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Unearthing the ripple effects of power and resilience in large river deltas

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ABSTRACT

Historically, flood resilience in large river deltas has been strongly tied to institutional and infrastructural interventions to manage flood risk (such as building of embankments and drainage structures). However, the introduction of infrastructural works has inevitably brought unforeseen, major consequences, such as biodiversity and accelerated land subsidence, endangering the fertile characteristics that made them interesting places to live in in the first place. These ripple effects have sparked, a reconsideration of what deltas are, questioning the very separation and control between nature and culture, and how deltas are to be dealt with. These effects have further sparked changing modalities of power that tend to be overlooked by delta and resilience scholars alike. As a result, there is a real risk that future interventions to increase resilience, will in fact amplify unequal power relations in deltas as opposed to alleviating them. If the system as a whole has achieved some level of flood resilience (partly due to the flood defence mechanisms in place), does infrastructure have a differential effect on people's mobility under flood conditions? Are some groups experiencing less rather than more security, as water accumulates in some places but not others? This paper presents theoretical insights on the relationship between power and resilience in delta regions supported by two case studies, the Ganges-Brahmaputra-Meghna delta in Bangladesh and the Mekong delta in Vietnam.

1. Introduction

River deltas of the world are among the most resource rich and environmentally dynamic ecosystems on earth and are home to over 500 million people (Giosan, 2014). They provide a diverse range of ecosystem services, ranging from fertile soil to water for irrigation (Syvitski et al., 2009; Chapman et al., 2016). The Vietnamese Mekong Delta (VMD) is a typical large river delta and a major rice production region, providing more than 90% of Vietnam rice export and contributing greatly to the country's position as the 5th largest rice exporting nation[1] . Bangladesh lies in the Ganges-Brahmaputra-Meghna Delta (GBMD) which is Asia's largest and most populated delta (Ericson et al., 2006). Deltas are currently threatened by the effects of climate change, floods, droughts, coastal erosion or salinization (Dammers et al., 2014).

Historically, delta planning has been tied to institutional and engineering interventions to manage flood risk (namely by building embankments and drainage structures). In other words, infrastructural works have been central to maintaining control of the water flow and hence developing a socio-technical system that can manage the flood (Van Staveren and Tatenhove, 2016). Particularly for the larger river deltas such as those found in Asia, meeting ambitious agricultural objectives has been possible because of the stable social-ecological environment accomplished largely by technological interventions combined with command-control planning (Chapman et al., 2016; Biggs et al., 2009).

Growing awareness around the limits of technocratic planning of deltas has shifted attention towards the role of resilience and in particular how flooding can be seen as a more positive attribute by bringing into the delta fresh sediments and nutrients and supporting ecosystem

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[1] Source: http://www.worldstopexports.com/rice-exports-country/

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biodiversity (Van Staveren et al., 2017; Mao et al., 2017). As part of this new focus on resilience, cultural adaptation and social participation in delta planning has been emphasised alongside more traditional engineering concerns (Seijger et al., 2017).

The concept of resilience has some key strengths for understanding how deltas are changing and how to manage them more sustainably. Recently, scholars have proposed principles for resilience that include maintaining diversity and redundancy, fostering complex adaptive systems thinking and promoting polycentric governance among others (Folke et al., 2016). These principles could help guide interventions in deltas that could restore a better balance across societal, technological and ecological features of the delta. Importantly, resilience can be understood as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, and feedbacks, and therefore identity" (Folke, 2016, p. 4). Once this definition and the principles of resilience are applied to the discussion of deltas, this creates a potential to understand how deltas function in a more comprehensive way and to account for socio-hydrological dynamics, and to create possibilities for both anticipation and adaptation in light of stresses and shocks but also stable and unstable states (Mao et al., 2017).

The contribution of this article is to show that attention to the role of power dynamics in delta regions could help to better contextualize resilience as a strategy for delta planning. We turn to a body of scholarship from human geography, sociology and development studies that has emerged in recent years that highlights the importance of combining analyses of power with resilience. This work has not yet focused on deltaic regions undergoing change. Several deltaic countries are developing long-term comprehensive delta plans, which include infrastructural and institutional interventions to increase delta resilience (Liao et al., 2016; Seijger et al., 2017). But it remains uncertain how these plans will affect power relations between different societal groups living in the delta. Drawing upon the scientific literature on the topic of power and resilience the article brings these two concepts into closer conversation with each other. Even though some authors tend to view power and resilience as inherently irreconcilable (cf. Olsson et al., 2015), this article shows that there are valuable complementarities between the two concepts.

We first discuss the literature on flood resilience and the role of power highlighting recent literature examples that discuss jointly the concept of power and resilience and arrive at a set of four important dimensions of power and resilience. However, a comprehensive description of either the concept of power or resilience is outside the scope of this paper. Subsequently, we turn our focus to two case studies in the VMD, An Giang Province and the GBMD, Tangail district. We have selected these cases because they represent areas where delta interventions were implemented as early as the beginning of the 20th century and have continued up until the present and so it is interesting for our purposes to trace the implications of these interventions in terms of flood resilience after they took place. Furthermore, the cases give us the opportunity to analyse how meanings and experiences of resilience develop over time, and point out how power relations shape these meanings and experiences.

Deltas cover vast geographies and therefore the case studies are not representative of all deltaic areas. However, the case studies illustrate some of the features of power and resilience and (how) these might be shifting into new directions. For the investigation of the cases, we interacted with a diverse set of actors. The fieldwork took place between August-November 2017 in Vietnam and Bangladesh as part of the project 'Towards a framework for power-smart social resilience and a Social Resilience Impact Assessment (SRIA) tool for flood-prone deltas: the cases of Bangladesh and Vietnam' (2017–2018).

