Political ecology of freshening the Mekong’s coastal delta: narratives of place-based land-use dynamics

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ABSTRACT

This paper explores how the state-led ‘freshening the coastal zones’ policy has been implemented in pursuit of sustainable development in the Vietnamese Mekong Delta. Drawing on a case study of the Ba Lai irrigation scheme in a coastal district of Ben Tre Province, the paper argues that the state’s ideology of ‘freshening water over saltwater’ results in contested land-use policies that, in turn, drive forced transformation of resource-based livelihoods. By unraveling the political ecology of these social-political dynamics, the study shows how contemporary land-use approaches have modified coastalscapes, evidenced by the continued expansion of freshwater-based agricultural systems. These agriculture-favored development policies have negatively affected agrarian communities’ options to sustain their traditional livelihoods (e.g. shrimp farming), which otherwise help yield higher incomes. This paper raises doubts about the ‘freshening coastal zones’ policy in addressing saltwater intrusion at the delta scale, while recognizing the equal role of saltwater in supporting coastal livelihoods.

INTRODUCTION

The Anthropocene epoch is defined by accelerating occurrences of climatic stressors (Hinkel et al., 2018; Wong et al., 2014). In coastal deltas, climatic events such as sea level rise and saltwater intrusion coupled with human appropriation of nature for agriculture-led development has applied disproportionate pressure on common resources (e.g. water). These altered social-ecological relations have resulted in dramatic changes in adaptive capacity (Nicholls et al., 2020; Rahman et al., 2019). For example, in the coastal zones of Bangladesh, sea level rise coupled with water extraction have rendered local ecosystems profoundly exposed to salinity, affecting agricultural productivity and freshwater availability (Islam et al., 2020; Szabo et al., 2016).

Engineering measures such as seawalls and embankments are common responses to saltwater intrusion in coastal zones (Firth et al., 2013; Schooness et al., 2019). They embody how technocratic approaches remain dominant as part of rural modernization efforts, not least in developing countries (Eriksen et al., 2021; Molle & Mamanpoush, 2012). For most governments, technical responses are seen to be straight-forward, robust, predictable, and reliable in the context of climatic uncertainty (Cheong et al., 2013). River impoundment (conversion of a deltaic river system into a freshwater

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Supplemental data for this article can be accessed online at https://doi.org/10.1080/1747423X.2022.2126907

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storage – hereby referred to as a reservoir) has increasingly been embraced as a key solution able to support agricultural development (Mollinga, 2014). In coastal states of India, coastal reservoirs are built to store surplus freshwater that is later extracted from river systems, groundwater, and wetlands (Kolathayar et al., 2019). In the coastal zones of the Vietnamese Mekong Delta (VMD), which is highly exposed to saltwater intrusion (World Bank, 2022), similar technical approaches have been installed at riverine estuaries, designed in the form of sluice systems. These technical interventions achieve three aims, they: (1) address recurring saltwater intrusion events, (2) mitigate freshwater shortage for household consumption, and (3) enable intensification and/or expansion of agricultural production (Government of Vietnam, 2012).

In the VMD, land-use planning retains a technical orientation, with local government seeking to ‘tame’ nature in service of economic interests (Käkönen, 2008). Historically, this taming of nature was understood as the exploitation of the delta by individual settlers hundreds years ago (Biggs, 2010). In the contemporary period, ‘taming’ has been realized by larger-scale development plans, but with a transition from aims of ‘opening up’ the delta toward aims of ‘closing off’ the delta from the sea (Miller, 2007). However, the ways in which these infrastructural interventions (re)shaped the power dynamics that inform land-use management in support of resource-based livelihoods in the context of agrarian transition at the local scale are not well understood.

Political ecology is a central theory of nature-society research in geography (Walker, 2005). It tends to focus on interactions between state and non-state actors, treating the physical environment as a central actant (Forsyth, 2003). Embedded in everyday politics of coupled environment and development systems as well as captured in the domains of natural resource management and climate change, political ecology enables analysis of highly contested topics in which state and society undertake conflict resolution (Artur & Hilhorst, 2012; King et al., 2019). In this light, political ecology encompasses state exercise of authority and power in control over, management of, and transformation of natural resources (Harris, 2017), while simultaneously exercising influence over society (Suhardiman & Giordano, 2014). Robbins (2012) sees political ecology as a narrative encompassing several prominent theses. First, they suggest that political ecology inform local decision-making involving the enclosure of common property or modernist development planning efforts. Second, political ecology involves ways in which efforts to protect areas tend to exclude local actors from participating. Third, political ecology has exposed how conflicts over environments are linked to social and structural dynamics. According to Carr (2015, p. 332), political ecology and the study of livelihoods are said to be interwoven as ‘natural partners.’ This is because political ecology helps reveal the discursive politics of local access and control over natural resources, which holds important implications for livelihoods (Lindegaard, 2020; Liu & Liu, 2016). In the same vein, Scoville-Simonds et al. (2020, p. 5) argue that livelihoods are often shaped by ‘a question of values and whose values come to count within the context of unequal relations of power.’ However, these theoretical dimensions are not widely used to reflect state-society contestations in natural resource governance arrangements, especially in authoritarian governance contexts.

