Rescaling rationalities: Water management and climate change adaptation program formulation in Vietnam

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Short Abstract

Water management climate change adaptation programs in Vietnam are shaped by scaled historical dynamics. Specifically, program formulation reflects rescaled, domestic(ated) rationalities rather than novel global adaptation agendas, with implications for the nature of programs implemented.

Abstract

This paper sheds light on how historical dynamics and scales inform the framing of water management climate change adaptation programs. Rather than add to the burgeoning literature on the production of scales themselves, I contribute instead to the limited literature on how scales influence the formulation of particular programs. I do this in the setting of water management in Vietnam. Based on a historical view, semi-structured interviews and document and policy reviews, I examine historical water management in Vietnam before presenting the current program of Thao Long Dam which has been presented as climate change adaptation. I consider how historical dynamics and scales have informed the framing of such programs, and I find that program formulation reflects domestic(ated) rationalities rather than novel global adaptation agendas. This suggests that global agendas may not easily influence sub-national program formulation unless they have been adopted through a process of rescaling, gaining traction within new scales and the programs enacted from them. The paper also highlights the inherent power implications of whose rationalities prevail in program formulation.

Introduction

Programs of climate change adaptation will increasingly shape the lives of millions of people across the globe. Yet the formulation of such programs is not straightforward. Climate change adaptation as an enterprise encompasses inherent tensions: a global phenomenon with diverse local impacts, it is intersected by policies and programs at and across various scales and is informed by situated historical dynamics of environmental management, industry and investment and socio-political relations (Adger, Arnell et al. 2005, Taylor 2014: 73-97). Despite this, climate change adaptation efforts have evidenced a 'here and now' approach, in which understanding how these dynamics influence program formulation has taken a backseat to the push from practitioners, political authorities and academics to 'Adapt now!' (Leary, Adejuwon et al. 2007). In the scholarly literature, this is reflected by the dearth of literature on the domestic politics of climate change adaptation and a focus on global climate policy, especially that of mitigating climate change rather than adapting to it (Bulkeley 2005). This paper thus seeks to contribute to emerging literature on the domestic politics of climate change adaptation (Smucker, Wisner et al. 2015, Ojha, Ghimire et al. 2016, Funder, Mweemba et al. 2017), particularly shedding light on the interaction between global and domestic in the formulation of water management climate change adaptation programs.

Specifically, I consider the role of scale in program formulation. Since the 1990's, discussions of scale in academic literature have increasingly challenged these seemingly fixed labels. Scholars have illustrated how scales – such as global, national and local – are socially constructed and politically contested and sometimes re-formed in processes of rescaling (for a brief review of the literature, see Brenner 2001: 591-592, and Norman, Bakker et al. 2012: 53-54). In this paper, I engage specifically with scale regarding water management in a climate change context, building on emerging literature on scale in water management (Lebel, Garden et al. 2005, Feitelson and Fischhendler 2009, Norman and Bakker 2009, Harris and Alatout 2010, Moss and Newig 2010, Norman, Bakker et al. 2012) and climate change adaptation (Adger, Arnell et al. 2005, Urwin and Jordan 2008, Ribot 2010, Cartwright, Blignaut et al. 2013). Rather than adding to the burgeoning literature on the production of scale itself, I explore the concrete manifestations of scale in particular programs, contributing to the limited literature in this vein (Boyle 2002, Swyngedouw 2007). I structure my approach on the work of Rose and Miller (1992), who suggest that programs are tangible translations of political epistemologies and norms, which they call political rationalities. This 'problematics of government' approach gives insights into what kinds of programs may be formulated by identifying how scaled political rationalities play into program formulation.

To examine the formulation of current climate change adaptation programs, I go to the coastal province of Thua Thien Hue in Vietnam. Here, climate changes are felt and adaptation programs are underway. Sea level rise, shifting seasons, changing precipitation patters and temperature fluctuations have all been identified as impacts of climate change, both in local policy documents and international climate change analyses (CCAP 2012, Potsdam Institute 2013). Especially prominent among climate change adaptation initiatives in Vietnam are water management, particularly infrastructure, programs. I thus use the platform of water management in the empirical setting of Vietnam to consider how scaled rationalities inform programs of water management climate change adaptation.

I begin with a conceptual section expounding on the relationship between programs, rationalities and scale. The paper's examination of water management in Vietnam is then presented two parts, where the present is prefaced by the historical. This historical approach is based partly on the work of Rose and Miller (1992)

and also on the understanding that adaptation is fundamentally shaped by existing structures and practices of environmental management, social relationships and political organization. In the contemporary case, I examine current climate change adaptation approaches, drawing on document and policy reviews as well as semi-structured interviews with provincial, district and commune officials and water management practitioners. I consider current water management generally and present the specific program of Thao Long Dam, a salinity prevention intervention, to illustrate the rationalities it embodies and the implications for climate change adaptation.

I find that program formulation reflects domestic(ated) political rationalities rather than novel global agendas. This emerges from the more general conclusion that historical environmental management dynamics, in this case those of water management, strongly drive current climate change adaptation. These findings suggest that global climate change adaptation agendas may not easily influence program formulation unless they have been adopted at the scale of formulation. However, the analysis also demonstrates how rationalities can be rescaled, gaining traction within new scales and the programs which are enacted from them. Ultimately, it underlines how those defining climate change adaptation interventions define others' lived realities and joins the growing body of literature that highlights the inherently political nature of climate change adaptation.

Rationalities, programs and scales

Political rationalities and programs

Political rationalities and programs are key aspects of Rose and Miller's (1992) account of 'Political power beyond the state.' Building on the work of Michel Foucault (for example Foucault 1991), they put forward a new approach to studying the exercise of power not predicated upon bureaucratic structures of state power. Instead, they present government as "the historically constituted matrix within which are articulated all those dreams, schemes, strategies and manoeuvres of authorities that seek to shape the beliefs and conduct of others…by acting upon their will, their circumstances or their environment" (Rose and Miller 1992: 175). This inherent political focus supports an analysis of climate change adaptation as a political enterprise. In this account, *political rationalities* provide the conceptual and moral foundation for the activity of governance. These are then translated into concrete *programs of government*, which are implemented through *technologies of government*. In the setting of water management infrastructure, these could be exemplified by political rationalities of physical security from storms being translated into concrete programs of dykes, implemented through technologies of measuring, mapping and construction.

I seek specifically to shed light on the process of translation from political rationalities to programs. Rose and Miller describe political rationalities as regularities in political discourse. They have linguistic, epistemological and moral aspects, providing the language to describe the reality to be governed, conceptions of what is to be governed and principles and goals of how and to what ends these things are to be governed. While political rationalities are not fixed or beyond contestation, some gain more support and prominence than others. Political rationalities are then expressed tangibly through programs of government (Rose and Miller 1992). Rose and Miller describe this movement from abstract rationalities to concrete programs as one of translation, "both a movement from one space to another, and an expression of a particular concern in another modality" (Rose and Miller 1992: 181). They give the example of liberal rationalities and the obligations these entail for subjects in a liberal political body. Those who do not meet these obligations become subject to disciplinary programs of government such as prisons and asylums,

which tangibly embody the linguistic, epistemological and moral aspects of political rationalities. Such programs operate through linguistic fields of sickness and transgression, based on conceptions of the relationship between individuals and society and moral understandings of proper behavior and remedial activity (Rose and Miller 1992). In this way programs of government are the tangible expression of political rationalities.