The article structure is as follows. First, we briefly review the debate on power and resilience highlighting four key features. Subsequently we trace some of these features in the two case studies in Vietnam and Bangladesh focusing particularly on strategies to avoid flood disturbances. We end in our conclusions with synthetic reflections from the case studies and reviewed literature, and suggestions for future research.

2. Different dimensions of power in relation to flood resilience

2.1. Rendering power visible

Over the past decades there has been a rising interest in the concept of resilience (Davoudi et al., 2012; Béné et al., 2018). The earlier foundations of resilience can be traced back to ecology and conservation science (Holling, 1973). However, resilience has over the decades expanded to become a defining concept within diverse epistemic fields in the social sciences: environmental studies, disaster risk reduction, organisational and governance studies, human geography and political science are all fields where the concept of resilience is increasingly applied (Karpouzoglou et al., 2016).

In the systems thinking tradition, resilience proposes the lens of social-ecological systems (SES) that are co-evolving and in mutual interaction (Folke, 2006). Resilience also foregrounds non-linear changes, the importance of cross-scale feedbacks and the need for adaptive capacity in order to cope with future disturbances (Rockström et al., 2009). Both as an analytical framework and as a mobilizing metaphor, resilience can be found across a broad range of development interventions, such as those linked to poverty alleviation, urban planning, climate change mitigation and adaptation, water resources management and food security (Béné et al., 2018; Barua et al., 2014).

More recently scholars have highlighted the role of power as a critical concept for understanding social-ecological interactions (Ingalls and Stedman, 2016). However, power continues to play a relatively marginal role in the resilience framework which tends to regard questions of power and legitimacy largely as externalities. Perhaps because power is not a straightforward concept and because it is attached to many labels and theories it becomes too complex and challenging to reconcile with resilience. Rendering power visible is therefore partly about creating the necessary spaces for actors to engage with the concept (Pereira et al., 2015). Engagement does not mean that unequal power relations will suddenly disappear, particularly in the workings of power with resilience, it simply makes it easier to talk about the two in interaction.

At the most fundamental level, power is constituted through the social relations and interactions that occur between people, places and the natural resources they depend upon (Cote and Nightingale, 2012). Power can manifest in direct and more visible ways such as through force, violence or intimidation but also in less visible forms such as through shaping knowledge and influencing world views, belief systems and interests (Paulson et al., 2003; Lukes, 2005). Power can be a positive force as well as a negative one (Boonstra et al., 2016). Furthermore, power is not a finite resource; it can be used, shared or created by actors and their networks in different and sometimes surprising ways. While power is often interpreted as a 'negative' trait – to hold power is to exercise control over others, power is also an enabler, related to empowerment, overcoming obstacles and inertia (powering) and the capacity and agency for it to be used for positive action (Gaventa, 2006; Partzsch, 2017; Van Buuren et al., 2016).

2.2. Power as a form of difference

Thinking about power in the analysis of resilience requires an understanding of its differential nature. This is because distribution and access to natural resources is always going to be linked to power asymmetries. Consequently, outcomes for resilience tend to differ considerably according to the social group being considered and their relative access to different sources of power (Harrison and Chiroro, 2016). In aggregating resilience across diverse levels, from 'households' through to 'communities', it is possible to overlook the ways in which

resilience for some may be at the cost of resilience for others.

Taking into account power as difference has implications for deltaic river systems. If a river delta as a whole is more resilient, a sensitivity towards power as difference would imply reflecting about how people's mobility under flood conditions also depends on the cultural and social-economic circumstances which govern how diverse groups of people live in a delta (Thomas and Lele, 2017). It also depends on understanding differential access to sources of power such as financial resources, land, social networks, technology and social status. Nygren (2016) describes how in the city of Villahermosa, South-east Mexico, the affluent, middle-class and low-class neighborhoods all share the risk of flooding, however the informal residents' precarious housing conditions and their limited access to basic services is what intensifies the impact of floods on them (Nygren, 2016). This differential vulnerability to floods is in turn related differential access to power.

There is a risk of grouping together both powerful and powerless social groups who may be on different sides of the equation in terms of causing or suffering from threats to the system, or in terms of undermining or strengthening resilience to those threats (Krause, 2016). Differentiation between system properties and actor properties is therefore important, so that different communities and interests are able to put forward their own understanding and priorities in resilience decision-making. Recently, scholars have proposed the notion of 'negotiated resilience' as a way to foreground the process of negotiation between the powerful and the powerless without necessarily 'consensus' or shared meaning to be a necessary outcome (Harris et al., 2017). This negotiated perspective brings attention to the situated character of resilience, resilience as something which is continuously lived, shaped and experienced in a variety of geographies (Shah et al., 2017).

2.3. Normative power and resilience

Resilience can be applied to different systems, to different disturbances, and for different purposes, and often these choices are based on normative assumptions (Olsson et al., 2015). Resilience is often about protecting something, or keeping a system running, but what is worth protecting? What counts as acceptable and unacceptable in terms of disturbances that people are exposed to, or in terms of the costs and efforts needed to maintain resilience? Who defines what the 'normal' situation is to which the system needs to return? Taking these questions seriously requires consideration of the kinds of knowledges that shape social-ecological systems and the dimensions of power through which these knowledges are socially constructed (Van Assche et al., 2017).

That different actors in society possess differing degrees of knowledge and hold various theories or conceptualizations of social or ecological system processes is hardly contestable in resilience thinking (Tengö et al., 2016). However, insights on how power shapes the way these knowledges circulate in policy and the way certain kinds of knowledge are legitimised is often lacking (Ingalls and Stedman, 2016). Resilience is currently a very attractive buzzword for governments, multilateral agencies and NGOs seeking to implement reform or as mandates to rebuild infrastructures and services (Harris et al., 2017). The rapidity however with which streamlining resilience occurs can undermine dialogue around its underpinning normative and political dimensions.

