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The Infrastructure Bias in Vietnamese Climate Change Adaptation

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ABSTRACT

This working paper examines the climate change adaptation strategies of meso-level, or mid-level, government institutions in central Vietnam. It reveals a significant bias towards infrastructure over so-called 'soft' solutions. The main drivers behind this bias – a technocratic desire for visible solutions, a need to secure socio-economic development and aspects of the state apparatus itself – are explored and explained using data from interviews with government officials. Ultimately, the paper describes the key challenges this infrastructure bias creates for climate change adaptation, socio-economic development and local people's relations with their environment.

I. INTRODUCTION

Governments around the world have begun to launch a variety of programmes, policies and projects in response to the increasingly experienced impacts of climate change. Climate change adaptation responses, ranging from the national to local levels, are becoming more proliferate and visible. While this trend is evident across all levels of development, the greater vulnerability of certain developing and middle-income country populations makes climate change adaptation efforts in these countries more pressing (World Bank 2013). Understanding the drivers behind these efforts and their impacts on the ground is thus imperative for informing future adaptation and climate change responses.

In Vietnam specifically, climate change adaptation strategies and activities are essential for protecting the population and 'climate-proofing' the country's socio-economic development. With its extensive coastline and low-lying landscape, Vietnam is predicted to be one of the countries hardest hit by climate change (Bingxin et al. 2010). In response, the national government has drafted the 2008 National Target Program to Respond to Climate Change (NTPRCC), which will direct the country's response at all levels. In addition, mid- or meso-level government institutions at the provincial, district and commune levels have increased adaptation-related projects. Interestingly, however, the balance of projects between 'soft' solutions (capacity-building, awareness-raising, land-use planning, mangrove planting, etc.) and 'hard' infrastructure solutions seems consistently skewed towards investments in the latter. As current investments may have an impact on local areas and adaptation for decades to come, delving into the drivers and impacts of these skewed investments can offer important insights for current and future adaptation.

To examine this infrastructure bias more closely, consideration of the role of meso-level actors and institutions is crucial. The meso-level occupies a unique intermediate position between national policies and localized climate impacts and adaptation. In relation to infrastructure specifically, 'a large part of infrastructure development takes place at the subsovereign level, with subsovereign entities responsible for the provision of public services' (Estache 2004: 13). Therefore, this paper will examine the role of the meso level in shaping the tendency towards infrastructure-based adaptation, though the influences of both the national and micro levels will also be considered. The paper will ultimately consider the implications of the infrastructure bias for both current socio-economic development and long-term adaptation.

II. BACKGROUND AND METHODS

This paper on the context of climate adaptation in Vietnam is part of the Climate Change and Rural Institutions (CCRI) programme, which seeks to generate knowledge of better climate change adaptation among the rural poor (for more information, see www.diis.dk/ccri.). The programme includes four countries as case studies, namely Vietnam, Nepal, Uganda and Zambia, and specifically focuses on the role of meso-level institutions in adaptation processes. This paper contributes to the wider project by enhancing an understanding of meso-level priorities and responses in central Vietnam, as well as the drivers behind them. It will ultimately help support a systematic contrast between the CCRI's country case studies, providing insights into climate change adaptations across differing governance patterns and social orders.

Hue and Quang Binh provinces in central Vietnam are the focus of the programme. Both are coastal provinces with significant rural

populations. Historically, they have been considerably affected by extreme weather events and are currently experiencing climate change impacts (see the following section). Generally, there is little NGO involvement in the two provinces, as is evident in the lack of significant interest and investment in mangroves in the case study areas (mangrove-planting projects are popular in other areas, but are largely driven by NGOs). Climate change adaptation activities and decisions are thus determined almost entirely by the meso-level government institutions, making these provinces ideal for the analysis at hand.

The field study informing this paper was conducted in both provinces and consisted of a progressively localised focus, with fieldwork conducted first at provincial, then district, then commune level within each province. This progression towards the local level corresponded to shifts in institutional roles, priorities and preferences, which will be discussed in the paper. Specifically, semi-structured interviews were conducted with officials from the Department of Natural Resources and Environment (DONRE) and the Department of Agriculture and Rural Development (DARD) at the provincial and district levels, as well as with commune-level officials working with agriculture and/or the environment. (At commune level, government institutions do not suffer the departmental divisions characteristic of provincial and district-level institutions.) In Quang Binh interviews were conducted with officials from Quang Trach District and Quang Phong Commune, as well as those from the provincial level, while in Hue Province the field study included Quang Dien District and Quang Phuoc Commune along with the provincial level.

The data gathered from these interviews will be used to illustrate officials' priorities and preferences in managing extreme weather-related events and climate change impacts. The drivers and implications of these preferences will also be discussed at length, though an exhaustive account of the reasons behind existing prioritisations are beyond the scope of this paper. However, as the discussions in this paper suggest, any such account would identify complex situations of competing economic and political pressures, which cannot adequately be captured through the interview process.