This study takes a political ecology approach to reveal the awkward – and sometimes contested – intersections between policies and the struggles of agrarian communities to secure their livelihoods. Using the Ba Lai as a case study, political ecology illustrates how the state’s adherence to modernist development and the exercising of power and legitimacy to ensure rule compliance over the river-based freshwater utilization for crop production is at odds with agrarian communities’ desires to secure profitable livelihoods. To this end, the study seeks to answer the following questions:

1. How are land-use dynamics linked to the state-led ‘freshening coastal zones’ strategy?
2. How are the relations between the local government and farming communities shaped by the operation of the scheme?
3. How do farming communities respond to the ‘freshwater over saltwater’ policy as exercised on the ground?
Drawing on insights from qualitative data collected at governmental agencies across administrative levels and from farmers in two communes (Thanh Tri and Thanh Phuoc) of Binh Dai District, Ben Tre Province, this study argues that the state-led ‘freshwater over saltwater’ ideology results in contested land-use policies, which in turn drive forced transformation of resource-based livelihoods. Through a lens of political ecology, the study shows how contemporary land-use approaches have modified coastscape developments, and how agriculture-favored development policies have negatively affected agrarian communities’ livelihood options to improve their income (e.g. shrimp farming). These critical aspects have not been adequately addressed in the literature of natural resources governance in the VMD.

The study advances three contributions: first, it explains the everyday politics of the coupled environment-development system in the VMD. In this way, the paper challenges the state-led deployment of structural measures to deal with climatic stressors such as saltwater intrusion, premised as they are on a technocratic understanding of the delta’s coastal ecosystems (Carew-Reid, 2008; Government of Vietnam, 2012). Second, as coastal estuaries are sealed off from the sea through construction of an array of technical systems (Smajgl et al., 2015), the Ba Lai irrigation system case study provides insights into how the ‘freshening the coastal areas’ policy shapes the land-use dynamics on the ground. Third, by drawing lessons from the interactions between local government and agrarian communities, the paper accounts for the adverse effects of technical developments, with impacts that will inform ongoing and future water management projects in the delta. Overall, the research seeks to inform the climate-resilient development agenda as set out in the Vietnamese Government’s Resolution 120 (Government of Vietnam, 2017).

The paper is structured as follows. The following section presents the research methods, describing the rationale for selecting the study areas and approaches for data collection and analysis. In the results and discussion sections, the ‘freshening coastal zones’ strategy is presented, focusing on the everyday politics of environment and development as implemented by local government and agrarian communities in the context of land-use change. The final section offers conclusions pertaining to the ‘freshening coastal zones’ policy, which highlight policy implications for future technical interventions in other coastal provinces in the VMD and beyond.

**Research methods**

**Description of the study areas**

In Ben Tre Province, where sea level rise and saltwater intrusion are adversely impacting coastal ecosystems and livelihoods (Renaud et al., 2015; Veettil et al., 2019), the Ba Lai irrigation scheme in Binh Dai District is held up as an adaptation measure to tackle the ‘wicked’ problems (Ben Tre People’s Committee, 2016). It was built on the Ba Lai River in 2000 and is part of the North Ben Tre water control project, which covers 133,875 ha of the province, including Ben Tre City and four districts: Chau Thanh, Binh Dai, Giong Trom, and Ba Tri (Hoang et al., 2009). The scheme creates a river impoundment for freshwater storage that is regulated by a sluice gate (Figure 1). It forms a physical demarkation, leading to the creation of two distinct agro-ecological environments (the freshwater zones in the upper part of the river and the permanently saline zones at the river estuary). This enclosure suggests a critical aspect of political ecology in the contested land-use dynamics in the study area.

Binh Dai District sits in a low-lying coastal area of Ben Tre Province. The district is situated on An Hoa islet and surrounded by two rivers: the Cua Dai and Ba Lai. The district has a total land area of 42,758 hectares (ha), with nearly 50% (19,896 ha) devoted to aquacultural production and over 33% (14,240 ha) to agricultural production. It is home to nearly 140 thousand people, at a density of 321 people/km² (Ben Tre Statistical Office, 2019). The district has a coastline of 27 km, bordering the
Vietnamese East Sea. During the dry season (December–May), the strong northeast monsoon, combined with low discharge and high tidal amplitudes, intensifies the effects of saltwater intrusion (Eslami et al., 2021; Tran et al., 2021).