Scales

I also consider the scales from which political rationalities emanate. This is a response to what one author calls the 'here and now' of climate change adaptation discourses that divorces adaptation from "trajectories of socio-ecological change that have a longer time frame and whose causative forces stretch beyond the places in which they manifest themselves" (Taylor 2014: 64). I thus situate adaptation within these trajectories using a scaled, historical approach. Not only does this challenge the premise of prevalent conceptions of climate change adaptation, for instance as a universally applicable framework of local vulnerability to an external shock as laid out in authoritative IPCC reports (Field, Barros et al. 2014), or as a set of global solutions which should be cascaded down through scales (Bulkeley 2005). It also highlights the inherent governmentality of the application of certain types of language, epistemologies and morals being enacted through adaptation from particular scales. This is not to attribute undue moral or epistemological fixity to rationalities emanating from particular scales, but to acknowledge that rationalities from particular scales often evidence 'regularities' (Rose and Miller 1992: 178). This is for instance evident in normative global governance discourses within international development, which in some instances have closely cleaved to neoliberal epistemologies and ideals (Rose 1999: 16). Such neoliberal regularities are also emerging within both academic (for example Bassett and Fogelman 2013) and practitioner-oriented adaptation literature (Taylor 2014: 83-84), with fundamental consequences for how adaptation is understood and what forms it will take.

Since the 1990's, discussions of scale in academic literature have increasingly challenged seemingly fixed labels of, for example, local, national and global. Scholars have illustrated how scales are socially and politically constructed as well as contested and reformed in what is called rescaling (for a brief literature review, see Brenner 2001). These discussions have extended through various disciplines. In water management literature, critical considerations of scale have been limited until recently (Norman, Bakker et al. 2012). Instead of focusing on the issues of politics and governance which scales entail, water resources management has long been preoccupied by technical rationalities (Molle, Mollinga et al. 2008, Mollinga 2008). Heightened attention to the political nature of water management in the 2000's has supported explicit discussions of the import and influence of various scales on water governance, illustrated for instance in Mollinga's four domains of water politics: "the everyday [local] politics of water, the politics of water policy in the context of sovereign states, inter-state hydropolitics, and the global politics of water" (2008: 12). These domains reflect the increasing traction of the politics of scale – a view of scale as "socially constructed and politically mobilised" (Budds and Hinojosa 2012: 119). The emerging literature works to, among other things, clarify what the politics of scale means in water management (Lebel, Garden et al. 2005, Moss and Newig 2010, Norman, Bakker et al. 2012); emancipate analyses of scale from the constructed fixity of river basins and watersheds (Feitelson and Fischhendler 2009, Molle 2009); and interrogate how the management of water resources contributes to rescaling (Norman and Bakker 2009, Budds and Hinojosa 2012, Johnson 2012).

Discussions of scale have also entered literature on adaptation, though this too has been slow in coming (Adger, Arnell et al. 2005). Often these discussions have remained polarized, focusing on adaptation either as a large-scale phenomenon requiring global action and policy tools or as a local phenomenon predicated upon endogenous capacities and norms. The first framing takes its starting point in understandings of climate change itself as shared global phenomenon, a conception which is the culmination of global environmentalist discourses (Jasanoff 2004) and global climate change discourses more particularly (Miller 2004). Discourses of climate change and adaptation as local phenomena are generally considered separately. Authors in this vein emphasize the localized nature of climate changes, the role of local socio-economic dynamics in determining how climate changes are felt and the centrality of local institutions and politics in determining adaptation outcomes (Miller 2004, Agrawal 2010). The local focus of adaptation is evidenced in the weight of community-based adaptation in the field (Ayers and Forsyth 2009) and in discussions of 'autonomous adaptation,' implicit in which is a focus on individual and local scales. Such perspectives call for a comparatively larger focus on the role of local actors and institutions in judging adaptation needs and implementing solutions. Considerations of the role of other scales in adaptation initiatives is only beginning to be explored (Adger, Arnell et al. 2005, Urwin and Jordan 2008). While local and global are not mutually exclusive in adaptation, the weighting of one over the other will necessarily impact the framing of climate change adaptation needs and solutions as well as outcomes and implications. Overall, scholarly discussions on scale in adaptation are currently limited. They tend to focus on adaptation at a particular scale (Jeffers 2011, Cartwright, Blignaut et al. 2013) rather than across scales (Adger, Arnell et al. 2005, Lundqvist 2016) and have not yet critically engaged in discussions of adaptation and the production of scale.

I this paper, I look at the scalar origins of the political rationalities translated into water management programs. Specifically, I consider whether these are global or domestic. While this may amount to conceptual blunt object, this basic distinction underlines the point I aim to make, namely that the scale of the political rationalities framing adaptation programs matter. They entail moral, epistemological and linguistic regularities with ramifications for both adaptation and governance more generally. In the following sections, I illustrate this in water management programs historically in Vietnam, in the case study province of Thua Thien Hue, which I also refer to as Hue Province, and in the case of Thao Long Dam specifically.

Water management historically

This section traces the scaled political rationalities of water management programs from the earliest Vietnamese civilization to the present hydraulic bureaucracy. Such a historical perspective is supported in the state, water management and adaptation literature that I draw on (Rose and Miller 1992, Molle, Mollinga et al. 2008, Taylor 2014) and provides a basis for the discussion of current adaptation water management programs. The review unfolds in precolonial, colonial and communist periods. For each period I identify one to two key political rationalities, translations into particular types of water management programs, and the scales from which these rationalities emanate. What becomes clear when conducting this exercise across historical periods is that water management programs in Vietnam have physically reproduced political rationalities and that the scale of political rationalities can shift over time in a process of re-scaling.

The Precolonial Period

Precolonial water management unfolds in two distinct periods. The first is the early pre-colonial period, in which the Vietnamese civilization was located in the Red River Delta of what is now northern Vietnam. A distinct Vietnamese civilization has been identified by historians as emerging in the Red River Delta at around 2000 to 1400 BC (Cima, 1987). At this time, rationalities of physical and food security translated into programs of dykes and irrigation. By the sixth century BC, "an important aspect of this culture…was the tidal irrigation of rice fields through an elaborate system of canals and dikes. The fields were called Lac fields, and Lac, mentioned in Chinese annals, is the earliest recorded name for the Vietnamese people" (Cima 1987: 1). Wet rice cultivation necessitated some level of water management in the turbulent climate of northern Vietnam, where the annual rainy season brings powerful typhoons and huge volumes of water (Porter 1993: 1). Protective infrastructure was necessary to prevent devastation of settlements, enable wet rice agriculture and prevent the destruction and unrest that accompanied floods and resulting famines. Early water management thus coalesced around rationalities of securing physical and food security. It also formed a basis for political authority. The building and maintenance of water management infrastructure helped legitimize central political authorities and the structures of taxation such infrastructure required (Cima 1987). The water environment and management of the same were thus foundational aspects of life, political organization and political rationalities in the Red River Delta.

The second period is that of southwards expansion of the Vietnamese, when a rationality of territorial expansion was translated into programs of irrigation and canals. Around 1000 AD came the beginnings of the extended southward movement of the Vietnamese people, termed *nam tien* (Cima, 1987). This movement brought with it the customs of wet rice production and associated irrigation schemes along the coastal plains of Vietnam (Hardy 2005: 4). Vietnamese settlers reached the Mekong Delta in the 17th century, which was at that time a sparsely-populated part of the Khmer empire (Biggs 2012). Here, water management again played a role in the extension of central authority as the Vietnamese emperors expanded their territorial control through strategic hydraulic works, particularly canals which aided in transport (as the Bao Dinh canal) or supported settlement and security (the Thoai Ha and Vinh Te canals).

The significance of programs of water management and their governance for the Vietnamese state historically led to what Benedikter (2014) terms the 'hydraulic paradigm' as an organizing principle of society and state and more nuanced consideration of similar themes taken up by Wittfogel several decades previously (1957). In the precolonial period, this paradigm was driven by domestic political rationalities of security and territorial expansion. These were translated into various water management programs of dykes, irrigation and canals that closely corresponded to the domestic water environment.

