019). Farmer adoptability for livelihood transformations in the Mekong Delta: A case in Ben Tre province. *Journal of Environmental Planning and Management*, 62(9), 1603–1618.
- Nguyen, V. K. T., Nguyen, V. D., Fujii, H., Kummu, M., Merz, B., & Apel, H. (2017). Has dyke development in the Vietnamese Mekong Delta shifted flood hazard downstream? *Hydrology and Earth System Sciences*, 21(8), 3991–4010.
- Nicholls, R. J., Adger, W. N., Hutton, C. W., & Hanson, S. E. (2020). *Deltas in the Anthropocene*. Palgrave Macmillan.
- Olsson, P., Folke, C., Galaz, V., Hahn, T., & Schultz, L. (2007). Enhancing the fit through adaptive co-management: Creating and maintaining bridging functions for matching scales in the Kristianstads Vattenrike biosphere reserve, Sweden. *Ecology and Society*, 12(1), 28.
- Paisley, R. K., & Henshaw, T. W. (2013). Transboundary governance of the Nile River basin: Past, present and future. *Environmental Development*, 7, 59–71.
- Patterson, J., de Voogt, D. L., & Sapiains, R. (2019). Beyond inputs and outputs: Process-oriented explanation of institutional change in climate adaptation governance. *Environmental Policy and Governance*, 29(5), 360–375.
- People's Committee of Dong Thap Province. (2019). *Mekong Delta integrated climate resilience and sustainable livelihoods – Environmental and social impacts assessment report*. Office of the Provincial Committee.
- Pham, V. H. T., Febriamansyah, R., Afrizal, A., & Tran, T. A. (2020). Adapting to saline intrusion: Empirical insights from two coastal areas in the Vietnamese Mekong Delta. *Pertanika Journal of Social Sciences and Humanities*, 28(2), 1553–1566.
- Poelma, T., Bayrak, M. M., Nha, D. V., & Tran, T. A. (2021). Climate change and livelihood resilience capacities in the Mekong Delta: A case study on the transition to rice-shrimp farming in Vietnam's Kien Giang Province. *Climatic Change*, 164(9), 1–20.
- Pokhrel, Y., Shin, S., Lin, Z., Yamazaki, D., & Qi, J. (2018). Potential disruption of flood dynamics in the lower Mekong River basin due to upstream flow regulation. *Scientific Reports*, 8(1), 17767.
- Quan, N. H., Toan, T. Q., Dang, P. D., Phuong, N. L., Anh, T. T. H., Quang, N. X., Quoc, D. P., Quoi, L. P., Hanington, P., & Sea, W. B. (2018). Conservation of the Mekong Delta wetlands through hydrological management. *Ecological Research*, 33(1), 87–103.
- Räsänen, T. A., Someth, P., Lauri, H., Koponen, J., Sarkkula, J., & Kummu, M. (2017). Observed river discharge changes due to hydropower operations in the upper Mekong Basin. *Journal of Hydrology*, 545, 28–41.
- Runhaar, H., van Laerhoven, F., Driessen, P., & Arts, J. (2013). Environmental assessment in The Netherlands: Effectively governing environmental protection? A discourse analysis. *Environmental Impact Assessment Review*, 39, 13–25.
- Santos, M. J., & Dekker, S. C. (2020). Locked-in and living delta pathways in the Anthropocene. *Scientific Reports*, 10(1), 19598.
- Slade, C., & Carter, J. (2016). Towards institutional fit? The reality of institutional capacity through two food security exemplars. *Geoforum*, 76, 100–113.
- Smajgl, A., Toan, T. Q., Nhan, D. K., Ward, J., Trung, N. H., Tri, L. Q., Tri, V. P. D., & Vu, P. T. (2015). Responding to rising sea levels in the Mekong Delta. *Nature Climate Change*, 5(2), 167–174.
- Sneddon, C., & Fox, C. (2006). Rethinking transboundary waters: A critical hydropolitics of the Mekong basin. *Political Geography*, 25(2), 181–202.
- Soussan, J., McGrath, T., & Mai, N. T. N. (2019). *The development of regional coordination in the Mekong Delta*. GIZ.
- Sternlieb, F., Bixler, R. P., Huber-Stearns, H., & Huayhuaca, C. (2013). A question of fit: Reflections on boundaries, organisations and social-ecological systems. *Journal of Environmental Management*, 130, 117–125.
- Suhardiman, D., & Middleton, C. (2020). The Salween River as a transboundary commons: Fragmented collective action, hybrid governance and power. *Asia Pacific Viewpoint*, 61(2), 301–314.
- The Prime Minister of The Vietnamese Government (2020a). Decision no. 324/QĐ-TTg. On “approval of a comprehensive program on climate-resilient and sustainable development of the agricultural sectors in the Vietnamese Mekong Delta as of 2030 and visions towards 2045”, dated March 2, 2020, Hanoi: Office of the Government.
- The Prime Minister of The Vietnamese Government (2020b). Decision no. 825/QĐ-TTg. On “establishment and promulgation of the operational regulation of the Mekong Delta regional coordinating council for the 2020–2025 period”, dated June 12, 2020, Hanoi: Office of the Government.
- The Vietnamese Government. (2017). *Resolution no. 120/NQ-CP on “climate resilient and sustainable development of the Mekong Delta”*, dated 17 November 2017. Office of the Government.
- The Prime Minister of The Vietnamese Government (2016). Decision no. 593/QĐ-TTg on Promulgation of piloting principles on regional coordination for social-economic development in the Vietnamese Mekong Delta, dated April 6, 2016, Hanoi: Office of the Government.
- The Prime Minister of The Vietnamese Government (2012). Decision no. 1397/QĐ-TTg on Approval of hydraulic planning for the Vietnamese Mekong Delta from 2012 to 2020 and orientations towards 2050 under conditions of climate change and sea level rise, dated September 25, 2012, Hanoi: Office of the Government.
- Timmerman, J., Matthews, J., Koepfel, S., Valensuela, D., & Vlaanderen, N. (2017). Improving governance in transboundary cooperation in water and climate change adaptation. *Water Policy*, 19(6), 1014–1029.