This study focuses on two communes, namely Thanh Tri and Thanh Phuoc. They represent the two distinct ecological zones of Binh Dai District. We define the spatial characteristics of the communes based on their locations relative to the scheme. Accordingly, while Thanh Tri is located in the upstream zone (i.e. freshwater area) of the Ba Lai River, Thanh Phuoc is in the downstream zone (i.e. estuary area). For the former, freshwater-based agriculture and aquaculture constitute the primary livelihood of the majority of local farmers (Table 1). The local environment allows farmers to diversify their livelihoods using a wide range of crops, such as rice and bananas. Given the permanent saline environment, most farmers in Thanh Phuoc Commune are inclined to practice traditional farming systems, including upland crops (e.g. pumpkins) and other coastal aquacultural practices (e.g. shrimp farming and shrimp-mangrove integrated farming).

**Data collection and analysis**

Data were collected through a narrative inquiry strategy including focus group discussions (FGDs) and in-depth interviews with target respondents (see Appendix 1). The FGDs were undertaken with three groups of farmers (poor, medium, and better-off) in each commune. The categorization of the farming groups was based on the previously defined wealth ranking criteria (Ha et al., 2013). Those who were landless or held little land (<0.5 ha) were defined as poor, with their income derived primarily from wage labor or wild fisheries capture; the medium group was defined as having 0.5–
3 ha of land, with their income derived primarily from on-farm and off-farm labor; and the better-off group was defined as having more than 3 ha of land and engaging in various income-generating activities such as farming or commercial businesses. Participants recruited for FGDs were those who: (1) had lived in their areas of residence before construction of the Ba Lai irrigation scheme and who had experiences with saltwater intrusion, and (2) engaged in farming practices (agriculture or aquaculture). They were asked if they agreed to join the FGDs. The recruitment of the participants was undertaken in partnership with local government officials, who have local knowledge of the context and have the authority to recruit the participants.

The main topics discussed encompassed saltwater intrusion in the study areas and its impacts on rural livelihoods, the transformation of the local coastalscapes before and after the construction of the Ba Lai irrigation scheme, and environmental implications of the scheme's operation. The participants were also asked to give insights into the role the scheme played for their agricultural and aquacultural production activities, as well as their reflections on contemporary relationships between local governments and agrarian communities.

A total of twelve interviews were held with key informants with expertise concerning the issues under study. Theses participants included representatives from local farming groups, environmental experts, and government agencies across administrative levels. Interviews included open-ended questions to gather respondents’ views on the impacts of saltwater intrusion on local livelihoods and
environments, including the implications of the Ba Lai irrigation scheme in light of anticipated levels of saltwater intrusion. These narratives exposed the contentious political relations between local governments and farmers concerning livelihood decisions and, more broadly, perceptions of the efficacy of the ‘freshening coastal zones’ policy.

The data was collected from April to June of 2019. All FGDs and interviews were conducted in the local language (Vietnamese) and facilitated by the first author. Most of interviews were conducted face-to-face, except for one (via Zoom). Each interview lasted between one and two hours, and was digitally recorded and transcribed for analysis.

The FGDs and interviews were assessed, following coding strategies developed by Corbin and Strauss (2007) (i.e. open coding, axial coding, and selective coding). This analytical strategy allows the organization of raw data into conceptual categories, whereby emerging themes are uncovered for analysis (Neuman, 2011). The ‘story-making’ draws from the narrative inquiry approach (Paschen & Ison, 2014). The qualitative data analysis was assisted by the use of NVivo software.

Multiple sources of secondary data were accessed to supplement the study. These sources included books, journal articles, government policy documents, and local and international newspaper articles. They provided the contextual basis of the issues under study, guided the development of inquiry strategies for field data collection (FGDs and interviews), and situatd data analysis.

### A case study of the Ba Lai irrigation scheme

#### An extended experiment of the ‘freshening coastal zones’ policy

The ‘freshening coastal zones’ campaign by central and local governments was divided in two main stages (Figure 2). The first one was launched in the 1990s, which attempted to expand rice-cultivating areas into rural coastal zones, especially in the Ca Mau Peninsula (Benedikter, 2014). The expansion of these hydrosocial territories was undertaken by the conversion of large swampy, wetland areas (mostly brackish areas with acid sulfate soil) into permanent freshwater zones in order to enable rice-based agricultural systems (Nguyen et al., 2016). The second stage is marked by local governments’ strategic decisions to close off riverine estuaries (i.e. extended experiment) with the aim of preventing saltwater intrusion while storing the significant amount of freshwater necessary for agricultural production at a greater scale.