The Colonial Period

The second half of the 1800's heralded the beginnings of colonial influence as French forces gained a foothold in the Mekong Delta. In this period, global colonial rationalities of exploitation and modernist development were translated into large-scale dredging programs. Exploitation and development first required control, and the French expanded their military control and transport capabilities in the Mekong Delta initially through established waterways and canals and later through dredging new routes of transport and access (Biggs 2012). In 1879 French engineers began developing a plan for the water management of the delta, ushering in ideals of environmental control through master planning (Brocheux, Hémery et al. 2009) which reflected the high modernist "aspiration to the administrative ordering of nature and society" (Scott 1998: 88). Between 1890 and 1910, over 165 million cubic meters of soil was dredged as

waterways were expanded, extended and constructed (Biggs, Miller et al. 2009). (In comparison, the Panama canal required dredging 210 million cubic meters (Biggs 2012: 42-43)). Dredges, "more than gunboats, locomotives, or machine guns…meant immediate ecological and social change" (Biggs 2012: 43). This high modernist approach and the ramifications it would have on the water environment, modes of production and administration entailed a new era in the relationship between nation and nature (Ehlert 2012).

The canals enabled both exploitation and purported development by providing transport and drastically expanding access to land which could be worked. They were supplemented by new modes of exploitation through changed land and labor relations, which allowed for double-cropping and dramatic increases in rice production (Brocheux, Hémery et al. 2009: 121-122, Biggs 2012). In the 1930s, however, economic recession and a buildup of social grievances and ecological problems in the colony of Indochina led to increasing challenges to French rule. Colonial administrators, in turn, pointed directly to their achievements of hydraulic management and booms in rice production, population and cultivated land as proof of the development their presence had wrought (Biggs 2012: 87-89). Colonial dredging, while offering the vehicle for the expansion of the colonial state, also came to be used as a justification for its presence. Rationalities of high modernism continued to inform hydraulic planning and interventions in the southern Republic of Vietnam under American involvement (Biggs 2006). This was partly due to constraints of earlier hydraulic interventions which had left their imprint on the landscape, but was also driven by American adherence to the 'hydraulic mission' of high modernist management and the Confucian authoritarian-style rule of the government in the south (Biggs 2008, Reis 2012: 36).

These global colonial rationalities of exploitation and high modernist development led to programs that were much less compatible with local conditions than previous water management programs driven by domestic rationalities. This was partially due to the scale of such interventions under high modernist programs. While the Vietnamese had also built canals to aid in transport and control, French and later the American-backed administration extended this system significantly and in doing so, disturbed the carefully balanced ecological, social and economic conditions that had already been constructed (Biggs 2012: 41). It was also due to diverging perspectives inherent in local rationalities versus those of global high modernism. While the latter viewed nature as something to be ordered by human administration, local rationalities accepted the limitations of human interventions. This was evident in understandings of the silted 'dead points' that quickly built up in canals, sometimes rendering them impassible. While colonial engineers understood these as hindrances, locals considered them meeting points and places to stop and rest on a journey. This reflected the more general approach of living with natural water flows instead of trying to manage them (Biggs 2012: 32-34).

The Communist Period

In the new Democratic Republic of Vietnam (DRV) established in the north of Vietnam in 1945, domestic rationalities of state-building informed and hinged on water management infrastructure. Declassified American intelligence reports following the development of the DRV in the 1950s give valuable insights into the role of irrigation at that time:

> July 19, 1955 — The rapid rehabilitation of transportation and irrigation facilities, which has been the principal accomplishments of the regime in recent months, demonstrated the DRV's ability to mobilize large pools of unskilled manpower. (78)

May 14, 1957	Agricultural rehabilitation is fundamental to the recovery and development of all sectors of the North Vietnamese economy and it has been the most important program of the regime…there have been striking achievements in irrigation and flood control. (115)
May 26, 1959	…the Hanoi leaders seem to have begun their planning with full attention to the basic importance of agriculture in their economy. As a result they are emphasizing investment in irrigation…North Vietnam has ended its rice imports and has even exported small amounts. (129-130)

(National Intelligence Council 2005)

Rationalities of political control, social stability, food security and economic development all coalesce in the water management of this period. They supported the broad goal of state-building through agricultural collectivization (Fontenelle 2001) and were in turn supported by the French and earlier Vietnamese hydraulic interventions on which they often were founded (Fforde 2010).

These same rationalities of state-building extended into the post-war period with the establishment of the current Socialist Republic of Vietnam. Here, the new nation-state faced three main problems: "how to develop rural areas in order to curb uncontrolled urbanization, how to achieve national food security for a growing number of people and how to develop and modernise rural areas to stabilise them politically" (Benedikter 2014). The solution to these foundational challenges? Irrigated agriculture. A 1977 World Bank report, written at the genesis of Bank involvement in Vietnam, states that "the clear priority of the Government's development program is agricultural development…with investment initially being concentrated on irrigation infrastructure" (World Bank 1977). In Vietnam, irrigation is generally taken broadly to include all of the components supporting irrigation – not only irrigation channels, but also the pumping stations, drainage functions, dams, and reservoirs and water retention pools that make up the entire system. Irrigated agriculture thus represented an entire set of water management programs.

The new nation continued to incorporate irrigation infrastructure as a main pillar of its development. A 'rice everywhere' campaign promoted the establishment of irrigation across the country, addressing multiple challenges with one initiative (Hoanh et al 2014). First, irrigation contributed to social and political stabilization, being "focused primarily to occupy the labor force…as the government feared that a free labor force might result in or contribute to the country's political instability" (Hoanh 2014: 68). Public labor campaigns were organized by new irrigation authorities at provincial and district levels to harness available manpower for dredging canals and building embankments and irrigation channels (Benedikter 2014). Second, the spread of irrigation was also a way of institutionalizing the new communist systems (Hoanh, Suhardiman et al. 2014). Labor conducted on these irrigation schemes was reimbursed with stamps under the subsidy system, which could be redeemed for food and other goods, although in practice there were often shortages and a quite limited selection of goods available. In addition, subsequent management of irrigation systems by cooperatives or districts shifted decision-making away from households in line with collectivization policies (Benedikter 2014). Finally, as described as some of the earliest priorities of the state, irrigation works were also central in securing food security for the population. Through these multiple rationalities and pathways, "water was capitalised by the new regime in order to create a new social order based on socialist institutions led by the one-party state" (Benedikter 2014: 41). Thus, in irrigation schemes, several state-building goals – political stabilization and institutionalization as well as food security – were served through water management schemes at a time of very limited resources.

While domestic rationalities of state-building initially drove these irrigation programs, global rationalities of high modernist development fuelled their proliferation. In this more recent iteration, high modernist rationalities were ushered in through the revolutionary communist government, which espoused "the rational design of social order" including "an increasing control over nature" (Scott 1998: 89). This continued adherence to high modernist rationalities – now linking to global communist movements – contributed in the water sector to a 'hydraulic bureaucracy' in Vietnam. Literature on bureaucracies instantiated through water management – hydraulic bureaucracies – boomed after Wittfogel's provocative (1957) thesis that administering water control could lead to authoritarian styles of government. This line of argument, while heavily critiqued, continues to inspire scholarship on the relationship between political authorities and water management (Molle, Mollinga et al. 2009, Obertreis, Moss et al. 2016). It has continued to be influential in literature on Vietnam due to the tight linkages between water management and its experts, political authority and the lived water environment (Biggs 2008, Biggs, Miller et al. 2009, Evers and Benedikter 2009, Fforde 2010, Biggs 2012, Reis 2012, Benedikter 2014, Benedikter 2014, Reis and Mollinga 2015).