In the context of deltas, resilience may therefore easily be co-opted by interest groups and political perspectives that use it as justification to transfer the focus of responsibility from the state or the public sphere more broadly to the individual (Harrison and Chiroro, 2016). This normative orientation assumes that affected populations have always known best how to adapt to social-ecological change and therefore to deal with the unavoidable effects of climate change, vulnerable communities are best to be left alone (Methmann and Oels, 2015). However, failing to carefully analyse these dimensions of resilience there is a risk of further disempowering actors that already have too much to loose from natural disasters.

When resilience is used as a buzzword the question, "what is worth protecting in the delta in terms of resilience and for whom?" is rarely taken seriously. In the context of delta planning in Western contexts such as the Netherlands but also in the South (Vietnam and Bangladesh) the focus on the river basin or other natural boundaries for planning purposes is hardly ever contested. As a result, important decisions can be taken from a distance ignoring local culture, identity and informal practices (Warner et al., 2018). The river basin fits well with resilience thinking because it emphasises the importance of nature (i.e. the river and the biodiversity it sustains, including essential ecosystem services) even though it can stand in opposition to interests of local livelihoods. Reflecting on the power of normative assumptions would mean that whether the system is resilient or not depends partly on what is the focal scale of interest but also how power relations cause particular focal points to become prioritised and not others.

2.4. Resilience and the 'green' delta

Resilience is linked to power in the way that it has become a central narrative for change in the global development discourse, often synonymous with a range of higher-level interventions (e.g. related to emergency support, property rights, water policies etc.). Unpacking the ways in which resilience circulates in policy as a narrative eventually reveals that it is not a static concept, rather it is subject to different interpretations. These interpretations in turn influence the types of technical solutions and policy orientations that result into action plans (Béné et al., 2018)

Environmental concerns now figure more prominently in the policy narratives through which delta plans and actions are formulated. This marks a break from the past, since historically, delta plans emphasised control over nature (Biggs, 2012) . However, now there is a drive for 'greener' forms of flood management in large river deltas as well as restoring some level of flooding in the delta to address environmental concerns such as conservation of wetland ecosystems and biodiversity, introduction of fresh sediments and nutrients (Van Staveren et al., 2017). This new logic contains the crucial idea that infrastructure projects alone cannot combat flood disasters; rather, technological flood-control needs to be linked to cultural adaptation and social resilience (Nygren, 2016).

Planners are therefore realising that they cannot rely entirely on engineering to control nature. It is indeed argued that the success of resilience relies in shaping multiple areas of governance (Walker and Cooper, 2011; Nelson, 2014; Galaz and Pierre, 2017). In other words narratives around the future of deltas are now no longer deliberated strictly within the confines of water bureaucracies but instead implicate powerful global circuits of knowledge exchange across states and transnational bureaucracies.

In Table 1 we summarize our key insights on the interlinkage of power and resilience. For the purposes of conceptualising the implications of power it is useful to relate resilience to real situations where power is either visible or invisible. In the next section, we contextualize some of the features of resilience and power highlighted in this theoretical discussion using insights from Vietnam and Bangladesh.

3. Case study insights from the delta areas of An Giang and Tangail

3.1. An Giang, situated in the Vietnamese Mekong Delta

An Giang is a province located in the upper part of the VMD which represents a key rice production region of Vietnam (see also Fig. 1). An Giang was first established as a province in 1832 by Vietnamese migrants moving south for new land. Currently it comprises of a Kinh population (predominant ethnicity of Vietnam) as well as several ethnic minorities including from bordering Cambodia. From the early

Table 1
Towards combining power and resilience in delta planning.

Power dimension	Power invisible	Power visible
Rendering power visible	*Managing disturbance and uncertainty (i.e. bouncing back or forward) †Reducing flood risk disturbance so that the system can perpetuate key functions	*There is often little consensus, resilience reflects contested norms, values and responsibilities †There are multiple and contested resiliencies found in one delta
Power as a form of difference	*Powerful interest groups sustain position of authority †Delta planning concentrates power with a small group of actors such as commercial farmers	*Diverse interests and social groups are recognized †Delta planning helps redistribute power in favour of poor and landless farmers
Normative power and resilience	*Foregrounding the system but neglecting its constituent parts †Delta planning assumed only at the bioregional level (e.g. the river basin)	*Balanced focus on both system and its constituent elements †Delta planning recognises the bioregion as well as the diverse social-ecological contexts which exist within
Resilience and the 'green' delta	*Bringing back nature in narratives of sustainability †Shifting delta resilience planning from hazard mitigation to ecosystem preservation	*Bringing back nature does not undermine social justice †Delta planning recognises trade-offs and inter-linkages between protecting nature and protecting livelihoods

*General feature of resilience highlighted in relation to power.
†Specific feature of resilience as it relates to river deltas.

twentieth century, French engineers have sought to transform this landscape into a vast hydro-agricultural machine (Biggs, 2012; Benedikter, 2014). This transformation has resulted in An Giang's network of many canals and water control structures (namely the dykes) that have created a landscape predominantly suitable for rice cultivation (Hoanh et al., 2014). An Giang is now the second largest rice producing region of Vietnam (GSO, 2018).

To understand how resilience becomes operationalized in An Giang it is important to look at how decisions that relate to flood management are dealt with. There are currently two types of flood defense systems, the so-called semi dyke and full dyke depending on the height of embankment. The full dyke system was firstly deployed in Cho Moi in 1996. Since 2000, the construction of full dyke system has been promoted in the whole province. The Long Xuyen Quadrangle, North Vam Nao, and South Vam Nao flood controls are the main key projects. As a result of this type of intervention, the area protected by the full dyke system has been growing continuously.