| Description                  | Thanh Tri | Thanh Phuoc |
|------------------------------|-----------|-------------|
| Total land area (ha)         | 2,390     | 5,315       |
| Agriculture land area (ha)   | 1,112     | 890         |
| Aquaculture land area (ha)   | 971       | 2,798       |
| Population (persons)         | 7,493     | 9,130       |
| Density (persons /km²)       | 313       | 172         |
| Location                     | Located in a freshwater zone (Upstream of the Ba Lai irrigation scheme) | Located in a salinity zone (Downstream of the Ba Lai irrigation scheme) |
| Ecological characteristics   | Partly exposed to saltwater intrusion by the Ba Lai irrigation scheme | Directly exposed to saltwater intrusion |
| Primary household livelihood activities | Mixed farming | Upland crops (pumpkins) |
|                             | Freshwater crops (bananas, coconuts, rice) | Brackish aquaculture (white-legged shrimp) |
|                             | Freshwater aquaculture (Giant freshwater prawn) | Shrimp-mangrove integrated farming |
|                             | Intensive white-legged shrimp farming | Nearshore capture fisheries and marine aquaculture (blood cockle farming) |
|                             | Salt farming | |

Sources: Binh Dai Statistical Agency, 2018; Focus group discussions and interviews with local respondents.
The construction of the Ba Lai irrigation scheme falls under the second stage. Until present, the agricultural sector remains the mainstay of the national and regional economy, which seeks to ensure national food security and export demands as stipulated in Resolution 34 (Government of Vietnam, 2021). In response to this overarching objective, the Vietnamese government has expanded permanent freshwater zones, shifting its focus from the Ca Mau Peninsula to coastal plains in the northeast. This endeavor embodies a strategic action plan in tackling climate change in the VMD as articulated in national policy documents (e.g. MARD’s Decision No. 1864/QD-BNN-KH). It also provides a foundation for the state-led modernization and development of rural economy in the coastal delta, which are currently confronted with the implications of intensified saltwater intrusion.

The Ba Lai irrigation scheme provides evidence of how the ‘freshening coastal zones’ policy was incorporated into the combined strategies of rural development and climate change responses in the coastal delta. First and foremost, these strategies affirmed that agriculture-based growth will be a cornerstone for the delta economy, and that the VMD is still a focus for the Vietnamese government to implement food-related national policies (Government of Vietnam, 2021). At the local level, the scheme makes important contributions to land transport systems, for instance, establishing connectivity between Binh Dai District and its neighboring jurisdictions. This provides enabling conditions for the improvement of local economies (e.g. enabling commercial transport of rural commodities such as fruits, fishery products). Second, the coverage of agricultural landscapes in the freshwater zone suggests that the construction of the Ba Lai irrigation scheme stimulates crop productivity and prosperity. This perception increases the national legitimacy for the implementation of the ‘freshening coastal zones’ policy. Third, this development planning has shaped local land-use policies and livelihood patterns. An environmental expert expressed that the Ba Lai irrigation scheme paves the way for the further sealing-off of other coastal estuaries (e.g. Ham Luong River estuary) in coming years (interview, July 2021). This suggests that technical measures will continue to take precedence in governments’ development planning and will be key to responding to climatic stressors in the delta over the long term.

Our data suggest that while the Ba Lai River impoundment attempts to mitigate the adverse effects of saltwater intrusion, the scheme has revealed several drawbacks of technical environmental governance. One of the local government officials considered that the scheme failed to deal with extreme saltwater intrusion events in the dry seasons of 2015–2016 and 2019–2020. He explained that, as the entire project area has not yet been fully protected with a ring dyke system, it cannot hold back the encroachment of saltwater, which often moves through open distributaries (e.g. Cua Dai, Ham Luong). These shortcomings suggested that further coastal engineering works are needed to accommodate the year-round freshwater supply for agricultural production. They also assume that if all estuaries of the distributaries in Ben Tre Province were to be sealed off, then saltwater intrusion would be curbed.

While concerns about the efficacy of the scheme’s performance are critical, it is equally important to take into account how it induced adverse impacts on coastal agro-ecosystems, and how farmers across the study area responded to changing environmental conditions. The following section elaborates farmers’ perceptions of pre- and post-scheme water environments as well as the associated livelihood impacts.

**Farmers’ perceptions of pre – versus post-scheme change**

The Ba Lai irrigation scheme carries both risks and benefits. As noted by Eriksen et al. (2021), adaptation interventions do not necessarily reduce vulnerability. In this study, the scheme does not completely reduce the adverse impacts of saltwater intrusion, but rather, creates a new form of vulnerability as encountered by rural farmers. Our data revealed rural farmers’ mixed perceptions of how the scheme has shaped their livelihoods relative to their past experiences in dealing with the natural environment when the scheme was not in place.
During interviews, local respondents suggested substantial changes in ways that the irrigation scheme shapes local environmental conditions and livelihoods (Table 2). Farmers in Thanh Tri observed that prior to the scheme construction, the commune was substantially influenced by brackish and salty water environments. Local residents found it easier to earn a living from wild capture fisheries due to the seasonal flows of the river. Others cultivated aquaculture, mostly shrimp farming (black tiger shrimp or white-legged shrimp), which produced large profits. A FGD participant confirmed that: ‘The original salinity environment prior to the building of the scheme allowed us to cultivate shrimp, which gave us high yields’ (FGD, June 2019).