III. IMPACTS OF WEATHER-RELATED EVENTS AND RESPONSES IN CENTRAL VIETNAM

Central Vietnam has historically been susceptible to major storms and flooding. Winds and high floodwaters during such events have caused extensive damage to homes, structures and other infrastructure, as well as significant loss of life. While the number of such storms has fallen slightly over recent decades, the case-study areas of Hue and Quang Binh Provinces continue to be affected by extremely damaging storms and floods which affect meso-level institutions and practices, especially regarding flood and storm control. In addition, the case-study areas have experienced increasingly acute climate change impacts. To better understand the formative role they have played, these climate impacts and subsequent government responses are described below.

3.1 Impacts in Case-Study Areas

From 2 to 11 November 1999, Hue Province experienced extreme flooding. Rainfall topped a meter a day for many days, and floodwater levels were up to six meters above normal. During the floods, 352 people died and 120 were reported either missing or injured. Over 25,000 houses were destroyed, over one thousand schools collapsed, and hundreds of thousands of cattle and poultry were killed (Nguyen Ty Nien 2012). Significant changes

in attitudes and institutions across the country are attributed to this and other extreme floods experienced in Vietnam in 1999 and 2000. After these events, the central government strengthened disaster response systems and structures and increased investments in disaster risk-reducing infrastructure. These changes have had impacts on all levels of government, as discussed in the DIIS working paper 'Climate Change and Rural Institutions in Central Viet Nam' (Ngoan et al. 2013).

Due to reverberations at the national level, such changes have also been felt in areas not affected by the 1999 and 2000 floods. Informants in Quang Binh Province report notable changes in disaster-related institutions and investments after the 1999 floods, even though they were not directly affected at the time. The strengthened response to flooding and storms, however, served them well in later floods in 2007 and 2010. Flooding from 1 to 5 October 2010 was widespread throughout Quang Binh province and was especially destructive, the province experiencing rainfall amounting to half its total annual rainfall; 42 people died, and there was significant damage to property, structures and infrastructure. This event contributed to further changes in attitudes and disaster management institutions in Quang Binh Province.

Both case-study areas have also experienced increasingly severe climate change impacts from less extreme events. Salinity intrusion has been increasingly problematic, reducing agricultural yields and productivity, impacting livelihoods and industry, and sometimes severely limiting access to fresh water for individual consumption during the dry season. In addition, earlier flooding (which interferes with previously typical harvest times) and more erratic rainfall leading to dry spells and flooding during the growing season have threatened and sometimes devastated local agriculture and aquaculture production.

3.2 Responses in Case-Study Areas

The responses to these events have mostly focused on the more extreme floods and storms and have included responses within government institutions, for example, institutional capacity-building and training, as well as external responses enacted by the government institutions within their province, district or commune. This section will provide officials' accounts of the prioritization between different types of projects in order to understand better the bias towards infrastructure which emerges.

The external projects mentioned above can be roughly characterized as 'soft projects' and 'hard projects', with a few exceptions. Soft projects include the capacity-building and training of local people, for instance, in flood and storm responses or in adaptive changes to livelihoods. While the first of these activities is clearly perceived by government officials as a new climate change adaptation or disaster risk-reduction response (there is often an overlap and also confusion between the two), the second is often merely perceived as a modest change in ongoing support to farmers. This is because it frequently falls within the well-established agricultural extension responsibilities of district Departments of Agriculture and Rural Development (DARD) in the case-study areas, which are largely rural. Here, training and capacity-building activities often address challenges to agricultural and aquacultural production arising from shifting climate patterns, increasing salinity and the growing unpredictability of rainfall and flooding. Awareness-raising regarding disaster risks and responses was also among the soft projects discussed by informants, though it is typically carried out by commune-level officials. According to a district official, this division of labour, as it can be called, has been informally established to reflect the different capacities of different government levels. While the commune level has only a low capacity to conduct agricultural

extension activities, communes have a greater capacity as well as possible advantages in conducting awareness-raising in their local areas.

In addition, soft projects can also include mangrove-planting and protection, the preservation of dunes, changes in land-use planning and resettlement programmes. Mangrove and dune protection activities are typically managed at district and commune levels, sometimes with involvement from village officials, probably due to the localised nature of such efforts. Generally, these projects do not receive significant funding or other attention from government coffers. By contrast, mangrove-planting in Vietnam has received great attention in international discussions and could be described as the 'poster child' of community-based adaptation and disaster risk reduction in the country (see World Resources Report 2010-2011). Resettlement programmes have been conducted in the case-study areas both to settle the Sampan people, who traditionally lived on boats in areas highly vulnerable to storms, and to resettle households whose homes were threatened by a specific climate event or by acute river bank erosion.

'Hard projects' conducted in the case-study areas include a wide variety of infrastructure, including dykes, dams and reservoirs, irrigation systems, drainage improvements, roads and bridges (important for evacuation and relief efforts), concretized river banks, canals, a wave breaker, raised paths or roads between rice paddies and floodgates. The combined cost of these infrastructure projects is naturally significantly higher than the combined costs of the 'soft' projects, but the number of infrastructure projects is also notably higher, indicating a marked preference for them.