The culmination of this long history of translation of political rationalities into water management programs is the establishment of a hydraulic bureaucracy in Vietnam. The hydraulic bureaucracy is characterized by well-established and influential hydraulic institutions and extensive hydraulic works and policies. Hydraulic institutions in Vietnam manage water levels and flows, maintain and operate hydraulic infrastructure and design and construct new hydraulic interventions. They are an integral part of daily life – from the water on tap to the seasonal flooding and draining of rice paddy to protection from storms. While adaptive approaches are again gaining traction in Vietnam, high modernist approaches grounded in faith in engineering and technical solutions and mastery of nature remain paramount (Mollinga 2008, Biggs, Miller et al. 2009). Huge government expenditures, representing multiple percentage points of the government's own budget, go into maintaining and extending water management infrastructure. The vast majority of all water use in Vietnam is accounted for by irrigation (Evers and Benedikter 2009). Water management secures entire cities, regions, crops, exports. It has become foundational for Vietnamese society as it is currently ordered. This, however, again illustrates the difference in rationalities emerging from global rather than domestic scales. Intensive programs of water management driven by high modernist rationalities are often at odds with natural waterscapes and must be constantly maintained (Biggs 2012: 37-38), creating an infrastructural juggernaut upon which current the current Vietnamese society and economy is dependent.

Political rationalities of water management in Vietnam have changed over time, prompting shifts in concrete hydraulic programs. Such programs have so changed local conditions – environmental, institutional, and economic – that in some areas it would be difficult and costly to shift away from them. This illustrates the extent to which water management programs in Vietnam have organized the lived environment to conform to dominant political rationalities, demonstrating the inherent power of rationalities and those who wield them. Political rationalities have also been re-scaled in the domestication of global rationalities. This is evident in the domestic adoption and institutionalization of global high modernist rationalities in development generally and water management particularly in Vietnam over the course of decades. Together, these two points indicate that political rationalities from various scales powerfully shape dominant understandings of the environment and how authorities act upon it (and the societies which inhabit it) through concrete programs. This sets the stage for climate change adaptation.

Scaled Rationalities in Climate Change Programs

This section builds on the history, rationalities, and scales described above, using these as a foundation on which to understand current water management adaptation programs. First, I provide a brief history of water management in the case study province of Thua Thien Hue and describe the current climate change context. I then describe climate change adaptation programs within water management, focusing on the case of Thao Long Dam. Finally, I examine how this particular program is rooted in historical rationalities of water management.

The water management and climate change context

The water management interventions of the past and the rationalities that drove them have transformed Hue province through myriad hydraulic programs. The development of water management in Hue Province has occurred on the backdrop of a complex water environment influential for life and livelihoods in the province. The main river of the province, the Huong River, has a basin which extends over half of the province and is characterized by a complex hydrology, where western mountains swiftly descend to lowlands and the eastern shore (JICA 2017). This water environment is managed through extensive infrastructure systems:

> In the field of irrigation, a total of over 550 constructions have been built in the province, including two saltwater intrusion prevention dams (Thao Long and Cua Lac), two medium-sized reservoirs (Hoa My and Truoi), 251 small-sized reservoirs, hundreds of small dams at mountainous districts, and 295 small and medium-sized electrical pumps in the plains. Moreover, four large reservoirs Ta Trach, Binh Dien, Co Bi and A Luoi are under construction. (Hue People's Committee 2007)

Dams, canals, pumps and reservoirs are interposed across the landscape and in some areas unite to form a closed water system tenuously linked to its surroundings by systems of pumps and inevitable precipitation (Huong Phong Commune 2015). Current programs focus on optimizing current systems, completing major projects seen as cornerstones of the provinces water management (DARD 2015), securing the availability of adequate fresh water resources, preventing flooding and to a lesser extent on generating electricity (Hue People's Committee 2007, Thao Long Management Company 2015, JICA 2017).

These systems of hydraulic control support the fulfillment of high modernist development rationalities. In the words of the Irrigation Master Plan, they support the province's "potential to develop the general economy and the opportunity for economic growth in the period 2005-2010 and from 2011-2020" (Hue People's Committee 2007: Part III). They allow for agricultural intensification, especially on land otherwise unsuited to intensive agriculture, supporting the often poorer population living in these areas. They also improve physical and economic security from flooding and extreme events and help provide a more constant, reliable flow of fresh water for residents for daily use as well as for industry (Hue People's Committee 2007, CCAP 2012). Such infrastructural programs support an above average provincial growth rate and a growth rate in the agricultural sector of over 4 percent 'despite difficult conditions' (Hue People's Committee 2007).

Beyond embodying ideals of managing the environment as an input to development, these water management systems create the context within which current adaptation must operate. Climate change is significantly affecting daily life in the province in a variety of ways. Some of the points highlighted in the Province's Climate Change Action Plan (CCAP) include increasing frequency, intensity, fluctuations and

extremes in ‘dangerous weather phenomena’ as well as swings in temperature, water inundation and shortages and salinity intrusion. This range of impacts are seen to affect everything from human health and safety to industrial production to agricultural production. Importantly, they are problematized generally as issues of water management rather than unsuitable development trajectories, so soul-searching on the premises of high modernist development is sidelined in favor of finding the proper technical solutions (CCAP 2012), reflecting the ‘anti-politics’ (Ferguson 1990) evident in climate change adaptation (Swyngedouw 2010: 64-65, Taylor 2014).

Among the climate change impacts in the province are swings and more extremes in temperatures and precipitation, which contribute to flooding on the one hand and water shortages and droughts on the other. I look specifically at the latter, which have become a more or less annual occurrence (Hue People's Committee 2007). Increasingly dry weather in the dry season has negatively affected the quality of surface water, the primary source of water for domestic and economic purposes in the province. In the last few decades, this problem grew increasingly acute; droughts from 1993-94 damaged almost 13,000 ha of rice (out of roughly 48,500ha (GSO 2017)), leading to an estimated loss of 20,000 tons of paddy (CCAP 2012), and during the dry season of 2002, salinity intrusion into the Province’s Huong river system extended up to 30 km inland. Due to such severe saltwater intrusion, the tap water of the entire city of Hue, located about 10 km upriver of the coast with a population of over 300,000, sometimes turned salty in the dry season (DARD 2015). Local villagers of Thuan Hoa Village located near the coast of Hue Province have also noted and been coping with changing temperatures and seasonal fluctuations; dozens of interviewees offered a strikingly coherent account of hotter, dryer weather, fluctuations such as droughts and later onset of the rainy season. This dryer weather was also problematic for local rice production, especially for the second rice crop, which is typically planted long after the deluge of the rainy season had drained out into the rivers, brackish lagoon and ocean (Thua Hoa 2014).

The programs

To deal with climate change impacts, sub-national officials at provincial, district and commune levels have sought to improve irrigation infrastructure. Provincial planning documents illustrate the linkage between climate change adaptation and irrigation infrastructure clearly. An advocacy document on raising climate change awareness produced by the provincial Department of Natural Resources and Environment (DONRE) discusses “using water resources effectively in the irrigation system taking into consideration the impact of climate change” and “programs to implement irrigation management methods on rice fields” amidst a general focus on larger-scale projects (DONRE 2013). Furthermore, the CCAP (2012), produced to satisfy national (donor-driven) legislation, mentions irrigation over 30 times, indicating the perceived importance of irrigation in addressing climate change impacts. This linkage also emerges in irrigation planning documents and governmental programs. The irrigation master plan of Hue Province states: “During the past years, due to the extreme changes of weather, heavy rains, prolonged drought, floods caused by typhoons, flash floods, landslides, etc., the irrigation and water supply capacity, flood control, and a program of completing the existing irrigation constructions should be reviewed” (Hue People's Committee, 2007). Related irrigation programs include the major dams currently under construction in the mountainous areas of the province, trapping the freshwater that would otherwise drain to the sea, and concretizing of irrigation channels to optimize use of the fresh water available. A linkage between climate change as an issue for provincial development and irrigation programs as a solution is thus evident in planning and practice.