Other advantages were also reflected in the comments of Thanh Tri residents. They perceived that, for example, when put into operation, the scheme enabled local farmers to diversify their farming activities, given the year-round availability of freshwater. As one of the FGD participants put it: ‘After the scheme was put into operation, local farmers can cultivate up to three rice crops per year, which was not possible previously. We can also grow sugarcane and coconuts’ (FGD, June 2019).

There were also concerns, however, about the ways the scheme adversely transformed the coastal landscape and its ecosystems. An environmental expert noted that the building of the scheme eliminated the natural brackish water due to the formation of a sharp physical boundary between the freshwater and saltwater zones. He contended that: ‘The brackish water environment provides important habitats for the (re)production of a wide variety of “good-taste” aquatic products, which are hardly found around the scheme areas at present’ (interview, July 2021). These findings resonate with Hoanh et al.’s (2003) critical reflections on the coastal development processes undertaken in the 1990s. They claimed that when the government first attempted to expand freshwater zones in the coastal delta, they failed to recognize the diversity of livelihoods of those who reside within the project areas and did not give adequate consideration to detrimental effects on the local environment.

Our data found noticeable benefits, which the scheme brought to communities residing in Thanh Phuoc Commune. Given the high salt concentration in the dry season, the freshwater supply from the scheme allows farmers to mix it with saltwater to reduce the salinity and stock shrimp post-larvae. Local communities also gained access to piped water provided by a local water treatment plant, which sources water from the Ba Lai reservoir for household consumption.

Our analysis also identified challenges faced by agrarian communities in Thanh Phuoc Commune due to the drainage of freshwater through the Ba Lai sluice system. Local farmers complained that

| Study areas                        | Change in coastalscapes and associated livelihoods                                                                 |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------|
| **Thanh Tri Commune**              | Pre-scheme context                                                                                                 |
| (upstream zone)                    | Land use shaped by local salinity (brackish and salty water) environments                                          |
|                                   | Salinity-based adaptation patterns (e.g. shrimp farming) are dominant                                               |
|                                   | Lack of freshwater in the dry season                                                                               |
|                                   | A smaller concentration of local residents                                                                         |
|                                   | Post-scheme context                                                                                                 |
|                                   | New land-use practices formed by the freshwater environment (homogenous freshwater-based farming patterns)         |
|                                   | Proliferation of freshwater crops (e.g. triple rice crops, sugarcane, coconuts) and cattle husbandry                |
|                                   | Freshwater aquaculture (e.g. giant freshwater prawn)                                                              |
|                                   | Saltwater aquaculture (e.g. white-legged shrimp)                                                                  |
|                                   | Higher level of resident resettlements                                                                           |
|                                   | Less exposure to salinity                                                                                        |
|                                   | Disruption of brackish water systems                                                                               |
|                                   | Land use remains largely shaped by local salinity (brackish and salty water) environments                         |
|                                   | Water supply from the Ba Lai irrigation scheme for domestic household consumption                                  |
|                                   | Greater magnitude and intensity of saltwater intrusion experienced by local communities                           |
|                                   | Mixing freshwater supplied from the scheme with saltwater for shrimp farming                                   |
|                                   | Water pollution from upstream household and agricultural production activities adversely affects water quality and farming activities in the commune. |

| Thanh Phuoc Commune                   | Land use shaped by local salinity (brackish water and saltwater) environments                                    |
| (downstream zone)                    | Lack of freshwater in the dry season                                                                             |
|                                   | Salinity-based adaptation patterns (e.g. shrimp farming) are dominant                                             |

*Table 2. Change in coastalscapes and associated livelihoods perceived by local respondents.*
irregular drainage schedules constrained farmers, especially those who cultivated blood cockles, with regard to the timing of their livelihood activities. For example, a farmer cultivating blood cockles in Thanh Phuoc Commune explained that: ‘water waste was often drained twice a month, particularly on 15th–16th and 29th–30th of the month. However, we experienced an unnotified change in the draining schedule last year (2018) when water was drained up to 10 days. These did not allow us to cultivate blood cockles, as they cannot survive in the flooded freshwater in farming areas’ (interview, June 2019).

An additional challenge linked to the intensity of saltwater intrusion was more recent. During the dry season, the water intakes had to be closed for about 1–3 months to prevent saltwater intrusion (Hoang et al., 2009). Most farmers raised the concern that, while tidal saltwater intrusion was increasing, the obstruction of the scheme infrastructure did not allow wet-season flows needed to reduce accumulated salinity to reach upstream estuary areas, thus aggravating the salinity conditions in the commune.