IV UNDERSTANDING MESO-LEVEL ADAPTATION PRIORITIES

To delve into the drivers of the preferences informing the responses discussed above, this section will provide accounts from government officials themselves, offer a discussion of some of the possible drivers of these preferences and consider the historical factors which may play a role.

4.1 Accounts of Officials Themselves

During the field research, government officials at different levels provided fairly consistent accounts of a greater preference for infrastructure over other types of climate adaptation responses. This was expressed both as personal opinions and observations and reflected a perceived increase in the emphasis on infrastructure solutions in both national policy and by officials at other levels. Accounts from officials are presented below, divided according to their institutional affiliations and levels.

Provincial Level

At the provincial level, DARD officials noted in interviews that infrastructure has received greater national political attention since the 1999 floods. Other DARD interviewees stated that project priorities are determined by a combination of lower-level demand (which is communicated through requests from communes and districts) and national priorities, suggesting a preference for infrastructure from both lower and higher government levels. Multiple respondents noted that there have been increased funding and communicated emphasis on infrastructure from the national level, indicating a likely push towards infrastructure prioritisation at the provincial level. Lower level demands will be discussed below.

Provincial Department of Natural Resources and Environment (DONRE) officials offered interesting input, including personal opinions

on response priorities. One official stated that infrastructure is the priority because it protects agricultural production and livelihoods. This was seen as absolutely essential and as a foundation for soft projects, which the official considered to be a secondary, supplementary activity to infrastructure. He also noted that, from a policy-maker's point of view, the visibility of infrastructure, along with its immediate, measurable impacts, makes it more desirable. He contrasted this with soft projects, which may have more delayed effects which are difficult to measure. Another official noted more neutrally that there was higher spending on infrastructure projects and currently more infrastructure projects running than soft projects.

District Level

At the district level, DARD officials also noted increased attention to and funding for flood and storm control infrastructure from both the provincial and central governments. They attributed the increased funding to heightened emphasis and subsequent funding from higher levels of government, to contributions from NGOs and donors and to economic development more generally. One district official noted a major preference for infrastructure projects at the district level, which, according to him, is limited only by funding (and therefore not by the prioritization of other adaptation solutions). He contended that at the district level, infrastructure is seen as a straightforward solution with clear benefits and noted that the high demand for infrastructure also comes from commune level.

District-level DONRE officials in one case-study area saw infrastructure as extremely important at both the district and local levels. It was perceived as a kind of foundation which would support other climate change adaptation activities; the interviewee suggested that, without the foundational security provided by certain climate infrastructure, other possible solutions such as training and awareness-raising would not provide adequate protection. So, while there was an understanding that awareness-raising, capacity-building and improving human resources are necessary, they were considered supplementary to infrastructure. In another case-study area, however, district DONRE officials considered awareness-raising to be of primary importance. In this case, the main respondent noted that climate change and related technologies are new to local people and leaders, and if they do not understand climate changes and new technology solutions, they will not be able to adapt or properly implement the climate change action plan.

Commune Level

At the commune level, there was one respondent who discussed the prioritisation of infrastructure versus other climate change 'solutions'. He considered the most important solutions to be those focused on economic development, specifically including irrigation systems and vocational or livelihood training. Other kinds of infrastructure were to him secondary priorities, and awareness-raising of lowest priority.

4.2 Possible Drivers of Priorities

The responses above clearly indicate that climate-related infrastructure is a high if not the main priority. The drivers of this are diverse and will be discussed in detail below.

Main Drivers

The drivers mentioned specifically by officials interviewed included visibility, flooding and storm control, the protection of agriculture and livelihoods and clear positive results. These can be grouped into two main drivers: a technocratic driver and a driver of developmental security. The first includes visibility and assured results from officials' political need or desire to demonstrate that they are actively ad-

dressing problems and contributing to positive outcomes. This has become increasingly challenging in a climate change context, which is characterized in the case-study areas by increasingly unpredictable and erratic weather. Infrastructure presents a 'no- or low-regrets' solution aimed at socio-economic development as well as climate goals, so some sort of positive outcome is more or less assured regardless of which future climate scenario – if any – is ultimately accurate (World Bank 2010). Interestingly, though the technocratic bias would be assumed to emphasize short-term results, infrastructure projects requiring years for completion remain popular among technocrats in the case-study areas. Interviewees indicated that this tendency is also evident in other areas.

The second driver, developmental security, includes ensuring flood and storm control as well as the protection of agriculture and livelihoods. It is common in developing country contexts and is often referred to as 'climate proofing of development investments' (ADB 2012). This driver is likely to be especially acute in the flood-prone, rural areas where the fieldwork was conducted. In these areas economic development and livelihoods can be severely affected by increasingly unpredictable storms and floods, and as government officials are responsible for the security and well-being of their constituencies, this second driver can be assumed to be especially present in their priorities.