Irrigation programs are being communicated in terms of joint political rationalities of economic development and managing the impacts of climate change. The CCAP specifically includes a subsection on irrigation under 'Socio-economic development planning in Thua Thien Hue province in 2015 and orientations towards 2020' (CCAP 2012). This focus is also evident in the irrigation master plan, which notes:

> Due to the natural conditions with risks caused for the economy in the past few years and the impact of irrigation schemes in the province area, in order to grow and develop the economy in a sustainable way, Thua Thien Hue needs to develop irrigation, especially the construction of works for integrated use. (Hue People's Committee 2007: Part III)

In a setting of intensifying climate changes, irrigation programs are thus presented as a way for political authorities to retain control of the environment and continue on the pathway of modernist development.

The specific case of Thao Long Dam is illustrative of this as well as of the complex historical dynamics and rationalities of current adaptation. Thao Long Dam is a roughly 600 wide barrage dam (composed of a series of gates) by the mouth of the Huong River in Hue Province, Vietnam. It sits as a gate-keeper, strategically releasing or retaining the freshwater that drains from the Huong river system and further to the dam. Particularly, it prevents the incursion of saline water inland during the dry season, protecting freshwater resources for irrigation, industry and domestic consumption and is presented as having "thoroughly controlled" the province's "salinization situation" (CCAP 2008: 82). The import of this is evident in the province's Climate Change Action Plan (CCAP), which notes that "[o]ne of the greatest and the most specific effect of climate change on water resources in Thua Thien Hue is expanding the range of the influence of salinity intrusion" (CCAP, 2012: 82). Thao Long follows on the heels of earlier salinity prevention interventions (Hue People's Committee 2007, Thao Long Management Company 2015). The previous construction at the mouth of the Huong River, built before 1970 and repaired after reunification, was rudimentary, composed of a cement and stone foundation and an array of wood attached to cement poles to form the dam (Hue People's Committee 2007, Thao Long Management Company 2015). The dam could thus not be opened to allow floodwaters to escape, and the wooden barrage also became penetrated by saline water, becoming in the words of one water management director "completely useless" (Irrigation Management Company 5 2015). Thao Long Dam, completed in 2007, was built in its wake.

The case of Thao Long Dam seems clear-cut. It is presented in official documents as a key infrastructural solution to managing the province's climate change challenges. Yet what emerged in interviews with government officials was something else entirely. The dam was first conceived of in the 1980's as part of a vast provincial water management scheme, typifying the high modernist planning approaches both colonial and communist governments. In this scheme major upland dams would be built to create reservoirs to store additional freshwater which could then be released slowly during the dry season. Thao Long would help retain this released water within the river system, securing freshwater for the secondary and tertiary irrigation canals – and a second rice crop – as well as for industry and domestic consumption. It could also be opened to allow for drainage of upstream floodwaters. This system would provide the hydraulic engineering necessary to ensure continued exploitation of water resources to support the planned development of the province.

The development of this master scheme began at a time where Vietnam was undergoing profound transition. Critical shortages of food and the means of production had contributed to crisis, and the reform policies of the 1980's were praised as having "brought the country out of crisis and bankruptcy and saved

its people from starvation" (Nguyen 2006: 332). It was in this setting that a far-reaching hydrological intervention was framed, yet funds were lacking. The province requested financial support for the project from the national government, which supported the concept. With the national government's stated goals of economic growth and considering the development challenges posed by salinity intrusion, it was unsurprising that the ministry chose to support the project, given its significance for such a broad area. The dam project also incorporated a bridge, which has helped link peripheral coastal areas to the rest of the province, another important contribution to rural development. The national government, in the face of seeming overwhelming resource demands across the country, did not initially direct funding to the project, however. It was only after the increasing agricultural devastation of droughts in the mid 1990's that the project was provided with national financial support.

The initial steps for the project were undertaken from the late 1990s under the purview of the Ministry of Agriculture and Rural Development (MARD), with the Ministry of Construction also involved. These steps included the pre-feasibility study, project appraisal, feasibility study, design and design appraisal, with each of these 6 phases involving a different consultancy or design company (some if not all of which were likely government companies) (Irrigation Management Company 5 2015). An environmental impact assessment was not required at the time and was not conducted, perhaps reflecting high modernist approaches to the subjection of nature (Thao Long Management Company 2014). Project construction then began in 2001, culminating in 2007, and the dam went into operation under the responsibility of the Department of Agriculture and Rural Development (DARD), the line ministry of MARD at the provincial level, and under the direct management of Central Vietnam's semi-public Irrigation Management Company No. 5 (ibid). A department within the company was established to oversee the everyday operation of the dam and includes management, technical staff and administrative personnel. The process of design, construction and management illustrate the sprawling hydraulic bureaucracy of Vietnam.

The dam has indeed helped with issues of salinity intrusion. During the dry season, the dam is able to manage water flow quite precisely by opening and closing one or more of its 15 gates as needed, and during the rainy season, some or all of the gates can be opened to allow runoff to drain. This has aided industry, tourism and agriculture in the province, as well as daily life (CCAP 2012). Locally, the dam has also transformed almost 300 hectares of marginal agricultural areas close to the sea, with 274ha converted from single to double rice cropping and 8ha of previously unused land now being farmed (Huong Phong Commune 2014, Huong Phong Agricultural Cooperative 2015).

The rationalities

Tracing the framing of this ostensible adaptation program captures the complexity of the process of translation from rationality to program emerge. Such translation occurs not in a vacuum, but in a pre-existing policy and physical environment, which influences the formulation and subsequent portrayal of new programs.

Thao Long Dam was framed in the transition from state-building to global high modernist rationalities. The initial conception of the program in the 1980's occurred against a backdrop of volatile national policy and lack of local development. In the 1990's, when the program framing coalesced, conditions were still severe. In 1993 – during the period of extreme drought in Hue – over half of Vietnam's population lived on less than $1.90 a day (compared to 3 percent today) (World Bank 2017). Issues of basic development and subsistence were at the forefront of official concerns as political authorities sought to implement sweeping

reforms and re-forge the socialist path of development. At this time, water management programs in the province were generally small-scale. Interviews indicate that it was roughly at this time that the digging of irrigation infrastructure began to be mechanized (DARD 2015). Yet the dam reflected a forward-looking vision of high modernist control of the province's water resources through a set of dams envisioned to one day compose a controlled water environment in the province. By the time the dam was under construction in the 2000's, rationalities of economic development though such high modernist management had come to the fore; concerns with subsistence had largely faded, and surpluses, industry, exports, and growth targets had gained ground. These provided a rubric upon which the government's high modernist development could be judged, and government legitimacy became increasingly linked to meeting economic targets (Thayer 2010). This seems to be reflected in the framing of Thao Long in current interviews with officials, who present the dam as a development intervention. Officials specifically highlight its ability to control salinity intrusion and retain fresh water, supporting economic development across sectors (DARD 2013, DARD 2014, Huong Phong Commune 2014, DARD 2015, Huong Phong Commune 2015).