**Contestations between state-led irrigation policies and farmer-led adaptations**

The Ba Lai scheme provides a backdrop where contested relationships between local government and farming communities occurred (Table 3). There were remarkable contradictions between the rules imposed by the local government to ensure rural farmers’ compliance with the ‘freshening coastal zones’ policy relative to livelihoods needs associated with their farming practices. The enforcement of these rules has transformed farming practices in Thanh Tri Commune. In particular, local farmers were forced to grow freshwater crops such as bananas, citric fruits, and coconuts by capitalizing on the scheme’s supply of freshwater. Practices associated with similar freshwater crops have gradually homogenized the agricultural landscapes of the commune. From a policy perspective, this homogeneity is indicative of rural development success. A local government official noted that ‘following the district government’s implementation of a 500-ha pilot project for fruit orchard development using the Ba Lai freshwater, local farmers have continually expanded the production areas with these crop patterns’ (interview, April 2019).

Our data revealed that these agricultural production policies hampered farmers investment in high-income farming activities. While most farmers in Thanh Tri Commune followed the local government’s policies to grow freshwater crops, others sought to revert to their traditional farming systems (i.e. shrimp farming). Respondents admitted that freshwater crops often experienced low

| Table 3. Observed contestations between the local governments and agrarian communities. |
|----------------------------------------|------------|---------------------------------|------------|
| **Local actors** | **Thanh Tri Commune** | **Thanh Phuoc Commune** |
| Local government | Freshwater as a predominant resource for local livelihoods. The local government attempts to promote freshwater-based farming systems (e.g. multi-crops of rice (triple crop), fruit orchards). Freshwater-oriented development policies Local farming activities are bound up with the use of freshwater taken from the irrigation scheme. Pumping groundwater (brackish water) for shrimp farming is strictly prohibited. | The irrigation scheme helps provide freshwater for shrimp farming (mix of freshwater and saltwater) in times of high salt concentration in the commune. Building a water treatment plant provides freshwater (piped water) access to local residents. |
| Farming communities | Both freshwater and saltwater are equally important resources. Local farmers seek to maintain the traditional farming practice (shrimp farming) by using groundwater (brackish water) for shrimp farming. Farmers prefer to have diversified livelihood options. The freshwater scheme reduces or eliminates some high income-oriented livelihood strategies. | Bi-monthly release of freshwater from the irrigation scheme makes it difficult for the intake of water for shrimp farming. Farmers cultivating blood cockles in the estuary areas incur economic losses due to freshwater drained from the scheme. Lack of coordination in water management between upstream (freshwater areas) and downstream (estuary areas). |
and unstable market prices. This raised risks associated with loss because farmers could not obtain desired or predicted economic returns. The finding was found in contrast to a case study in coastal Bangladesh (Satkhira District, Khulna Division), where rural villages organized a variety of farming activities in dealing with saltwater intrusion (Bernier et al., 2016). In this regard, the villagers did not rely solely on shrimp farming but expanded their farming strategies by diversifying their production practices. Unlike their counterparts, shrimp farmers in the present study perceived shrimp farming as a straightforward ‘short-cut’ approach to increased income. There were two reasons for this endeavor. First, shrimp farmers could easily sell their produce at high prices with high national and global market demand. Although this aquacultural practice is often seen as a ‘high-risk and high-return’ commodity (MARD (Ministry of Agriculture and Rural Development), 2016), many farmers in the commune believed that shrimp farming would enable them to enhance household incomes. Second, freshwater crops, by contrast, often experienced seasonally low prices. Meanwhile, despite price fluctuations in recent years, shrimp farmers were seen to earn approximately 5–7 times compared to their rice producing counterparts (Lan, 2013). As one of the FGD participants expressed: ‘Most of us find it a good opportunity to cultivate shrimp because the market prices of sugarcane and cattle (for meat) have dropped substantially, so we decided to shift to shrimp farming to earn higher profits’ (FGD, June 2019).

The shrimp farming in Thanh Tri Commune, however, was claimed to violate the ‘freshening coastal zones’ policy, and was prohibited. As explained by a district government official, the prohibition was attributed to three main reasons. First, farmers’ utilization of the groundwater (brackish water) would create unanticipated risks of propagating brackish water on a large scale, especially when farmers released the water after harvest. He put it that ‘the propagation of groundwater through shrimp farming has deteriorated the water quality of surrounding freshwater zones, thus damaging freshwater crops’ (interview, April 2019). He claimed that it would be unfair if the short-term benefits obtained by a small group of shrimp farmers would cause detrimental impacts on freshwater crops and threaten efforts in freshwater-based farming production over the long term. Second, shrimp farmers’ actions would come to establish an unexpected precedent for the widespread utilization of groundwater, leading to uncontrolled water resource management across the commune. Third, from a policy perspective, this would undermine the overall environment-development plan set out by local governments.

