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Mobilising adaptive capacity to multiple stressors: Insights from small-scale coastal fisheries in the Western Region of Ghana

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ABSTRACT

The processes by which adaptive capacity is mobilised in response to multiple stressors are yet to be fully understood. This study addresses this pressing research gap by drawing on the capitals framework and empirical data from small-scale coastal fisheries in the Western Region of Ghana. It employs an ethnographic approach, based on multiple sources of evidence including documents, interviews and participant observation to examine mechanisms of mobilising adaptive capacity in response to climate and non-climate stressors. Our findings suggest that responding to stressors involves mobilising sets of main-available capitals, such as local innovation, ability to improvise, new technologies, corrupt practices and belief systems (cultural capital); collective action, networks and social ties (social capital); and complaints to the government (political capital). These capitals were the main constituents of adaptive capacity, particularly considering non-responsive government and formal organisations. Further, other forms of capitals, i.e., local leadership, local knowledge, learning capacity, and training (human capital); networks, collective actions, associations and bonding ties (social capital); sand (natural capital); funds from fishing (financial capital), combine in complex ways to mobilise such available capitals. This understanding is critical if synergies among main-available and supporting-available capitals are to support building and mobilizing adaptive capacity. Further, it may help guide important decisions, proactive plans and strategic investment for developing key capitals to enhance adaptive capacity.

1. Introduction

Small-scale coastal fisheries (SSCF) are sensitive and constantly exposed to multiple climate (e.g., flooding, coastal erosion, severe storms, ocean acidification and increased sea surface temperature) and non-climate stressors (e.g., poverty, poor governance, lack of alternative employment and diseases), with serious implications for livelihoods and coastal environments. In this study, stressors are conceptualised as any new or old internal or external driver of change that may directly or indirectly impede the development of small-scale fisheries (McDowell and Hess, 2012; Bunce et al., 2010; O'Brien et al., 2009).

Expected effects of climate change include species loss in tropical reef fisheries, decrease community turnover in tropical fisheries, and increase fish diversity and yield in Arctic waters (MacNeil et al., 2010). Moreover, Sumaila et al. (2011) noted that non-climate stressors, such as overfishing, habitat degradation, pollution, and inappropriate fishing methods challenge fishers' ability to adapt to climate change. In sum, climate-related stressors very often intensify the impacts of non-climate stressors, leading to a decline in fishery resources and, consequently, livelihoods (Sumaila et al., 2011; MacNeil et al., 2010). Similarly, non-climate stressors can increase the vulnerability to climate stressors. While there is a broad understanding that fishers' and coastal communities' success in responding or adapting to these stressors will depend on their adaptive capacity (Cinner et al., 2015; Bennett et al., 2014; Dolan and Walker, 2006), the processes of mobilising and using such capacity are yet to be fully understood.

Research on adaptive capacity, adaptation and vulnerability has grown over the past few decades (Jonah, 2015; Wagner et al., 2014; Eisenack and Stecker, 2012; Engle, 2011). There has also been increasing attention to the impacts of climate change on SSCF and coastal communities (e.g., Cinner et al., 2012; Dolan and Walker, 2006; Baptiste and Kinlocke, 2016). Such research generally examines how different forms of resources or pre-conditions may influence adaptive capacity. However, research examining how resources are mobilised to enhance adaptive capacity are still emerging (Keys et al., 2014; Leonard et al., 2013; Dumaru, 2010). For example, Dumaru (2010) showed that adaptive capacity is enhanced through increasing awareness of the

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community about climate change risks, forging of networks that enhance access to information and resources. Similarly, Allen (2006) revealed that local adaptive capacity to climate change and environmental stresses is built through technical information dissemination and training, increasing awareness of risk and vulnerability, and accessing local knowledge and resources. Keys et al. (2014) showed that adaptive capacity can be enhanced through three key strategies: increasing scientific knowledge on climate change by supporting the introduction of related programs in schools; developing informed social networks by facilitating, fostering, and sustaining citizen forums; and, engaging local people in identifying specific sources of vulnerability. Notwithstanding, studies focusing on how interactions among various forms of resources influence adaptive capacity are seemingly scarce.

This study adds to the emerging literature outlined above by further exploring processes of mobilising adaptive capacity. Specifically, it analyses how the various types of capitals are mobilised and used in response to climate and non-climate stressors. It draws on an empirical ethnographic study of three small-scale fishing communities of the Western Region of Ghana and is guided by the vulnerability and capitals frameworks. By doing so, this research provides a better understanding of the synergies among important forms of capital for enhancing adaptive capacity with significant implications for adaptation policy and practice.