Interestingly, however, officials did not link Thao Long explicitly to climate change unless prompted (ibid). At the time Thao Long was built in the 2000's, climate change as a political agenda was still gaining momentum. The formulation of domestic policies on climate change commenced with the initial 2003 National Communication under the United Nations Framework Convention on Climate Change (GoV 2003), and it was only after the completion of the dam that more extensive national climate change policies were unfurled (Zink 2013: 142-157) – one in 2008, one in 2011 and two in 2012 (MONRE 2012). This process was largely donor-driven, yet reflected existing political interests. One Vietnamese climate change policy co-author noted that climate change is important in Vietnam because donors think it is important, but climate change activities can contribute to meeting what Vietnamese policy makers see as more pressing needs (Zink 2013: 142). One of these may be salinity intrusion. The third sentence of the 2011 National Climate Change Strategy notes that: "Higher temperature and sea level rising will cause inundation and water salinity which can bring about negative effects on agriculture and high risks to industry and socio-economic systems in the future" (GoV 2011: 1). This rebranding of existing interests as climate change adaptation is also evident at provincial level and within the specific program of Thao Long. At the provincial level, a Climate Change Action Plan was produced in 2012 in accordance with national (donor-driven) legislation, but mainstreaming across departments and sectors has been uneven (CCAP 2012, DONRE 2013). Many of the departments with responsibility for sectors affected by climate change have quietly been dealing with it for years, and the 'actions' of the CCAP evidence rebranding of existing project proposals. With Thao Long, while sub-national officials highlight aspects of the dam that offer crucial adaptation functions, these functions are grounded in established rationalities of economic development. The representation of Thao Long as a central adaptation intervention for the province seems first to emerge in the CCAP of 2012, which can be traced back to donor-driven climate change policies.

The rationalities evident in the roughly 30 years from the conception of Thao Long Dam to its present portrayal have a long history. They draw on rationalities of security in the Red River Delta which were translated into water management programs and the territorial expansion of the Vietnamese, which spread these rationalities and programs to what is now Hue Province. They then extend through the high modernist visions of colonialism and communism and enter the near past of Hue Province at a time of political crisis and palpable need. Ultimately, a new rationality of climate change adaptation has emerged, yet only after program completion. Though Thao Long Dam is indeed a central adaptation initiative in the

province in that it helps address climate change impacts, it was not formulated in reference to rationalities of adaptation. It can instead be seen as a provincial mascot of national political strategies, which are in turn linked to global climate change agendas through donors. The fact that it can be cast as adaptation illustrates how many adaptation initiatives overlap with broader development and environmental management rationalities and the reality that many governmental officials (as well as many others) have been conducting 'adaptation' for years, just not under that label. Excavating this history of rationalities is instructive and suggests that governmental programs grow out of a diversity of rationalities. This is perhaps especially true of large-scale interventions with a lengthier lifetime. In addition, the case illustrates how the label of climate change adaptation can be misleading. When viewing concrete programs as translations of governmental rationalities, the case of Thao Long suggests that they should be analyzed as expressions of shifting rationalities, intertwined across scales.

Adaptation: Rationalities, Scales and Implications

The case of Thao Long Dam provides broader insights into the formulation of both water management and adaptation programs. First, it illustrates how historical rationalities and the programs into which they are translated shape the context in which current programs are formulated. Rather than acting on a clean slate, such programs are fundamentally shaped by existing domains of political structures and processes, environmental management and constructed social and economic configurations. For Thao Long, domesticated rationalities of high modernism have been present in the project conception from the start. National traditions of historic water management are evident, and more current national development priorities determined the timing of the project. Provincial officials proved the instigators of the entire water management scheme of which the project is a key part. The presence of both a culture and the institutions of a hydraulic bureaucracy across scales in Vietnam have supported the instantiation of the project. Finally, local environmental conditions have been a key factor in project framing, though have only become critical in their intersection with local demographics and national and provincial socioeconomic development visions. This is especially relevant for adaptation projects within sectors such as water management, which often have a long history and entail extensive existing investments. New adaptation rationalities which drastically depart from existing programs and practices within such fields may have difficulty in breaking through. However, as the increasing understanding of the political nature of water management indicates, new appraoches can gain traction over time (Mollinga 2008).

Second, it illustrates how domestic(ated) rationalities dominate adaptation. Rationalities behind Thao Long are largely domestic or domesticated ones of global origins. Those global rationalities that emerge in project framing have been domesticated at national and sub-national scales over decades, through a process of rescaling of political rationalities. Rescaling describes the "continuous reshuffling and reorganisation of spatial scales" (Swyngedouw 2004: 33), a concept I use here to describe the movement of rationalities between institutional scales of governance (drawing, for example, on the rescaling of regulatory practices as described by Swyngedouw 2004: 37). The national planning organs, engineering programs, technical organizations, local management offices, and particular infrastructural interventions this entails illustrate how a global high modernist mindset has truly been taken up throughout the political and organizational landscape of Vietnam, melding with existing rationalities in what can be seen as a dual process of 'glocalization' (Swyngedouw 2004). Institutions, processes and physical constructions both result from and reinforce this trajectory and continue to influence the room for formulation of new programs. In practice, it suggests that global climate adaptation rationalities that are not emic to or adopted by the site

of adaptation formulation may have difficulty gaining traction in program formulation. Yet in Vietnam, this process of domestication may be beginning in climate change adaptation. The Province's CCAP is direct result of national policy requirements. National climate change policy in Vietnam, in turn, has been extremely donor driven. Donors have supported the drafting process and have provided funding contingent on the passing of national climate change legislation (Zink 2013: 142-157). Yet the policies reflect not only donor wish-lists, but also domestic interests, echoing similar findings of from other countries of how global adaptation policy processes are used as a vessel for domestic politics (Smucker, Wisner et al. 2015, Funder, Mweemba et al. 2017).

A third important aspect that emerges from the case is the power dynamic evident in *which* rationalities come to be translated into programs. Programs "express and re-constitute physical, social, cultural, economic or political power relations" (Swyngedouw 2007: 10). In terms of scales, the comparative weighting of local versus global (or national, meso, community, household, etc.) rationalities, or the rescaling of these, will necessarily impact the framing of adaptation needs and solutions as well as outcomes and implications (Bulkeley 2005). In the case of Thao Long Dam, rationalities of climate change adaptation were added long after program formulation and implementation, part of a broader trend in Vietnam. An analysis of programs identified as climate change up to 2006 versus from 2007-8 show that in the first period, only 35% of programs were conceptualized specifically in terms of climate change, while in the subsequent period, 88% were (Zink 2013: 129). Thao Long Dam falls squarely in this first group. Officials have invoked adaptation only after its construction, seemingly in reference to the extension of global climate change policy interventions into the domestic political scene. Program formulation drew instead on domesticated rationalities of economic development through high modernist environmental control, thereby reproducing the linguistic, epistemological and moral characteristics of these rationalities. The genealogy of such programs entail moral, epistemological and linguistic regularities that they then translate into lived realities. The future of climate change adaptation programs in Vietnam and beyond, and the understanding and experience of climate change for those affected, is thus dependent on which rationalities inform adaptation programs. This question of 'which rationalities?' points to the power of those wielding rationalities in program formulation and suggests further exploration of trusteeship (Li 2007: 4-5) and expertise (Rose and Miller 1992: 187-189) in climate change adaptation.

Finally, climate change adaptation programs have ramifications not only for adaptation, but also for governance more generally. Indeed, "state policies and interventions on climate change adaptation in development can be understood as a form of governmentality through which state agencies seek to assert control over rural citizens and resources" (Funder, Mweemba et al. 2017: 2). In the case study area, climate change adaptation initiatives lean heavily on water management infrastructure, which structures daily life and perpetuates certain forms of environmental control (Lindegaard 2013). They reinforce current pathways of development and associated social and political dynamics and disparities. They feed into authorities' efforts to "shape the beliefs and conduct of others…by acting upon their will, their circumstances or their environment" (Rose and Miller 1992: 175). The approach taken here situates climate change within the broader efforts to order societies and environments. It forefronts the power dynamics of adaptation, which often fall victim to depoliticizing discourse and practices (Swyngedouw 2010, Taylor 2014: 64-65, Ojha, Ghimire et al. 2016). And it highlights the manner in which scaled rationalities, and the epistemologies and morals they manifest, structure the lived environment through adaptation programs.

Conclusions

The paper examines how (re)scaled rationalities influence the formulation of a particular adaptation program. It suggests that program formulation is more heavily influenced by historical, domestic(ated) rationalities than by novel global agendas. However, it also documents how rationalities can be rescaled, gaining traction within new scales and thus factoring into subsequent program formulation. This contributes to existing literature of the politics of scale and rescaling, especially in program formulation. By pairing work on scales with the problematics of government approach, the paper also offers a framework through which to apply scale within studies of the activity of governance.