Both of these drivers are based on managing situations of uncertainty and risk. They become drivers of an infrastructure bias more or less by default as few types of soft projects can visibly and immediately address uncertainties and secure economic development goals. Mainly one kind of soft intervention, land-use changes, would meet all of these requirements. Changes in land-use planning are a soft and immediately effective intervention to address climate issues (though some construction work may be necessary for the new land-use purpose). While such interventions are not very flexible because land-use changes can be expensive and time-consuming, making frequent changes unfeasible, they are suitable for addressing a long-term climate problem. For instance, the increasing salinization affecting land adjacent to river banks in the study areas has prompted land-use shifts from rice production to brackish water aquaculture.

Government officials, however, often do not explicitly identify land-use planning changes as a climate change adaptation tool, so there may be unharnessed potential in land-use planning which could be brought to bear through its more explicit and strategic use for climate change adaptation. A more explicit use of land-use planning for adaptation may also help prevent maladaptation through land-use changes; currently, for example, there is a notable maladaptation of converting agricultural land to industry and residential areas. This is driven by powerful economic pressures which seem to outweigh concerns about climate change.

Coastal forest and mangrove-planting may also seem to fit the requirements of being soft interventions with visible impacts. However, they lack the necessary immediacy as it takes time for newly planted saplings to grow and offer substantial protection. This may seem to be discountable, as infrastructure can also require several years to become functional, but the outcome of an infrastructure investment after several years is much surer than that of mangroves, which in some of the study areas have a survival rate of about 30%.[1] Thus, infrastructure remains preferred over mangroves and coastal forests, though these soft projects

1 This is due to several factors, including the low quality of saplings, a lack of care or tending, disease, the overpopulation of a certain lobster around mangrove roots, pollution (especially in the form of solid waste from local communities) and using saplings which are too young to survive when transplanted into coastal zones.

are sometimes combined with infrastructure and are increasingly recognized as valuable in certain contexts (McIvor et al. 2012).

Under pressure from the drivers of technocratic efficacy and developmental security, soft projects are perceived as inadequate and uncertain by meso-level government officials. Instead, they turn to infrastructure as tangible, physically commanding investments in the face of uncertainty and change.

The Nature of Government

Additionally, there are drivers which are more intrinsically connected to the nature of the government and government structures and procedures themselves. These include the configuring of investments according to socio-economic development and related plans, divergent capacities and subsequent division of labour between meso levels, and the historically hydraulic focus of governments in what is now Vietnam.

Meso-level socio-economic development and related plans establish formative investment trajectories for an area. As such plans typically include proposals for major projects, overarching development goals and related funding requests, infrastructure projects are more likely to be included than smaller, low-budget soft projects, leading to a bias towards infrastructure in these plans. In Hue Province, for instance, the new Climate Change Action Plan includes a list of priority projects, which is dominated by proposals for new infrastructure. As the action plan will largely determine the climate change response for the province, this bias is meaningful and will have concrete consequences for area adaptation and development. Other development and investment plans also include biases toward major projects, and thus infrastructure projects, making this a general phenomenon within meso-level investment planning.

Another driver derived from the nature of government relates to government capacity and the subsequent division of labour. Province, district and commune levels have differing capacities, which affects the projects they manage and how they communicate their priorities. While officials at district and commune levels can suggest infrastructure projects, as a rule the provincial government is responsible for approving them and administering their contracts due to their size and the resulting high capacity necessary to manage the contracts. The district level, in turn, is mainly responsible for the technical aspects of agricultural extension and related projects, while the communes were perceived by officials at higher levels to be best suited for local capacity-building, awareness-raising and community mobilisation. This division of labour corresponds to each level's capacity, but it may also contribute to the bias towards infrastructure. At the influential provincial level, a marked emphasis on infrastructure is likely to emerge due to provincial officials' and institutions' competences and responsibilities in relation to infrastructure projects. At the commune and district levels, a possible communication bias regarding infrastructure is likely, as officials must appeal upwards for their infrastructure needs. Consequently, they may place disproportionate emphasis on infrastructure when communicating their needs to higher levels, as it is these needs in particular which they cannot address themselves. Diverging competencies and subsequent divisions of labour between meso-levels may therefore also be a key driver contributing to an infrastructure bias.

The final driver related to the nature of the state is the historically hydraulic focus of area governments. While the modern state of Vietnam is relatively young, governments of what is now Vietnam have been heavily involved in hydraulic management for centuries. Sea dykes in particular are and have been crucial in protecting resources and development in flood-prone

areas and have been built along area rivers as early as the Ly dynasty (1009-1225). Subsequently, dyke construction and maintenance have become a critical aspect of the state's relationship with its population, figuring into its fulfilment of the social contract of disaster protection and affecting the population's perception of the state's integrity (Nguyen Nguyen Hoai 2005; Scott 1976). This acute hydraulic involvement by the state is reminiscent of Wittfogel's account of 'Oriental despotism,' an authoritarian style of government characterized by hydraulic control. While some of Wittfogel's more extreme characterizations of such states are not applicable, he does note that 'the hydraulic state fulfilled a variety of important managerial functions. In most instances it maintained crucial hydraulic works [and] usually it also controlled the major nonhydraulic industrial enterprises, especially large constructions' (Wittfogel 1957: 48). This historical tendency of a strong state managing hydraulic control and large constructions remains present in the field study areas, further supporting the infrastructure bias.