Flooding in An Giang is an annual phenomenon which follows the flooding pattern of the entire lower Mekong basin (Le Anh Tuan et al., 2007). There are two flood peaks in the year, the minor flood peak occurs normally in August and the major flood peak tends to occur towards the end of September. Flooding is important for food security since it brings important benefits to farmers including natural fertilization of agricultural fields through accumulation of nutrient-rich sediment on soils, controlling pests and rats, and removing pollutants from the soil (Arias et al., 2013; Chapman et al., 2016). The dyke system has created the possibility for farmers in An Giang province to generate more income from the same amount of land by having three rice cropping seasons annually (i.e. the so-called triple rice cropping system), instead of two. At the same time, the large scale construction of full and semi dyke systems has provided protection against extreme flooding events. So in essence, the dyke system has been catalytic for resilience in the context of a dynamic delta with a highly erratic flooding pattern.

However, as this study and others have observed the dyke system supported through more than 30 years of government investment in dykes as part of Vietnam's Rice First Policy has several limitations (Hoang et al., 2018; Lebel et al., 2009). In Cho Moi, one of the districts of An Giang, the full dyke system was completed in 1999. Initially after the completion of the dyke system, rice production grew sharply, but later on, farmers had to increase input of chemical fertilizers to maintain the yield because the dyke systems prevent sediments which contain natural nutrients for crops (Chapman et al., 2016). According to farmers in An Giang, the full dyke system performed well within the first 6–7 years after construction, which was very effective in flood control and created favorable conditions for rice. However, dyke intensification now seemingly contributes to poverty in some of the smallholder farmers (Chapman et al., 2016). Poor rice farmers who cannot afford to change crops (from rice to vegetables) are very likely to be negatively affected for they cannot take flood water in to replenish soils and their farms are usually invaded by rodents from nearby cash-crop fields. Landless people are also among those affected by the construction of the full dyke due to the loss of flood-based livelihoods. The construction of a full dyke system also blocks the entrance of fish and other types of aquatic species which are usually very abundant in the flood season (Le Anh Tuan et al., 2007). The absence of flood in protected areas also increases damages caused by pests (such as presence of plant diseases). Therefore, after dyke construction the rice system's resilience has been compromised while local people begin to recognize the disadvantages of this intervention such as exacerbated environmental pollution, higher input investments, and lower farming profits.

Looking at the decision making process in An Giang province, we find that decisions to implement the full dyke system largely reflect deeper structural power inequalities. The process of dyke planning begins at the central government level with the identification, approval and financing of the planning objective. This is usually within the administrative boundaries of the Ministry of Agriculture and Rural Development (MARD) that has tasks related to irrigation, rural water supply and fishery, but has also a mandate in flood and disaster prevention. MARD generally maintains an engineering based approach to flood risk management (Molle and Chu, 2009; Molle et al., 2012). MARD works with the Ministry of Natural Resources and Environment (MONRE) on issues related to general land use planning, international coordination of water resources and collection of water quality and quantity data and development of climate change policy.

Ministries and ministerial-level agencies have their corresponding provincial and district institutions. These institutions exist in the form of departments at the provincial level, offices in the district administration and sections at commune level. The Department of Agriculture and Rural Development (DARD) is the corresponding organization of MARD at the provincial level. The Office of Agriculture and Rural Development (OARD) operates at the district level. Provincial and district authorities are together responsible for service provision and infrastructure maintenance, notably the repair of canals and dykes and can be seen as 'executive actors' (Biggs et al., 2009) (see also Fig. 2).

The most direct way in which local farmers can influence this top-down style of decision making is through organizing a village ballot. The ballot is overseen by the Commune People's Committee and local farmers can use their vote in the ballot to influence important flood management decisions, such as those related to new dyke construction. In practice, farmers have limited influence over the content of the discussion in the ballot, as well as the composition of the farmer group being invited. This can limit the representation of different farmer groups, and consequently different flood management options. Farmer