For programming, the findings suggest a critical approach. Practitioners, organizations and authorities should attend to the power dynamics of whose or which rationalities inform program formulation, also turning this critical gaze inwards. This is true broadly – for water management, for climate change adaptation and beyond. To take a more instrumental approach, the analysis suggests that adaptation cooperation between global organizations and institutions at national and sub-national levels will likely be most successful when building on national and sub-national rationalities. Yet it also indicates possible benefits of cross- and intra-scalar involvement in adaptation program formulation. This may support dissemination of new rationalities, which could broaden the ideas influencing program formulation, mediate the influence of particularly dominant rationalities, and offer additional and perhaps better adaptation options in the future. In addition, those pushing for local adaptation should also take note. While the impacts of climate change are indeed highly localized and contingent upon not only environmental conditions but also local socioeconomic dynamics, responses to localized changes may well benefit from cross-scalar involvement. A large infrastructural water management intervention such as Thao Long Dam, highly effective at limiting salinity intrusion and beneficial in many ways to surrounding residents, cannot be formulated, built or managed by a community. Fixing climate change adaptation at any scale limits the prospects and tools available for adaptation.

The paper also probes deeper power dynamics evident in programming. It illustrates the historical grounding of current programs and indicates that water management and climate change adaptation programs reproduce the linguistic, epistemological and moral characteristics of the rationalities they instantiate. It points to the power of those wielding rationalities in program formulation and suggests further exploration of trusteeship and expertise in climate change adaptation especially. This has implications beyond adaptation or water management. Such programs further the premises of the systems of governance which engender them and extend existing power relations and discrepancies. This paper thus joins emerging literature that highlights the inherently political nature of climate change adaptation.

Works Cited

Adger, W. N., et al. (2005). "Successful adaptation to climate change across scales." Global environmental change **15**(2): 77-86.

Agrawal, A. (2010). "Local institutions and adaptation to climate change." Social Dimensions of Climate Change: Equity and Vulnerability in a Warming World. Washington DC, World Bank: 173-198.

Ayers, J. and T. Forsyth (2009). "Community-based adaptation to climate change." Environment: science and policy for sustainable development **51**(4): 22-31.

Bassett, T. J. and C. Fogelman (2013). "Déjà vu or something new? The adaptation concept in the climate change literature." Geoforum **48**: 42-53.

Benedikter, S. (2014). "Extending the Hydraulic Paradigm: Reunification, State Consolidation, and Water Control in the Vietnamese Mekong Delta after 1975." Southeast Asian Studies **3**(3): 547-587.

Benedikter, S. (2014). The Vietnamese hydrocracy and the Mekong Delta: water resources development from state socialism to bureaucratic capitalism, LIT Verlag Münster.

Biggs, D. (2006). "Reclamation Nations: The US Bureau of Reclamation's Role in Water Management and Nation Building in the Mekong Valley, 1945-1975." Comparative Technology Transfer and Society **4**(3): 225-246.

Biggs, D. (2008). "Breaking from the colonial mold: Water engineering and the failure of nation-building in the Plain of Reeds, Vietnam." Technology and Culture **49**(3): 599-623.

Biggs, D. (2012). Quagmire: Nation-Building and Nature in the Mekong Delta (Weyerhaeuser Environmental Books), University of Washington Press.

Biggs, D., et al. (2009). "The delta machine: water management in the Vietnamese Mekong Delta in historical and contemporary perspectives." Contested waterscapes in the Mekong region: Hydropower, livelihoods and governance: 203-225.

Boyle, M. (2002). "Cleaning up after the Celtic Tiger: scalar 'fixes' in the political ecology of Tiger economies." Transactions of the Institute of British Geographers **27**(2): 172-194.

Brenner, N. (2001). "The limits to scale? Methodological reflections on scalar structuration." Progress in Human Geography **25**(4): 591-614.

Brocheux, P., et al. (2009). Indochina: an ambiguous colonization, 1858-1954, University of California Press Berkeley.

Budds, J. and L. Hinojosa (2012). "Restructuring and rescaling water governance in mining contexts: the co-production of waterscapes in Peru." Water Alternatives **5**(1): 119.

Bulkeley, H. (2005). "Reconfiguring environmental governance: Towards a politics of scales and networks." Political geography **24**(8): 875-902.

Cartwright, A., et al. (2013). "Economics of climate change adaptation at the local scale under conditions of uncertainty and resource constraints: the case of Durban, South Africa." Environment and Urbanization **25**(1): 139-156.

CCAP (2012). Action Plan to respond to climate change in Thua Thien Hue by 2020 approved by Thua Thien Hue People's Committee. Thua Thien Hue Province, Vietnam, Translation by Phan Diem My with English language edits by the author.

Cima, R. J. (1987). Vietnam: A Country Study,‖. Washington, DC: GPO for the Library of Congress.

DARD (2013). "Interview with Vice Head and Staff Member of the Department of Water and Irrigation Systems and Flood and Storm Control, Department of Agriculture and Rural Development, Hue Province, August 8, 2013."

DARD (2014). Interview with Head of Agricultural Department, Department of Agriculture and Rural Development of Hue Province, October 1, 2014.

DARD (2015). "Interview with Irrigation and Flood and Storm Control Section, Department of Agriculture and Rural Development (DARD), Hue Province, May 4, 2015."

DARD (2015). "Interview with Vice Head of Irrigation and Flood and Storm Control Section, Department of Agriculture and Rural Development, Hue Province, May 6, 2015."

DONRE (2013). "CONTENT ON ADVOCACY TO RAISE AWARENESS AND RESPONSIBILITY OF COMMUNITY ABOUT CLIMATE CHANGE IN THUA THIEN HUE PROVINCE."

DONRE (2013). Interview with Vice Head of the Department of Natural Resources, Weather and Climate Change, Department of Natural Resources and Environment, Hue Province, August 6, 2013

Ehlert, J. (2012). Beautiful floods: environmental knowledge and agrarian change in the Mekong Delta, Vietnam, LIT Verlag Münster.

Evers, H.-D. and S. Benedikter (2009). "Hydraulic bureaucracy in a modern hydraulic society–strategic group formation in the Mekong Delta, Vietnam." Water Alternatives **2**(3): 416-439.

Feitelson, E. and I. Fischhendler (2009). "Spaces of water governance: The case of Israel and its neighbors." Annals of the Association of American Geographers **99**(4): 728-745.

Ferguson, J. (1990). The anti-politics machine:'development', depoliticization and bureaucratic power in Lesotho, CUP Archive.

Fforde, A. (2010). "Vietnam: Water policy dynamics under a post Cold War communism." Water Alternatives **3**(3): 552.

Field, C., et al. (2014). Technical Summary of Climate Change 2014: Impacts, Adaptation, and Vulnerability, IPCC.

Fontenelle, J.-P. (2001). "Water management decentralisation in the Red River Delta, Vietnam: an uncompleted transition process towards local governance." International Journal of Water **1**(3): 380-396.

Foucault, M. (1991). Governmentality. The Foucault Effect: Studies in governmentality. C. Gordon, G. Burchell and P. Miller. Chicago, University of Chicago Press**:** 87-104.

Funder, M., et al. (2017). "The Politics of Climate Change Adaptation in Development: Authority, Resource Control and State Intervention in Rural Zambia." The Journal of Development Studies: 1-17.

GoV (2003). Initial National Communication under the United Nations Framework Convention on Climate Change. M. o. N. R. a. Environment. Hanoi.

GoV (2011). National Strategy on Climate Change for the Period 2011-2020. G. o. Vietnam.