Rural interventions can engender competition among stakeholders. In this study, competition was associated with the state’s rejection of rural communities’ decisions in self-organizing their on-farm practices. The local government’s strict adherence to land-use rules (i.e. enforcing the sole utilization of freshwater for agricultural production) limited opportunities to secure brackish water for shrimp farming. These contestations demonstrated evidence of ‘water grabs.’ This finding corroborates Adams et al.’s study (Adams et al., 2019) in which water grabs are portrayed as akin to land grabs but with greater pressure on local communities and livelihoods. This competition amplified how the ‘centralized patronage’ of the environmental governance system (Dyzenhaus, 2021) constrains the self-organization of agrarian communities and their livelihoods. The findings exposed how power is skewed towards interests in the corporate world and among state actors, positioning the voices of poor communities as unheard in rural development policies (Mutsvangwa-Sammie & Manzungu, 2021). The dominance of the state obstructs autonomous changes undertaken by rural society, which, as a consequence, can stymie innovation and entrench poverty (Bruun, 2020). These insights correspond to Ehrensperger et al.’s (2019) claim that there exists a gap in understanding on the part of decision-makers of the complexities of socio-ecological systems and ways they interact with development processes.

The state-society contestations were also observed at the spatial scale. In this study, it was illustrated by the lack of coordination in water management between the upstream and downstream zones, inducing adverse water impacts on the latter. For example, farmers in Thanh Phuoc Commune complained that schedules for opening the Ba Lai sluice gate were not always publicly announced. Shrimp farmers confirmed that freshwater drained from the scheme had harmful impacts on their
shrimp and other aquacultural activities, including blood cockle and crab farming. Their shellfish were largely destroyed by the abrupt change in the water environment. One of the FGD participants complained that: ‘Some of the blood cockle farmers in the commune lost their crops. In particular, young blood cockles cannot survive from the exposure to freshwater released from the scheme’ (FGD, June 2019).

Farmers also expressed their concerns over the prioritization of freshwater-based agricultural production in the commune. They found it unequitable that the ‘freshwater over saltwater’ ideology came to dominate local economic development policies and were exercised on a large scale. As freshwater-based crops that the local government promoted yielded much lower returns compared with those from shrimp, support from local farmers for the scheme diminished.

Our data revealed that, when faced with critical problems, farmers were keen to engage in their ‘everyday politics’ (Kerkvliet, 2005) to deal with the situation. Some farmers kept silent, while others openly resisted the government’s agricultural policy in search of more equitable solutions. This form of everyday politics was exhibited through farmers’ determination to maintain highly-profitable livelihoods such as shrimp farming. Evidence from Thanh Tri Commune highlights resistance to government policies and practices, where farmers persistently invested in shrimp production despite being cautioned by the local government. Their perseverance and open challenge to the local government formed a strategy of bargaining in which farmers empowered themselves as part of their demands for justice.

**Pursuing high-value crops as bargaining power**

The qualitative analysis indicated that rural farmers were determined to deal with both the coercive measures imposed by the local government’s implementation of the ‘freshening coastal zones’ policy and meet their own needs. For example, in Thanh Tri Commune, shrimp farmers who sought to maintain their shrimp production by resorting to the utilization of groundwater could be seen as bargaining with the power of the state. Here, illicit shrimp farming is seen as a boundary object revolving around the contestations between the local government and rural farmers (Cohen, 2012).

The data suggests that maintaining high-value shrimp crops became a bargaining strategy that local farmers applied in concert with demands for rights and the legitimacy to practice aquaculture. Evidence suggests that coercive measures had been undertaken to control farmers’ actions at the local scale. For example, according to Directive 5 on ‘promoting leaders’ control of saltwater shrimp farming in the freshwater zone’ issued by Dinh Dai District Committee, wells that were built to extract groundwater for shrimp farming were to be demolished. However, shrimp farmers continued to practice aquaculture, as they believed strongly that boom harvests, albeit just once, could help them escape poverty. When asked, most shrimp farmers agreed that, despite the high risks associated with shrimp aquaculture, it would be the most profitable livelihood for them. They contended that it was more likely to bring them a prosperous life if they were granted permission to undertake aquaculture. These narratives resonate with Watts (2020) perception that addressing rural poverty, while dealing with environmental issues, needs engaging with small-scale farming and with those who depend on farming for their livelihoods. Farmers need to be empowered to emancipate themselves from poverty. Moving forward, this brings improved livelihood outcomes and well-being for themselves and for communities as a whole. Taking this further in the context of the VMD and beyond, we argue that local governments must execute equitable decisions that balance support for rural livelihood development and responses to water environments in times of climate change.
Conclusions

The Ba Lai irrigation scheme demonstrates the continued experimentation associated with the ‘freshening coastal zones’ policy for agriculture-led development in the VMD. Despite challenges, the Vietnamese government persistently prioritizes technical development approaches as the solution to climate change and local economic development. The Ba Lai case study demonstrates how this technocratic ideology has transformed the coastalscapes and triggered land-use contestations. Local government and farming communities are in a dilemma in which preserving freshwater-based farming and improving rural livelihood conditions are in conflict. This study advances the understanding of the dark sides of the ‘freshwater over saltwater’ policy having been implemented in the delta and ways it shapes social-political landscapes in coastal water management.