These three drivers connected to the nature of the state play a sometimes subtle yet foundational role in driving the bias towards infrastructure projects. Combined with the drivers of technocratic efficacy and developmental security, the tendencies towards a focus on infrastructure as opposed to soft projects are formidable. The possible impacts of these tendencies will be explored below.

V. IMPLICATIONS OF AN INFRASTRUCTURE BIAS

A bias towards infrastructure affects climate change adaptation as well as socioeconomic dynamics and development. This section will discuss what such impacts may include and what that means for the case-study areas.

5.1 Impacts on Climate Change Adaptation

Regarding climate change adaptation, one of the main impacts of the bias towards infrastructure is the rigidity it creates. While infrastructure may seem to present officials with a 'safe' option in the face of uncertainty, this may only be the case in the short or medium term. In considering long-term climate adaptation, a formative factor is uncertainty: currently, a there exist a range of scenarios which suggest very different future climate conditions, rendering future adaptation needs uncertain. A World Bank report on the costs of adaptation acknowledges this challenge, noting that 'decisions about investments in assets having a useful life of 20, 30, or even 40 years – such as dams, dikes, urban drainage, bridges, and other infrastructure – have to be based on incomplete information with a large variance in projections of future climate conditions' (World Bank 2010: 8). In the face of this uncertainty, the rigidity of large investments with significant sunk costs may limit the flexibility and concurrent effectiveness of future adaptation (Sovacool 2011).

The same World Bank report responds to the issue of climate uncertainty with the following lesson: 'Do not rush into making long-lived investments in adaptation unless they are robust to a wide range of climate outcomes or until the range of uncertainty about future weather variability and climate has narrowed' (World Bank 2010: 93). On the other hand, the report *Shaping Climate-Resilient Development* notes that '[d]ecision-makers will have no option but to make policy and investment choices under uncertainty' (ECA 2009: 10). So how can decision-makers find a balance? Regarding infrastructure, the World Bank has two suggestions. First, given the situation of uncertainty, countries' adaptation decisions should be delayed, and low-regret actions should be the focus (World Bank 2010). Sec-

ondly, decisions regarding long-lived and costly infrastructure should be made according to their 'climate robustness' (World Bank 2010: 92).

In Vietnam, however, climate infrastructure construction is markedly robust, and technical specifications for infrastructure projects may not take into account projections of future changes. Officials interviewed in Hue Province offered mixed accounts of whether scenarios of future climate conditions are incorporated into infrastructure projects. While a provincial DONRE official stated that climate-related infrastructure is designed merely to cope with the current climate situation, a provincial DARD official referred to at least two instances where this was not the case – a concretized river bank and upcoming dyke, both of which were designed with scenarios of future climate realities in mind. This is despite the recently-drafted Climate Change Action Plan (2013), which delineates a selected climate change scenario for Hue Province to be used for planning and development.

The mixed responses from officials would suggest that awareness of this selected scenario is not yet widespread, and there is likely to be even less integration of it into current planning. The scenario itself also seems to be lacking, as it considers only changes in temperature, rainfall and sea level, not changes in the frequency of extreme events, which inform the technical specifications for many types of infrastructure. This gap may explain officials' seemingly contradictory statements, as future sea-level rises may be incorporated into specifications, while the occurrence of what is now a fifty-year storm every twenty years is not taken into account. Generally, respondents suggest that such future concerns are not heavily weighed and that currently visible climate change impacts and annual flood- and storm-control efforts take priority: what may seem like a no-regrets option now may thus provide recipient communities with deficient infrastructure and a dangerously false sense of security in the future.

Alone, infrastructure thus offers a limited as well as a capital- and time-intensive approach to adaptation, and the infrastructure bias therefore contributes to rigid, imbalanced adaptation. This adaptation lacks holistic support from soft adaptations, is inordinately physical and is difficult to adjust to changing circumstances. The longer this bias continues through the drivers discussed above, the more set into a path-dependent trajectory such adaptation will become. Each of the drivers discussed above will be strengthened, in turn reinforcing the trajectory as a whole; technocrats will aim all the more to deliver infrastructure solutions as they more clearly become the typical and expected solution, while economic development may be predicated upon the presence of such infrastructure. Government systems and structures which support climate infrastructure will then be further strengthened in this network of interconnected factors. Such a path dependency would probably exacerbate the severity of overly infrastructure-based adaptation by leading further away from a balanced adaptation strategy. Ultimately, this would work to inhibit innovative change in climate change adaptation.