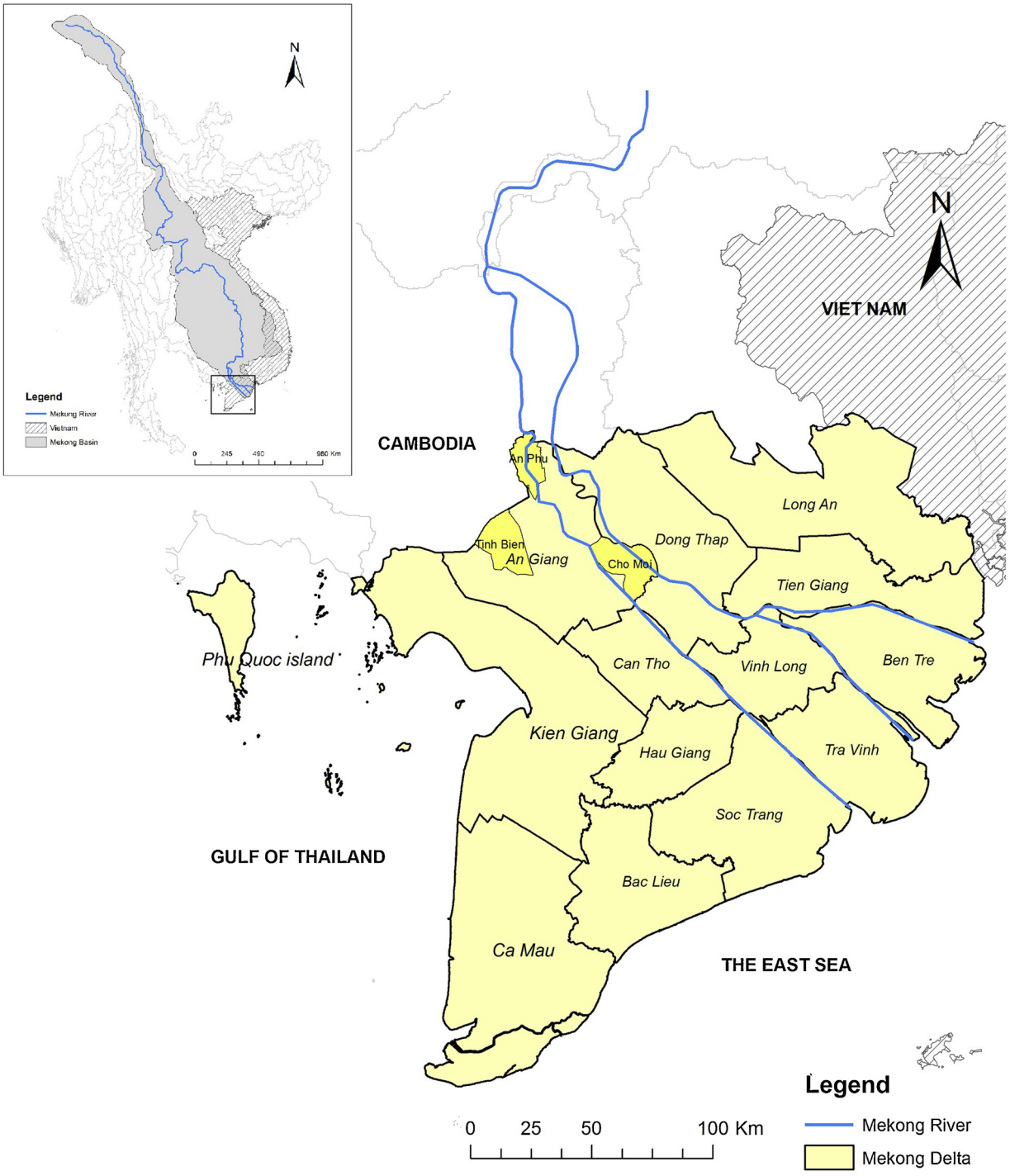

Fig. 1. Map showing the study area in An Giang province.

interviews also show that the ballot provides little information about the advantages of moderate floods, which become foregone benefits once the dyke system is put in place.

Land ownership was mentioned as being a decisive factor influencing the reproduction of unequal power relations during the village ballots. Better-off farmers typically own their land and as a result their vote can be seen more favourably by the Commune People's Committee. This also means that their particular framing of resilience may prevail over that of other farmers. This is one way in which resilience and power become entangled. For the better-off rice farmers resilience is indeed important but it means very different things. Namely, keeping the flood sluices closed to protect the fruit and vegetable crops is considered a measure of resilience. For the poorer (typically landless) farmers, resilience involves some level of flood protection but crucially it also means that some level of flooding is often desirable for fishing. However, opening the sluices needed approval from the inhabitants of the community and particularly from the better off rice producers who have become more invested into fruits and vegetables and want to restrict the floods. Since the power to open the sluices rested with the better off farmers who wanted to keep the sluices closed, the sluices have not been opened in Cho Moi since the building of the dyke system in 1998.

Our survey suggests in fact that most of the dyke construction projects in An Giang during the 1990s and 2000s were designed by

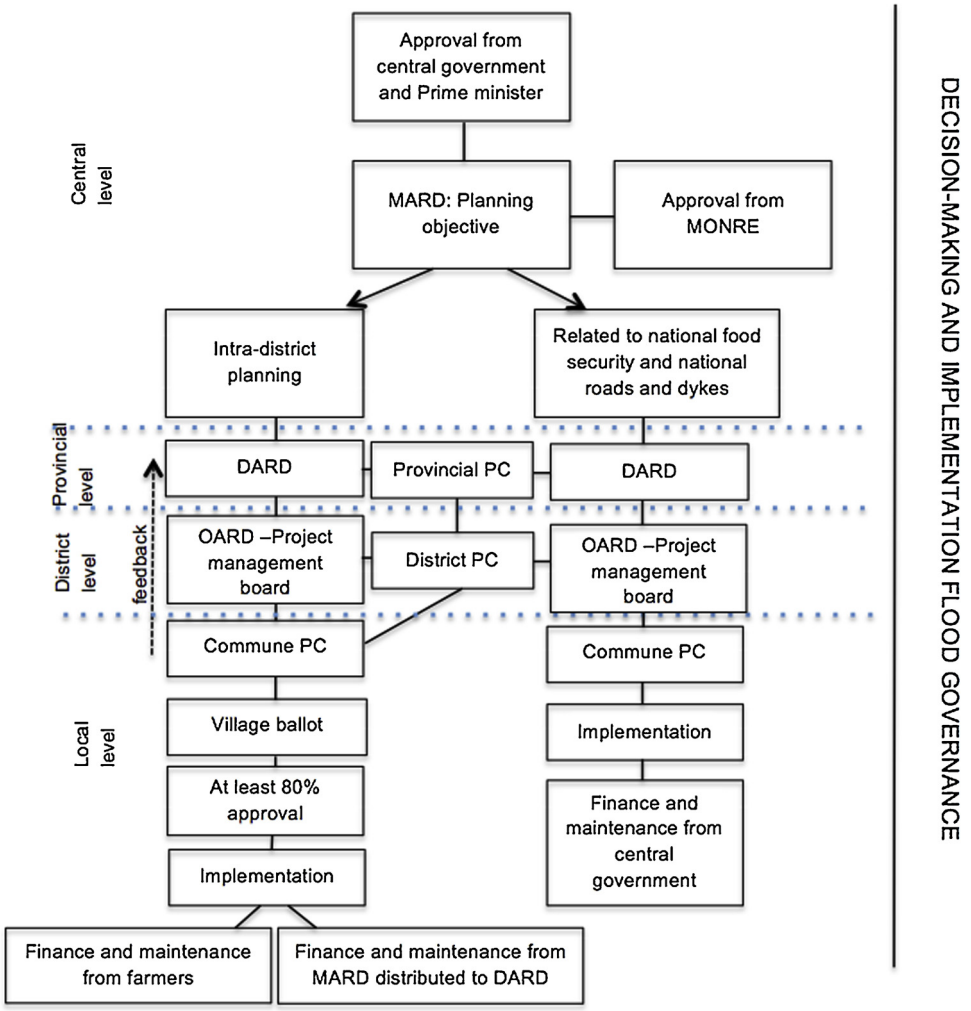

Fig. 2. Planning and decision making process across administrative levels for flood management in the VMD, adapted from SIWRP (2005).

experts and the government with limited consultation of local people. The household survey shows that 23% of farmers reported they were invited to various consultation meetings organised by the government to ensure consent before building new dykes, whereas 69% were not invited and 8% said "don't know". Generally, what the dyke system did not account for are that different types of flooding regimes can incur different benefits and costs to different farmers (depending on their wealth, status, farming strategies and landholding assets).