GSO (2017). "Area of planted paddy in Thua Thien Hue Province in 1995." Retrieved June 6, 2017, from http://www.gso.gov.vn/default_en.aspx?tabid=778.

Hardy, A. D. (2005). Red hills: migrants and the state in the highlands of Vietnam, NIAS Press.

Harris, L. M. and S. Alatout (2010). "Negotiating hydro-scales, forging states: Comparison of the upper Tigris/Euphrates and Jordan River basins." Political geography **29**(3): 148-156.

Hoanh, C. T., et al. (2014). "Irrigation development in the Vietnamese Mekong Delta: Towards polycentric water governance?" International Journal of Water Governance **2**(2): 61-82.

Hue People's Committee (2007). "Thua Thien Hue's Overall Irrigation Development Master Plan to 2015 and Vision to 2020."

Huong Phong Agricultural Cooperative (2015). "Interviews with officials from an agricultural cooperative in Huong Phong, Huong Tra Town, Hue Province, April 23, 2015."

Huong Phong Commune (2014). "Interview with Commune Vice Head and Land Management Official on September 30, 2014, Huong Phong Commune, Hue Province."

Huong Phong Commune (2015). "Interview with Head of People's Committee, Huong Phong Commune, Huong Tra Town, Hue Province, April 13, 2015."

Irrigation Management Company 5 (2015). Interview with the director of the provincial Irrigation Mangement Company, Hue Province.

Jasanoff, S. (2004). Heaven and Earth: The Politics of Environmental Images. Earthly politics: local and global in environmental governance. S. Jasanoff, Mit Press.

Jeffers, J. M. (2011). "The Cork City flood of November 2009: Lessons for flood risk management and climate change adaptation at the urban scale." Irish Geography **44**(1): 61-80.

JICA (2017). Preparatory Survey for the Project for Emergency Reservoir Operation and Effective Flood Management using Water related Disaster Management Information System.

Johnson, C. (2012). "Toward post-sovereign environmental governance? Politics, scale, and EU Water Framework Directive." Water Alternatives **5**(1): 83.

Leary, N., et al. (2007). "A stitch in time: lessons for climate change adaptation from the AIACC project." Washington, DC, AIACC.

Lebel, L., et al. (2005). "The politics of scale, position, and place in the governance of water resources in the Mekong region." Ecology and society **10**(2): 18.

Li, T. M. (2007). The will to improve: Governmentality, development, and the practice of politics, Duke University Press.

Lindegaard, L. S. (2013). "The Infrastructure Bias in Vietnamese Climate Change Adaptation."

Lundqvist, L. J. (2016). "Planning for Climate Change Adaptation in a Multi-level Context: The Gothenburg Metropolitan Area." European Planning Studies **24**(1): 1-20.

Miller, C. A. (2004). "Climate science and the making of a global political order." States of knowledge: The coproduction of science and social order: 46-66.

Molle, F. (2009). "River-basin planning and management: The social life of a concept." Geoforum **40**(3): 484-494.

Molle, F., et al. (2008). "Water, politics and development: Introducing water alternatives." Water Alternatives **1**(1): 1-6.

Molle, F., et al. (2009). "Hydraulic bureaucracies and the hydraulic mission: Flows of water, flows of power." Water Alternatives **2**(3): 328-349.

Mollinga, P. P. (2008). "Water, politics and development: Framing a political sociology of water resources management." Water Alternatives **1**(1): 7-23.

MONRE (2012). Introduction to several Climate Change Policies in Viet Nam. UNFCCC COP18/CMP8 Side Event, Doha, Qatar.

Moss, T. and J. Newig (2010). "Multilevel water governance and problems of scale: Setting the stage for a broader debate." Environmental Management **46**(1): 1-6.

National Intelligence Council (2005). "Estimative Products on Vietnam: 1948-1975."

Nguyen, P. A. (2006). "State–society relations in contemporary Vietnam: An examination of the arena of youth." Asia Pacific Viewpoint **47**(3): 327-341.

Norman, E., et al. (2012). "Introduction to the themed section: Water governance and the politics of scale." Water Alternatives **5**(1): 52.

Norman, E. S. and K. Bakker (2009). "Transgressing scales: Water governance across the Canada–US borderland." Annals of the Association of American Geographers **99**(1): 99-117.

Obertreis, J., et al. (2016). "Water, infrastructure and political rule: Introduction to the special issue." Water Alternatives **9**(2).

Ojha, H. R., et al. (2016). "Policy without politics: technocratic control of climate change adaptation policy making in Nepal." Climate Policy **16**(4): 415-433.

Porter, G. (1993). Vietnam: The politics of bureaucratic socialism, Cornell University Press.

Potsdam Institute (2013). 4° Turn Down the Heat: Climate Extremes, Regional Impacts, and the Case for Resilience. Potsdam Institute for Climate Impact Research and Climate Analytics, World Bank.

Reis, N. (2012). Tracing and making the state: policy practices and domestic water supply in the Mekong Delta, Vietnam, LIT-Verlag.

Reis, N. and P. P. Mollinga (2015). "Public Policy and the Idea of the Vietnamese State: The Cultural Political Economy of Domestic Water Supply." Asian Studies Review **39**(4): 628-648.

Ribot, J. C. (2010). Vulnerability does not Fall from the Sky: Toward Multi-scale Pro-Poor Climate Policy, World Bank Publications.

Rose, N. (1999). Powers of freedom: Reframing political thought, Cambridge university press.

Rose, N. and P. Miller (1992). "Political power beyond the state: problematics of government." British journal of sociology: 173-205.

Scott, J. (1998). Seeing like a state: how well-intentioned efforts to improve the human condition have failed, New Haven: Yale University Press.

Smucker, T. A., et al. (2015). "Differentiated livelihoods, local institutions, and the adaptation imperative: Assessing climate change adaptation policy in Tanzania." Geoforum **59**: 39-50.

Swyngedouw, E. (2004). "Globalisation or 'glocalisation'? Networks, territories and rescaling." Cambridge review of international affairs **17**(1): 25-48.

Swyngedouw, E. (2007). "Technonatural revolutions: the scalar politics of Franco's hydro-social dream for Spain, 1939–1975." Transactions of the Institute of British Geographers **32**(1): 9-28.

Swyngedouw, E. (2010). "Apocalypse forever?" Theory, Culture & Society **27**(2-3): 213-232.

Taylor, M. (2014). The political ecology of climate change adaptation: Livelihoods, agrarian change and the conflicts of development, Routledge.

Thao Long Management Company (2014). "Interview with Vice Director and Head of the technical department of Thao Long management company, the Joint Stock Limited Company One Management and Exploitation of Irrigation of Thua Thien Hue Province, October 1, 2015."

Thao Long Management Company (2015). Interview with Vice Director of the Thao Long management company, the Joint Stock Limited Company One Management and Exploitation of Irrigation of Thua Thien Hue Province, May 5, 2015.

Thayer, C. A. (2010). "Political legitimacy in Vietnam: challenge and response." Politics & Policy **38**(3): 423-444.

Thua Hoa (2014). Interviews with Thuan Hoa Village Residents, Huong Tra District, Hue Province, September 2014.

Urwin, K. and A. Jordan (2008). "Does public policy support or undermine climate change adaptation? Exploring policy interplay across different scales of governance." Global environmental change **18**(1): 180-191.

Wittfogel, K. A. (1957). "Oriental Despotism: A Comparative Study of Total Power." New Haven: Yale UP.

World Bank (1977). "The Socialist Republic of Viet Nam: An Introductory Economic Report."

World Bank (2017). "Vietnam Overview." Retrieved June 23, 2017, from http://www.worldbank.org/en/country/vietnam/overview.

Zink, E. (2013). Hot Science, High Water: Assembling Nature, Society and Environmental Policy in Contemporary Vietnam. Copenhagen, Denamrk, NIAS Press.