5.2 Implications for the Role of Soft Adaptation

While the infrastructure bias clearly limits soft adaption, soft strategies are present in meso-level adaptation and related institutional changes occurring. The institutional changes are generally tied to the NTPRCC and include new meso-level institutions, new planning and purportedly an increased emphasis on climate change responses in planning. Regarding soft adaptation, capacity-building and awareness-raising are not uncommon, and mangrove and coastal forest planting are also

evident (though not always successful) in the case-study areas. In addition, some ongoing meso-level activities, though not always recognized as climate change adaptation, offer soft adaptation opportunities. For example, extension is playing an increasingly active role in assisting farmers to cope with climate changes. While officials consider extension to be part of ongoing development responsibilities and not specifically a matter of climate change adaptation, extension can effectively address climate uncertainties, for instance by creating unique annual cultivation calendars to fit yearly climate forecasts. In addition, land-use planning is being used to adapt to changes in climate and subsequent land-use realities. Such strategies can be changed to address shifting climate conditions and impacts on local communities.

At the meso level generally, however, soft adaptation is largely lacking, along with its possible benefits. Climate change is not well understood and is either not integrated into long-term planning and projects or is incorporated in name only. One provincial DONRE official explained that there is minimal prioritization and understanding of climate change at the provincial level and in general very little interest. This is tied to a perception of climate change impacts as distant and not of immediate concern. There are similar dynamics at the district level. A group of district DARD officials interviewed were receiving training in climate change to understand it and its impacts, but they did not prioritise attending the training or understand how to apply the information practically in their work. In addition, few officials interviewed considered this general situation problematic; there is thus a limited recognition of the importance of increased capacity and awareness. This lack of understanding and of the prioritisation of climate change at the provincial and district levels will almost certainly undermine future adaptation.

Thus, the bias towards infrastructure not only presents the drawbacks discussed previously, it also poses a significant opportunity cost in the loss of positive benefits from an increased focus on soft adaptation, benefits that can be substantial. Soft adaptation strategies are more flexible and adaptable to changing climate circumstances and projections: awareness-raising, institutional change, capacity-building, mangrove-planting and other soft adaptation strategies generally have the benefits of being less costly, less capital- and labour-intensive and less technologically complex. Capacity-building and awareness-raising can also contribute to the strengthening of local communities, institutions and disaster preparedness (Sovacool 2011). In addition, soft adaptation can be more immediately effective. With infrastructure-based adaptation, current investments go into supporting future adaptation, while the benefits of investments in soft adaptation may be experienced in the short term as well as the long term. Considering these positive benefits of soft adaptation, the infrastructure bias creates a significant trade-off by opting against these strategies.

However, the situation is not so simple, especially since 'opting against' soft adaptation is more or less built into the funding system. Meso-level institutions have little funding available for developing and running their own projects. They must appeal upwards for funding, especially for capital-intensive infrastructure projects, and thus have limited ownership over received funding. This takes the consideration for such trade-offs largely out of their hands (and outside the funding system), as funding for such major projects is already earmarked when they receive it, and funding for any significant soft climate change adaptation projects are seemingly absent from government budgets. Instead, these funds are then provided by NGOs and donors, further freeing up government funds for infrastructure

and supporting a system which undermines soft adaptation. In the case-study areas, for instance, one commune-level official noted that he would resume awareness-raising activities as soon as more funds became available from NGOs. He did not mention or seem to consider government funding as a possibility for support. This is also notably the case regarding mangrove-planting, which is frequently supported by foreign donors and NGOs. However, this funding limitation for soft projects is evident almost exclusively with regard to climate change adaptation: in flood and storm preparedness, capacity-building and awareness-raising are unquestioned aspects of the government's approach.

The longer this situation persists, the weaker officials' and residents' capacity and understanding become in relation to increasingly acute climate change realities. They will be less able to address climate changes successfully, and the underlying lack of capacity and awareness are very clearly issues that require soft adaptation strategies in order to address them. However, there are formidable factors which limit change: widespread perceptions among officials of climate change as insignificant or non-pressing, the structural limitation of funding processes, and the continued perception of infrastructure as the main and sometimes only solution to climate issues. These all significantly weaken adaptive capacity in the research areas and suggest that shifting from the path-dependent trajectory of the infrastructure bias will be challenging.

5.3 Impacts on Socio-economic Development

Regarding socio-economic development, the impacts of the infrastructure bias will be mixed. Considering only the contributions of resulting infrastructure, the impact will generally be positive, as the infrastructure solutions are frequently no- or low-regrets options. The prioritisation process of meso-level projects exemplifies this: district-level officials noted that proposed projects must fall within the area of the Socio-Economic Development Plan (SEDP) and that projects with flood and storm control benefits will be further prioritised. Thus, projects both corresponding to the SEDP and including major flood and storm control benefits—as is almost always the case with climate-related infrastructure—will be most highly prioritised. Climate change adaptation infrastructure will likely receive an even greater focus in the future as the 2008 NTPRCC has required the creation of meso-level action plans. The plans include lists of climate change adaptation projects and are beginning to be implemented now.

Therefore, much of the existing climate-related infrastructure will support socio-economic development, at least in the short and medium terms. Dykes and raised paths between rice paddies help protect agriculture and aquaculture, while reducing risks encourages increased investments in rice production and aquaculture. Newly-built roads and bridges prioritized for disaster evacuation and relief also provide previously remote areas with greatly enhanced outside access and access to markets. Increasingly, dams help to control river flow and delay or reduce flooding, while their respective reservoirs can offer fresh water for cultivation and household use during the dry season. These and other existing climate-related, low-regrets infrastructures offer clear contributions to socio-economic development in the short and medium terms. New climate-related infrastructure projects will offer similar benefits in the medium-term, though because of construction time, their short-term benefits will be minimal.