What we believe has happened, is that a particular understanding of resilience has prevailed which over time amplified the needs of a particular actor group through legitimizing one style of technological interventionism, that of engineering dyke interventions. However, as it turned out, this framing of resilience requires this top-down fashion of planning flood management based on the almost exclusive negotiation of flood management options between the state and the better-off farmers. It is important to note that due to colonial legacies hydraulic bureaucracies have over time shifted local disputes over land and water rights from village councils to city court rooms and provincial planning boards (Biggs, 2012). This has left out an important framing of resilience that is linked to the small-holders and typically landless farmers that is also fundamentally about a more contextual approach to dealing with flood events.

The Vietnamese government recognises that an exclusive emphasis on the dyke system approach through a business-as-usual approach is probably untenable. This is more likely to be related to the adverse environmental consequences of these interventions and the visible reduction in rice productivity as opposed to an appreciation of social disparities such as the ones raised here. New narratives that have a more ecological emphasis have been on the table for some time now and resilience is often found in the policy documents (GoV, 2017). However, as unequal power relations are deeply entrenched in institutional cultures of decision-making, this creates serious difficulties for ensuring more democratic approaches to resilience planning. Even if resilience is broadly advocated at policy level as a socially inclusive notion, without sufficient engagement with decision-making cultures at the local level, resilience at best ignores power inequalities or at worst reinforces unequal power relations. There are already signs of this happening as poorer farmers are moving gradually out of farming and eventually migrate to the bigger cities such as Can Tho and Ho Chi Minh in search for different types of livelihoods.

Critically, what the Vietnam case study shows is that although the 'Rice First' policy became a powerful narrative for propelling economic growth, it was not necessarily well-suited for poorer farmers that are now seeking more diverse income streams. The better-off farmers have achieved this to some degree but only because they had the initial capital and land, but more importantly, sustained their interests and influence over the flood management regime that affects a particular framing of resilience.

3.2. Tangail situated in the Ganges-Brahmaputra-Meghna delta of Bangladesh

Tangail history dates back to the 2nd century A.D. In the 19th century, when it was a popular business center because of its

agricultural produce, weaving industries and artistry, famine and floods continued to ravage the district. The poor farmers were unable to pay taxes and became subject to torture from the landlords. This resulted into a number of indigenous uprisings which were terminated by the then British rulers. The unique political, administrative and cultural identity of Tangail was suppressed when it was included under the Greater Mymensingh district; it took 100 years for Tangail to be declared an individual district in 1969. Prior to the 1969 split, Tangail had a strong influence in the economic development of Greater Mymensingh, which at the time enjoyed higher economic growth compared to the capital, Dhaka.

Tangail one of the frequently flooded districts of Bangladesh, is located in the north central region of Bangladesh at the northern corner of Dhaka, the capital. The Bangladesh Water Development Board (BWDB) has built embankments and drainage structures in this area through Flood Control, Drainage and Irrigation (FCDI) projects to manage flood risk since 1992 under the Flood Action Plan, which emphasised controlled flooding (Noor, 2000), the FCDI projects were implemented using the compartmentalization concept introduced in the Flood Action Plans (FAP) to achieve controlled flooding, drainage improvement and food security. FAPs were developed on the basis of separating the entire country into five hydrological regions, specifically the north-west region, the north-central region (Tangail situated here), the south-west region, the south-east region and the north-east region.

Like in the Vietnam case, these systems mirror a top-down implementation paradigm of hard-engineering infrastructure sustained by networks of permanent embankments and canals with centrally regulated water inlets and outlets. In the Tangail District, FAP-20 (the Compartmentalisation Pilot Project, CPP) promised to place more emphasis on social and ecological concerns through enhanced participation. However, the ability of the project to yield such social and ecological benefits have been questioned (Boyce, 1990; Rammelt et al., 2018).

For the purposes of understanding the workings of resilience and power, the CPP example provides some useful insights. As one of twenty-six components of the FAP plan undertaken in the aftermath of the catastrophic floods of 1987 and 1988. The project was essentially conceived and executed as a flood risk management project principally as an experiment but with scope to replicate in other parts of Bangladesh if it became successful in Tangail. The project was largely inspired by experience of dealing with flood risk in the Dutch landscape, and a number of international consultants namely from Germany, Britain and The Netherlands lent advice on the design and plan for implementation (Rammelt et al., 2018; Warner, 2010). It became a joint venture of the Government of Bangladesh (GoB), the Netherlands and the Federal Republic of Germany.

The CPP had a strong water engineering component which included the construction of an embankment that encloses a 130 km2 area including a network of canals (see also Fig. 3). Regulated inlets and outlets were constructed to enable the controlled flooding and drainage of agricultural plots in compartments (Rammelt et al., 2018). In other words, different sub-compartments would allow flooding only those areas that need water for as long as it becomes necessary before draining it to the river. In many respects, resilience in Tangail was about how the CPP can help avert the effects of major flooding events effectively, but also allow for a controlled flooding regime to occur so that agriculture activities can continue. CPP from an institutional perspective, was again inspired by the Dutch polder model whereby the institutional setting for ensuring meaningful participation followed the Dutch regional water management boards (waterschappen) (Warner, 2010). Hence, following this model, water management organisations (WMOs) are expected to represent community priorities, working together with Water Management Groups (WMGs) at the village level and Water Management Associations (WMAs) at the polder level. This institutional solution may run into obstacles however, even though it creates some better possibilities for vulnerable stakeholders to participate in decision-making.