The study contributes to scholarship of environmental governance in the developing world while tackling climate change. Through the lens of political ecology, it presents the highly-contested dynamics of local government-led development through the ‘freshening coastal zones’ policy and everyday politics exercised by farming communities in securing means for improved livelihoods. In particular, it demonstrates the ways rural farmers employ groundwater use as a strategy to challenge government policy. The state rejection of rural farmers’ preferred livelihood options is evident in how local bureaucrats dictated the successful implementation of the state-backed development policy against farmers’ livelihood options. Farmers own the land but lose autonomy in decision making — a common situation in many authoritarian countries. The ‘water grabbing’ exercised by the local government forced farmers to hold onto shrimp farming and use it as a means of bargaining. Overall, our study on the political ecological understanding of contested relationships between local government and agrarian communities in the VMD shows how development policies can sideline the livelihoods of the agrarian communities who are meant to benefit. From a perspective of rural development, the study highlights how seeking agroecological livelihood alternatives to the ‘technocratic’ approach could form a possible pathway towards achieving poverty reduction.

Based on the empirical insights from this study, we call for deliberative dialogues between local government and agrarian communities with the aim of achieving shared visions that reconcile respective demands for freshwater preservation and livelihood development. Given the existing competition between (freshwater) resource protection and profit-seeking objectives, this study underscores the need to reconcile the risks and benefits of adaptation policy measures while undertaking adaptation projects in the rural delta. Competing needs must be taken into consideration to ensure equitable access to livelihood opportunities for rural agrarian communities who are often marginalized from state-led development policies. In this light, the study contributes to contemporary discourses on land-use policy on a broader geographical scale, where the state remains the predominant power in resource governance and rural development policies. Lastly, as many coastal regions are undergoing salinization, this study helps reframe negative conventional views of saltwater as it may provide important climate-resilient livelihood opportunities for rural coastal communities.

Notes

1. Resolution 120 is a flagship policy that guides climate-resilient and sustainable development trajectories in the VMD. It includes an overarching development agenda associated with the government’s planning strategies, with long-term visions, objectives, overall solutions, and concrete tasks to improve the economic development while prioritizing adaptation to climate change (Government of Vietnam, 2017).
2. Blood cockles (*Anadara granosa*) are one of the bivalve mollusc species that are commonly cultivated at open water estuarine ecosystems with intertidal alluvial mudflats (Tuan et al., 2012). Their cultivation concentrates downstream of the Ba Lai River, thus exposing it to waste water drained from upstream.
Acknowledgments
This work was supported by the Mekong Region Land Governance project (MRLG). MRLG is a project of the Government of Switzerland, through the Swiss Agency for Development and Cooperation (SDC), with co-financing from the Government of Germany and the Government of Luxembourg.

Disclosure statement
No potential conflict of interest was reported by the author(s).

Funding
This work was supported by SEARCA’s (Southeast Asian Regional Centre for Graduate Study and Research in Agriculture) Seed Fund for Research and Training Program, the Philippines and the project entitled “Natural Capital Management in the Mekong River Delta” at Fulbright University Vietnam (FUV).

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| Data collection methods | Respondent | Location | Number of FGDs and INTs undertaken | Number of respondents |
|-------------------------|------------|----------|-----------------------------------|----------------------|
| FGD                     | Agrarian communities in freshwater areas | Thanh Tri Commune | 3                                  | 14                   |
| FGD                     | Agrarian communities in salinity areas | Thanh Phuoc Commune | 3                                  | 19                   |
| INT                     | Southern Institute of Water Resources Research (SIWRR) | Ho Chi Minh City | 1                                  | 1                    |
| INT                     | Southern Institute for Water Resources Planning (SIWRP) | Ho Chi Minh City | 1                                  | 1                    |
| INT                     | Department of Agriculture and Rural Development (DARD) | Ben Tre Province | 1                                  | 1                    |
| INT                     | Department of Natural Resources and Environment (DNRE) | Ben Tre Province | 1                                  | 1                    |
| INT                     | Center for Agricultural-Aquacultural Extension, DARD | Ben Tre Province | 1                                  | 1                    |
| INT                     | Office of Agriculture and Rural Development (OARD) | Binh Dai District | 1                                  | 1                    |
| INT                     | Office of Natural Resources and Environment (ONRE) | Binh Dai District | 1                                  | 1                    |
| INT                     | Government official | Thanh Tri Commune | 1                                  | 1                    |
| INT                     | Government official | Thanh Phuoc Commune | 1                                  | 1                    |
| INT                     | Environment expert from Can Tho University | Can Tho City | 1                                  | 1                    |
| INT                     | Farmer (gardening and rice) | Thanh Tri Commune | 1                                  | 1                    |
| INT                     | Farmer (blood cockle cultivation) | Thanh Phuoc Commune | 1                                  | 1                    |
| Total                   | | | 18                                 | 45                   |

FGD as focus group discussion; INT as interview.

Appendix 1. Summary of qualitative data collection