In the long term, the effectiveness of such infrastructure is likely to decrease, as some infrastructure may become obsolete or inadequate in future climate contexts. Communi-

ties may find themselves with a range of infrastructure that needs to be either upgraded or replaced, at great cost and probably over a period of several years, if not many decades. While some of this infrastructure will naturally be replaced over time as it becomes overly weathered and eroded, if replacement infrastructure is also built to then-current climate conditions, this will turn into a negative cycle of perpetually regressive infrastructure, a costly trend for future adaptation.

There are also other factors to be considered which speak against the utility of certain infrastructure in adaptation. For instance, infrastructure investments designed to protect vulnerable areas often encourage increased investments in such areas; this is contrary to basic adaptation strategies limiting economic investments in vulnerable areas and can thus be seen as maladaptation (World Bank 2010). Such situations are not only a question of economic investment and risk: investments are generally accompanied by increasing populations and settlement in an area, which, in vulnerable areas, may translate into greater human risk. This situation is often evident with dykes, which encourage increased coastal investments and create more attractive areas for settlement in locations that are likely to be affected by future rises in sea level and possibly more severe and frequent storms.

Additionally, such infrastructure is often built in rural areas where high-cost investments may not be economically viable. In a case used by a World Bank report on the costs of adaptation, the 'expensive option of constructing dikes would be justified only for [protecting] vital coastal infrastructure' (World Bank 2010: 92). In contrast, dykes are often used in Vietnam as the most typical kind of coastal protection. For rural, meso-level governments, it may be worth asking whether encouraging more investment and settlement is the optimal way forward and whether extensive, expensive infrastructure is the optimal protection for those already in place. At the same time, discussions of risk and cost must be balanced by considerations of the meanings with which homes and property – however isolated and precarious – are imbued.

The justifications of such infrastructure are therefore complex, also due to their vital importance in disaster contexts: such infrastructure can mitigate disaster impacts such as loss of life, property and economic investments. As the case-study areas are extremely vulnerable to climate disasters, such as storms and floods, this role for climate infrastructure is extremely important for the security and stable economic development of the area.

Contributing to economic development now is also important for future adaptation. Infrastructure which secures economic development and improves people's standards of living now may make them more flexible in responding to climate change in the future. A higher standard of living can provide the means to move to less vulnerable areas or receive training or education for more 'climate-proof' livelihoods. On the macro scale as well, supporting economic development can be a key adaptation strategy. Simply put, '[e]conomic development is the most cost-effective method of adaptation…. Rich countries are more resilient to weather variability' (World Bank 2010: 90). In this way, current climate infrastructure can contribute to economic development and future adaptation.

These considerations suggest a more complex role for climate infrastructure in economic development. While it is important in disaster protection and in encouraging economic development – which can help drive later adaptation – it is also costly in terms of both time and capital and can contribute to maladaptation. There are also notable trade-offs between short- or medium- and long-term adaptation, though some of these issues could be addressed

by incorporating future climate projections into infrastructure design.

However, when considering the sidelining of soft adaptation due to the preoccupation with climate infrastructure, the economic impact of the infrastructure bias becomes much more negative, despite the no-regrets approach. The precluding of soft adaptation and the tendency to engage in lengthy, capital-intensive projects instead of opting for more immediate, low-cost soft alternatives is likely to be extremely costly in the long run, both economically and generally for the success of future adaptation. As one official noted, without institutions and populations with the capacity to understand and respond to climate change, adaptation will be severely limited. This poses a significant threat to future socio-economic development.

VI. FURTHER IMPACTS

In addition to the impacts discussed above, the infrastructure bias may have other notable effects, particularly on people's relationship with their environment. Specifically, it may encourage a mind-set of environmental control and a perception of the environment as a threat: much of the infrastructure being built – dykes, dams, flood walls and other barriers – has as its purpose to stave off the environment and protect against it. It implicitly suggests a threat or danger and the need to establish boundaries against it, creating a perception that further supports infrastructure as a solution.

When considering the photographs of destruction and disarray following Wutip, a typhoon which hit the case-study areas at the time of writing, such perceptions and a policy of control are indeed understandable (Tuoitrenews 2013). Human casualties, devastated homes and shattered livelihoods all speak to a very real threat which should not be underestimated. The sheer vulnerability imposed by the geographical realities of Vietnam is immense: the country's lanky topography and protracted coastline pose significant challenges, referred to by one author as the 'tyranny of Vietnam's geography' (Marr 2004: 29), which exposes much of the population to vulnerability and insecurity and, to put it mildly, is not conducive to adaptation.