In Tangail approximately 51.4% people are engaged in the agricultural sector and so flood management for protection of livelihoods appears to be as important for overall resilience as in the Vietnam case. This is why the CPP project was initially well received after the catastrophic flood events of the late 1980s-90 s, but over time support has dwindled. After the event various studies were carried and BWDB officials reported that if the CPP project had not been implemented, Tangail would have been under 6 feet of flood water during the monsoon season.

The general objective of the CPP project was to provide a secure and sustainable environment for intensive agriculture, fisheries and urban development. The major concern was protecting the town infrastructure and settlements inside the CPP project area from extreme flooding events. Besides that, the project also aimed at reducing crop damage and increasing crop productivity. Our study found that agricultural productivity has increased for some farmers that are now growing more cash crops, typically farmers with access to land. Our analysis however suggests that CPP has also generated unintended consequences particularly for the landless and subsistence farmers and therefore has intensified unequal power relations in the same way that the full dyke system did in An Giang.

In terms of protection from river floods, after the CPP, the settlements inside the project area became safer from extreme flood events and people inside felt more secure than outside the CPP project. Even if they were not entirely free from floods as internal flooding and drainage congestion is created by extreme rainfall events, they felt safer. This is in part reflected by the increase in the value of land inside the CPP as opposed to outside (Rammelt et al., 2018). However, the flooding condition has become worse in the areas adjacent and outside of the CPP project area. In other words, strengthening the resilience inside the CPP has led to the loss of resilience outside the CPP.

Respondents of the study living outside the CPP voiced concerns about the elongated flood duration which decreased their agricultural productivity. A particularly, major concern was presented around the homestead vegetable cultivation. According to respondents their production amount and variety has decreased after the CPP. Abdullah Miah from one of the villages outside the CPP, Silimpur, reported that 90% of his homestead vegetables were damaged due to floods. He also mentioned that before the CPP, they had abundant vegetable production but after the project they cultivated very few vegetables. Besides, respondents also reported concerns about the reduction in the availability of fodder. On the other hand, inside the CPP area, respondents reported an increase in production of homestead vegetables. Noor Mohmud and Romesa Begum from the village Char Mamudpur, mentioned that before the project they cultivated vegetables in 2/3 of the land area of their homestead but now use the whole area for this purpose and in addition the productivity has increased.

As the CPP project unfolded different types of tensions arose within the CPP area as well. It is well established that CPP facilitated privatisation and land grab for aquaculture at the expense of open fishing opportunities for landless fishermen (e.g. Rammelt et al., 2018). Fishermen allowed to fish in private ponds have to surrender up to half their catch. Groups of fishermen inside are adversely affected by the CPP as compared to those that are outside the CPP. During a flood event in 2004 the average flooding depth increased by 4–5 feet outside the project area whereas the flooding depth was 1–2 feet inside the CPP area. In both cases the fish ponds overflowed. Outside the CPP, pond owners had the opportunity to enclose the ponds with nets. However, due to the suddenness of the flood inside the CPP, the pond owners did not have enough time to react and take mitigation measures. As a consequence, the fish spread with the flood water in the surrounding low lying areas. This resulted into huge losses of culture fisheries. The CPP was in principle designed in a ‘fish friendly’ manner, as it turned out, with time, this has not been achieved because of poorly designed fish passes. Recent research carried out after the 2016–7 floods (Ansari,