1.1. Situating stressors in the context of the vulnerability framework

Generally, vulnerability is conceptualised as the susceptibility to adverse effects of climate change (Adger, 2006; Smit and Wandel, 2006). The concept of vulnerability emerged from the social and natural sciences; more specifically, the field of natural hazards (Nelson, 2011; Gallopín, 2006; Cutter et al., 2003). However, it has since advanced in many fields, including food security (Sen, 1981), sustainable livelihoods (Chambers and Conway, 1992) and global environmental change (Brooks, 2003; Kelly and Adger, 2000). The vulnerability of a system (e.g., small-scale coastal fisheries) is expressed by the system's exposure and sensitivity to disturbances, and its adaptive capacity to respond to such disturbances (Nelson et al., 2007; Adger, 2006; Gallopín, 2006; Turner et al., 2003). In the context of this study, exposure and sensitivity capture the disposition of existing and new disturbances faced by SSCF, and how they experience such disturbances. This is called stressors here; but, is also known as stresses or drivers (Adger, 2006; Gallopín, 2006; Smit and Wandel, 2006; Kasperson, 2005). A system is considered vulnerable when it is exposed and sensitive to stressors and has limited adaptive capacity. Exposure is the extent to which a system is in contact with or confronted with stressors, including the size, rate, and length of stressors (Adger, 2006; Kasperson, 2005; Smit and Wandel, 2006). Sensitivity is the extent to which a system reacts to, or is affected by the impacts of stressors (Adger, 2006; Luers, 2005). Adaptive capacity is the system's ability to adjust to, or cope with real or anticipated impacts of stressors, while keeping or improving its conditions (Engle, 2011; Gallopín, 2006; Nelson et al., 2007).

Studies on stressors (both climate and non-climate) have increasingly gained attention in climate change vulnerability studies. Part of these studies focus on multiple or 'double exposure' to climatic and non-climatic stressors to understand the vulnerability (Perry et al., 2011; Zou and Wei, 2010; O'Brien et al., 2009; O'Brien and Leichenko, 2000). In the context of the fisheries literature, it is argued that SSCF, as mentioned above, are often vulnerable to climate change because of inherent non-climatic stressors within the sector, such as diseases, overfishing, pollution, low income, poverty and poor governance (e.g., Sumaila et al., 2011; Andrew et al., 2007; Dugan, 2005; Ellis and Freeman, 2005).

While a system's exposure and sensitivity to stressors may be inevitable, its adaptive capacity can be mobilised or enhanced to reduce its vulnerability. Adaptive capacity is the system's ability to adjust to, or cope with, actual or perceived effects of climate change without compromising its conditions (Engle, 2011; Nelson et al., 2007; Gallopín, 2006). Adaptive capacity can reduce vulnerability with implications for adaptation and socio-economic development (Adger, 2006; Gallopín, 2006; Brooks, 2003). It is, therefore, a critical factor of adaptation. If adaptive capacity includes assessment of the potential of a system to cope with or adapt to the threats of climate change, then enhancing the adaptive capacity of such system is integral to undertaking adaptation.

1.2. Using the capitals framework to assess adaptive capacity

Capitals and resources are critical elements in the various definitions of adaptive capacity. For example, Nelson (2011) and Nelson et al. (2007) define adaptive capacity as sets of resources and the ability to organise and use these resources to respond or adapt to climatic stressors. However, the ability to adapt does not imply the mere existence of such resources, but the skills to wisely use them (Nelson, 2011). Other examples of how capitals feature in the explanation of adaptive capacity include the conceptualisation of adaptive capacity as sets of societal indicators, such as technology, infrastructure and knowledge that are controlled and managed by public and economic policies and policy-makers (Engle, 2011; Gupta et al., 2010; Dolan and Walker, 2006). Gupta et al. (2010: 461) define adaptive capacity as features of institutions that enable social actors to cope with or adapt to short and long-term impacts of climate change. Moreover, Dolan and Walker (2006) argue that adaptive capacity of a community or a system is found in the quantity and quality of its infrastructure and managerial skills for reducing negative impacts of climate change. Drawing on these concepts and definitions, adaptive capacity in this study refers to the different and interacting forms of capitals mobilised and used in response to climate and non-climate stressors. Such forms of capitals are those comprising the capitals framework, i.e., natural, cultural, human, social, political, and built capitals (Emery and Flora, 2006; Flora et al., 2004; Chambers and Conway, 1992). We conceptualise the meaning and relevance of the different forms of capitals to the assessment of adaptive capacity in Table 1.

The capitals framework is consistent with the assessment of adaptive capacity (Engle, 2011; Adger, 2010; Pelling and High, 2005). For instance, determinants of adaptive capacity such as risk perception (Ekstrom et al., 2011; Dolan and Walker, 2006) and policy beliefs (Fidelman et al., 2014) can be categorised as cultural capital. Formal institutions and informal norms (Pahl-Wostl, 2009) are examples of political capital. Social actors and their knowledge and skills (Eisenack and Stecker, 2012) are forms of human capital. Important features of such capitals are that they can be obtained, developed and transferred across generations (Moser, 2007), suggesting that adaptive capacity can be mobilised, enhanced and conveyed from one sector, community or place or time to another. Nevertheless, the use of the capitals framework in assessments of adaptive capacity is still scarce – as opposed to its wide use in community development and livelihood studies (Emery and Flora, 2006; Pelling and High, 2005; Bebbington, 1999). In this study, two categories of capitals are conceptualised, i.e., available and desired capitals. Available capitals include capitals at hand and in suitable condition to be used for enhancing adaptive capacity. In contrast, desired capitals are not readily available but are deemed necessary for further building adaptive capacity.

2. Description of communities studied and methods

The study includes three coastal fishing communities in the Western region of Ghana: Dixcove in the Ahanta West District Assembly, Abuesi in the Shama District Assembly, and New Tarkoradi in the Sekondi-Tarkoradi Metropolitan Assembly (Fig. 1). They were selected based on the concentration of fishing activities, high dependence on fisheries for livelihood, presence of various forms of capitals and multiple climate and non-climate stressors, i.e., overfishing, coastal erosion, oil