- Tortajada, C. (2014). Water infrastructure as an essential element for human development. *International Journal of Water Resources Development*, 30(1), 8–19.
- Tran, T. A., Dang, T. D., Nguyen, T. H., & Pham, V. H. T. (2021). Moving towards sustainable coastal adaptation: Analysis of hydrological drivers of saltwater intrusion in the Vietnamese Mekong Delta. *Science of the Total Environment*, 770, 145125.
- Tran, T. A., Pittock, J., & Tran, D. D. (2020). Adaptive flood governance in the Vietnamese Mekong Delta: A policy innovation of the North Vam Nao scheme, An Giang Province. *Environmental Science and Policy*, 108, 45–55.
- Tran, T. A. (2020). From free to forced adaptation: A political ecology of the 'state-society-flood' nexus in the Vietnamese Mekong Delta. *Asia Pacific Viewpoint*, 61(1), 162–182.
- Trung, L. D., Duc, N. A., Nguyen, L. T., Thai, T. H., Khan, A., Rautenstrauch, K., & Schmidt, C. (2020). Assessing cumulative impacts of the proposed lower Mekong Basin hydropower cascade on the Mekong River floodplains and Delta – Overview of integrated modelling methods and results. *Journal of Hydrology*, 581, 122511.
- Uda, S. K., Schouten, G., & Hein, L. (2020). The institutional fit of peatland governance in Indonesia. *Land Use Policy*, 99, 103300.
- VCCI (Vietnam Chamber of Commerce and Industry). (2020). *Annual economic report Mekong Delta 2020 – Enhancing competitiveness for sustainable development*. Can Tho University Publishing House.
- VDMA (Vietnam Disaster Management Authority). (2020). Flash update no. 1 about the drought and saltwater intrusion in the Mekong Delta. Hanoi: Vietnam Ministry of Agriculture and Rural Development.
- VNRC (Vietnam Red Cross Society). (2020). *Vietnam: Drought and saltwater intrusion*. Vietnam Red Cross Society.
- Waibel, G., Benedikter, S., Reis, N., Genschick, S., Nguyen, L., Huu, P. C., & Tran, T. B. (2012). Water governance under renovation? Concepts and practices of IWRM in the Mekong Delta, Vietnam. In F. G. Renaud & C. Kuenzer (Eds.), *The Mekong Delta system – Interdisciplinary analyses of a River Delta* (pp. 167–198). Springer.
- Wandel, J., & Marchildon, G. P. (2010). Institutional fit and interplay in a dryland agricultural social-ecological system. In C. Alberta, D. Armitage, & R. Plummer (Eds.), *Adaptive capacity and environmental governance* (pp. 179–195). Springer.
- Wassmann, R., Phong, N. D., Tho, T. Q., Hoanh, C. T., Khoi, N. H., Hien, N. X., Vo, T. B. T., & Tuong, T. P. (2019). High-resolution mapping of flood and salinity risks for rice production in the Vietnamese Mekong Delta. *Field Crops Research*, 236, 111–120.
- World Bank. (2020). *Mobilising financial for climate smart investments in the Mekong Delta: An options note*. World Bank.
- Young, O. R. (2010). Institutional dynamics: Resilience, vulnerability and adaptation in environmental and resource regimes. *Global Environmental Change*, 20(3), 378–385.
- Young, O. R. (2008). The architecture of global environmental governance: Bringing science to bear on policy. *Global Environmental Politics*, 8(1), 14–32.
- Zeitoun, M., Goulden, M., & Tickner, D. (2013). Current and future challenges facing transboundary river basin management. *Wiley Interdisciplinary Reviews: Climate Change*, 4(5), 331–349.