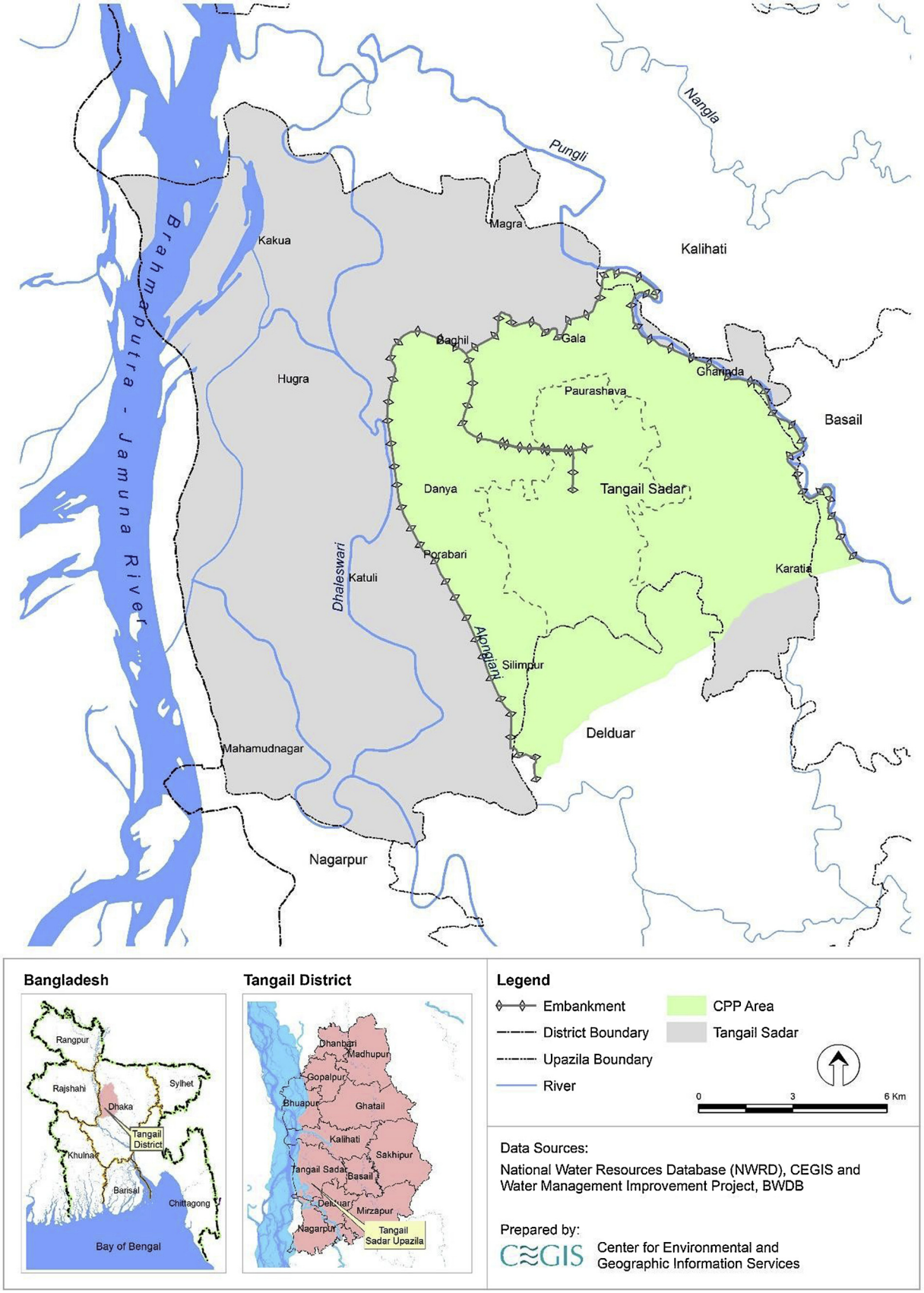

Fig. 3. Map of the Tangail district.

2018) also reveals that political clientelism in relief provision is prominent in Tangail, as elsewhere in Bangladesh. NGO interviewees themselves will readily admit their relationship with local authorities has become too cozy over time, leading to perceived collusion, leaving non-clients to fend for themselves.

4. Discussion and conclusion

Several decades of traditional engineering measures for dealing with flood risk in the delta are becoming inadequate and a search for policy and management alternatives is on the rise. However, what we wanted to show is that some of the historical legacies associated with technocratic planning of the deltas are still very much alive today and have a role in amplifying power and social inequalities. This is supported by existing studies and our own findings (Rammelt et al., 2018; Warner, 2010; Hoang et al., 2018; Biggs, 2012). This creates new challenging questions around how to manage deltas in the most appropriate way for the future particularly when including resilience in the discussion. Will resilience help to create more democratic and sustainable forms of delta management or will it at best ignore power inequalities or at worst amplify them? As resilience becomes increasingly more influential in delta planning, in this paper we have attempted to explore how a more balanced discussion of power and resilience could help make delta interventions more robust and socially inclusive.

A critical finding of our study is that power is not discussed in relation to resilience partly because it is often difficult to observe and talk about. In other words, Luke's (2005) second face of power (indirect power) which is about power as part of agenda-setting and rule-making, also influencing the context of interaction in resilience projects (Boonstra, 2016) is often not part of the picture. However, by making power an explicit feature of deliberation, the various definitions and uses of resilience are effectively re-politicised.

For delta planning the implications are potentially vast since it could mean that the priorities of social groups that may stand on different sides of the equation, i.e. in terms of benefiting or suffering from resilience are foregrounded. For example in the case of Tangail, this could mean incorporating what happens not only inside a historically safe flood protected area that has enjoyed some degree of security, but also outside a protected area. This mode of discussion could also reveal that while one framing of resilience, is often more powerful in agenda-setting, situated experiences of resilience reveal different priorities and concerns that are linked to power relations.

We find that, historical legacies associated with several decades of top-down management are still persistent despite a policy shift towards adaptive alternatives. There is therefore a strong risk that resilience with its emphasis on systems thinking, in which the survival of the whole tends to privilege the survival of each of its parts, will become yet another discourse that gives legitimacy to top-down planning and technocratic management of water flows that are vital for survival. It is this risk that needs to be avoided particularly when national interests are often those driving resilience agenda-setting in a much more direct way than the multiple actors residing in the deltas themselves. Hence, new delta narratives that recast the centrality of nature, could amplify unequal power relations if power itself is not rendered visible. However, given the sheer vastness and complexity of river deltas we do not wish to overgeneralize our claims as reflecting patterns everywhere in delta areas. Indeed more case study work could help reveal deeper mechanisms of power and resilience and across a variety deltaic regions, systems and actors than what we have shown here.

As Mouffe (1996) noted, to see the effects of power, one first has to make power visible. To render power visible, a more pragmatic and action-oriented approach is required that can shift the dialogue on power and resilience away from the confines of academia, policy and aid discourse to the lived spaces and experiences of social actors in deltas. As we found, institutional arrangements such as the Commune People's Committee in Vietnam and Water Management Groups (WMGs) in Bangladesh do exist and these could in-principle help strengthen democratic planning of delta resilience.

As numerous delta plans are in the process of development, or are being revised, resilience is implicated in a new planning logic that shifts away from traditional engineering towards cultural adaptation and social resilience, including an emphasis on the role of private actors. But this does not mean that new delta plans will not replicate and reenforce a system view that will continue to dispossess already marginalized actors. For example, the EUR 45 million Dutch-Bangladeshi Blue Gold project, which was initiated to rehabilitate and fine-tune existing flood management systems to better cope with new climatic challenges still retains features of top-down command and control style water governance (GoB and GoN, 2012; Rammelt et al., 2012). Now is the right time to consider new possibilities that allow novel deliberation of power dimensions of resilience within planning whereby delta resilience is recast as a contextual property of the real world experienced in diverse ways by social actors residing in deltas.

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