However, it is worth asking whether the Vietnamese response is itself conducive to improving the relationship between people and environment. While the tendency towards control is understandable given the severe uncertainties posed by climate change, it also has an impact that should be considered. Control of the environment, the landscape and their role in human lives and livelihoods is reflected in an extreme manner in Wittfogel's (1957) account of oriental despotism, for instance. Here, such control is irrevocably connected to a harshly authoritarian government, which indiscriminately applies a policy of control to the social and political as well as to physical environments. Thus, such control ultimately permeates the entire society.

Considered in a more moderate manner, control through infrastructure impacts on local society as well. As Allen (2007) notes, '[s]pace is *meaningful*: that is, spatial formations reflect and instantiate a range of meanings and values, from the cultural to the social to the political' (2007: 18, original emphasis). Other authors have also considered this issue with a more environmental perspective. King (2003), for instance, finds that the relationship 'between humans and nature is reinforced by the spatial arrangements of daily life' (2003: 7). Changing the physical realities and formations of a landscape thus influences the manner in which people relate to and interact with their environment. Dykes, dams and concretized river banks are not only functional, tangible constructions which physically shape the en-

vironment, but also influential, intangible interventions that structure people's relationship with the surrounding world.

Along with considering tangible adaptation and economic impacts, it is thus also important to take into account these aspects of climate infrastructure. Most basically, such infrastructure presents control as a climate adaptation solution, with the infrastructure bias clearly indicating it as the preferred solution. This emphasis on control sets expectations and reinforces the technocratic driver discussed above, creating a path dependency, as technocrats strive to fulfil expectations. In addition, the controlling aspect of infrastructure may itself support technocrats' inclination towards infrastructure as they seek to control climate uncertainty and risk. A mind-set of control is thus an integral aspect of the infrastructure bias and its shortcomings.

Furthermore, an approach using environmental control also creates distance and dissonance with the local environment. Man-made structures must intervene in the landscape and also protect from it, in this way creating a kind of division between a population and its environment. This can be contrasted with a more 'integrated' relationship between population and environment, which in an adaptation context would be illustrated by, for example, planting mangroves and coastal forests. Interestingly, these are the solutions that are generally undervalued and disregarded in the case-study areas, which suggests that the emphasis on control through man-made infrastructure solutions also undermines trust in more natural adaptations. Also in this way, a mind-set of control is thus self-perpetuating and a further driver of the infrastructure bias.

Attempted control through climate infrastructure could also reinforce a sense of alienation with the environment which infrastructure attempts to hold at bay. Interpreted in an extreme manner, climate infrastructure could be a step towards vilifying the environment, as the idea of protection against a threat or hazard is 'reinforced by the spatial arrangements of daily life' (King 2003: 7). As informal relationships and norms are reminiscent of infrastructure in that they can be extremely enduring once established, such relationships and perspectives are likely to be formative in future adaptation also, though not necessarily in such an extreme form.

Ultimately, environmental control reinforces a dissonant relationship with the environment as well as certain political trajectories, creating path dependencies disconcertingly at odds with balanced adaptation.

VII. CONCLUSIONS

There is a clear infrastructure bias in climate change adaptation in central Vietnam, though it emerges in a situation of complexity. Climate change, flood and storm control and the social contract provide a foundation for the bias, which continues to be propelled forward by technocratic, socio-economic and state-related drivers. These drivers contribute to an increasingly entrenched path dependency of infrastructure as a solution to climate issues in the area.

This path dependency is likely to have severe impacts on the case-study areas. In a situation of change and uncertainty, it contributes to a locked-in response that lacks the flexibility to adequately address the changes that are undoubtedly coming. In this sense, what may seem like a no-regrets option may actually be contributing to an extremely detrimental adaptation path, which will become increasingly difficult to break out of. This will most likely result in an extremely skewed approach lacking recognition of the necessity of a combination of soft and hard adaptation strategies. As noted in the World Bank report on the economics of

adaptation, '[t]he distinction between "hard" (capital-intensive) and "soft" (institutions and policies) adaptation is easily exaggerated. The reality is that both approaches are necessary' (World Bank 2010: 94). The cost of overlooking this reality is likely to be high in climate change adaptation, as well as social and economic development and in the relationship between the people and their environment.

Ultimately, much of the infrastructure bias is tied up in aspects of the state itself. The historically hydraulic nature of governments in what is now Vietnam is one part of this, and it is now coupled with a systematic preference for infrastructure. Meso-level officials' accounts clearly indicate that infrastructure is almost unfailingly the priority. Planning and funding systems reinforce this preference and leave little leeway in meso-level procedures and structures for cultivating other approaches to adaptation.

These insights into climate change adaptations in central Vietnam provide important considerations for government institutions in the area, as well as on a broader scale. While the meso-level institutions involved have significant influence over the bias, some of the funding and planning procedures involved go up to the national level. Comprehensively addressing the infrastructure bias – and subsequent costs and adaptation failures – will thus require some level of attention and action at the national level as well. Beyond that, this case illustrates the highly influential role of the meso level in climate change adaptation and affirms the defining role of the nature of government in adaptation outcomes. These findings will support more targeted considerations of the drivers behind burgeoning adaptation activities globally.

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