How to cite this article: Tran, T. A., & Tortajada, C. (2022).

Responding to transboundary water challenges in the Vietnamese Mekong Delta: In search of institutional fit.

Environmental Policy and Governance, 1–17. <https://doi.org/10.1002/eet.1980>

APPENDIX A

TABLE A1 Summary of key informants in in-depth interviews

Method	Number	Information collected	Informant groups
Interviews (face to face)	2	Hydrological alterations of the Mekong River, drivers, and their social, economic, and environmental implications for riparian countries and the VMD	Mekong hydrology and ecosystem experts
	3	Occurrences and impacts of climate change (and El Niño in particular) in the Mekong region	Climate change and environmental scientists at Can Tho University
	8	Exposure of environmental change associated with changing water flows and implications for aquacultural and agricultural production in the study areas; uptake of innovative practices in water management and adaptation policies; transboundary water characteristics and institutional understanding of the impacts, as well as decision-making processes at the provincial level	Government officials in the Department of Environment and Natural Resource and Department of Agriculture and Rural Development in the study areas (An Giang, Dong Thap, Kien Giang, and Ben Tre)
	1	Changing water systems in the VMD, drivers of change, and implications for water management delta-wide; delta planning strategies in the new environmental conditions (climate change and hydropower development)	Southern Institute for Water Resource Planning
	1	New water challenges facing the VMD, drivers of change at transboundary and local scales, and relevant adaptation strategies across governance scales	Southern Institute of Water Resources Research
Interviews (through Skype)	1	Development of hydropower projects in the Mekong region, and local and transboundary environmental implications; operational mechanisms of hydropower projects in relation to changing water flows downstream; institutional processes underway to address hydropower-related impacts on ecosystems and riparian livelihoods in the Mekong region and the VMD	Senior hydrology expert at the Centre for Sustainable Development of Water Resources and Climate Change Adaptation
	1	Transboundary impacts driven by climate change and hydropower operations, and implications for the VMD as a whole; institutional responses to environmental change delta-wide; long-term development strategies in current environmental complexities; policy gaps in water governance in the VMD	Senior environmental scientist at Can Tho University
	1	Local responses to the new economic and environmental context of the VMD; transboundary water challenges and policy engagement at the delta scale	Mekong development expert
Short communication (email)	1	Implementation and effects of Resolution 120 on the ground	Mekong ecosystem expert