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Can multilevel governance facilitate coastal climate change adaptation in Jamaica?

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Introduction

Navigating and responding to current and projected climate and environmental change in coastal-marine areas throughout the Caribbean is a significant challenge for communities and governments. In response, there has been a proliferation of investments and initiatives for climate change adaptation from national, regional and international levels in the Caribbean in the past two decades (CRFM 2013). These initiatives have resulted in numerous climate change adaptation projects and strategies at different scales and levels requiring the engagement of diverse actors, organizations, and agencies in decision-making, policy development, and implementation.

Governance provides a valuable analytical entrée to examine the emerging diversity of actors, institutions (i.e. formal and informal), and processes concerning adaptation to climate change. Moreover, governance is an important yet often overlooked aspect that can inform and influence how communities and countries respond and adapt to climate change. As Plummer (2013) posits, "the concept of governance is highly relevant for adaptation because societal actors at a variety of levels are building adaptive capacity, undertaking adaptive actions, and developing adaptation policies" (p. 1).

Climate change poses a particular governance challenge due to its multidimensional nature (Fidelman *et al.* 2013). As a multi-scale and multi-sector problem it requires responses by communities and governments at multiple: i) scales (e.g. geographical, jurisdictional); ii) levels of organization (e.g. administrative); and iii) sectors (e.g. tourism, agriculture, fisheries) (Termeer *et al*. 2011, Fidelman *et al.* 2013). Moreover, climate change is one of several drivers (e.g. invasive species, tourism development, marine resource exploitation) contributing to environmental change – particularly in the Caribbean – that together are producing cumulative effects and conflicts that are complex, emergent, and cross-scale (CARSEA 2007). Rooted in the context of Jamaica – while drawing on insights from other Caribbean sites (e.g. St. Lucia) – we seek to identify conditions that enable and/or constrain governance strategies and institutional arrangements that respond to climate change vulnerabilities and promote climate change adaptation in coastal-marine environments.

This working paper reflects an initial identification of conditions that enable and constrain multi-level governance for climate change adaptation through examining a case study of coastal-marine governance in Jamaica. The anticipated and projected impacts of climate change suggest the importance of such governance strategies and institutional arrangements considering effective implementation, policy development and decision-making concerning climate change adaptation will require the participation and contributions of diverse actors ranging from community based organizations to government agencies. Accordingly, an empirical assessment of coastal-marine governance in Jamaica with an emphasis on the communities of Bluefields Bay and Whitehouse in the parish of Westmoreland is offered. First, an outline of a theoretical and analytical framework concerning multi-level governance for climate change adaptation is presented. An overview of the case study context and background are then provided with a detailed account of the research methods following. Next, preliminary results of the research are presented followed by a discussion of the results in relation to the

theoretical framework. Finally, the working conclusions of the paper are provided.

Multilevel governance and climate change adaptation

Climate change adaptation requires the engagement of diverse actors in decision-making, policy development and implementation from multiple scales, levels, and sectors. As such, governance provides a valuable theoretical framework and analytical entrée to examine and address the challenges associated with effectively adapting to climate change. We define governance here as the "…formal and informal rule-making systems, and actor-networks at all levels of human society (from local to global)…set up to steer societies towards preventing, mitigating, and adapting to global and local environmental change" (Biermann *et al.* 2009, 9). In this context, institutions are the formal and informal "working rules" (i.e. monitored and enforced) mediating interactions and decisions (Ostrom 1990).

Drawing on insights from adaptive governance (Dietz *et al.* 2003; Folke *et al.* 2005) and multilevel governance (Houghe & Marks 2003; Termeer *et al.* 2010) we outline a theoretical and analytical framework to identify the conditions that enable and constrain governance for climate change adaptation. Building on the work of Dietz *et al.* (2003) and Pittman *et al.* (2014) we consider four key aspects of adaptive governance with specific reference to: i) actor networks: ii) analytical deliberation; iii) institutional variety; and iv) nested and multilevel structure (see Figure 1).

Social networks have emerged as a crucial component of adaptive governance. Formal and informal social networks are central to multi-actor governance arrangements (e.g., co-management) and have been repeatedly cited as a key attribute in the broader adaptive governance literature. However, not all social networks are structurally equal, and recent research suggests that different patterns of social relations contribute to different governance outcomes (Bodin & Crona 2009). As such, in recent years, attention has turned to a structurally explicit social relational network approach (*sensu* Alexander & Armitage 2014) that goes beyond binary (i.e. the network is either present or absent) and descriptive approaches to examine the structure (e.g. density of relations, degree of network centralization) and function of social networks in order to understand key features and processes of adaptive governance (e.g. learning, social memory, trust) (Crona *et al.* 2011). Moreover, such an approach has provided important insights on specific actors and positions identified as critical for successful adaptive governance including the role of bridging organizations (Sternlieb et al. 2013) and cross-scale brokers (Ernstson *et al.* 2010).

Analytical deliberation has also been identified as a key component of adaptive governance. Dietz and Stern (1998) define analytical deliberation as "structured discussion among scientists, decision-makers, and parties with an interest in policy" (p. 442). Benefits of such deliberation include enhancing social learning, building social capital and trust, developing conflict resolution, and improving transparency in turn leading to increased resilience and the capacity to adapt to future change (Dietz *et al.* 2003, Akamani & Wilson 2011). Key attributes and characteristics of analytical deliberation include multi-stakeholder interaction, inclusion of diverse actors, meaningful participation, and the integration of diverse knowledge types and

information (Dietz & Stern 1998, Dietz *et al.* 2003, Akamani & Wilson 2011).

Institutional variety is the third important component of adaptive governance identified by scholars. Institutional variety refers to the employment of diverse institutional types to govern natural resources (e.g. social norms, economic incentives, state mechanisms) (Dietz *et al.* 2003, Akamani & Wilson 2011). As Dietz *et al.* (2003) posit, such variety makes it more challenging for the 'innovative rule evaders.' Moreover, institutional variety contributes to managing for uncertainty, as it is less likely that all institutions would necessarily fail in response to the same system shock or change (Akamani & Wilson 2011). This mixture also enhances institutional performance (i.e. rule formulation and implementation) (Akamani & Wilson 2011).

Nested and multilevel structure has been repeatedly identified as a critical component of adaptive governance. Ostrom (1990) first identified the importance of 'nested enterprises' and described it as the organization of governance activities in multiple layers (e.g. provisioning, monitoring, enforcement) in order to address different problems. Key attributes and characteristics of nested and multilevel structure include the complexity of arrangements (Dietz *et al.* 2003), redundancy (Low *et al.* 2003, Levin 1999), subsidiarity (i.e. overlap in function) (Marshall 2008), co-ordination and integration (Young 2002, Hooghe & Marks 2003), and multi-level linkages (Young 2002, Poteeete 2012, Fidelman *et al.* 2013).

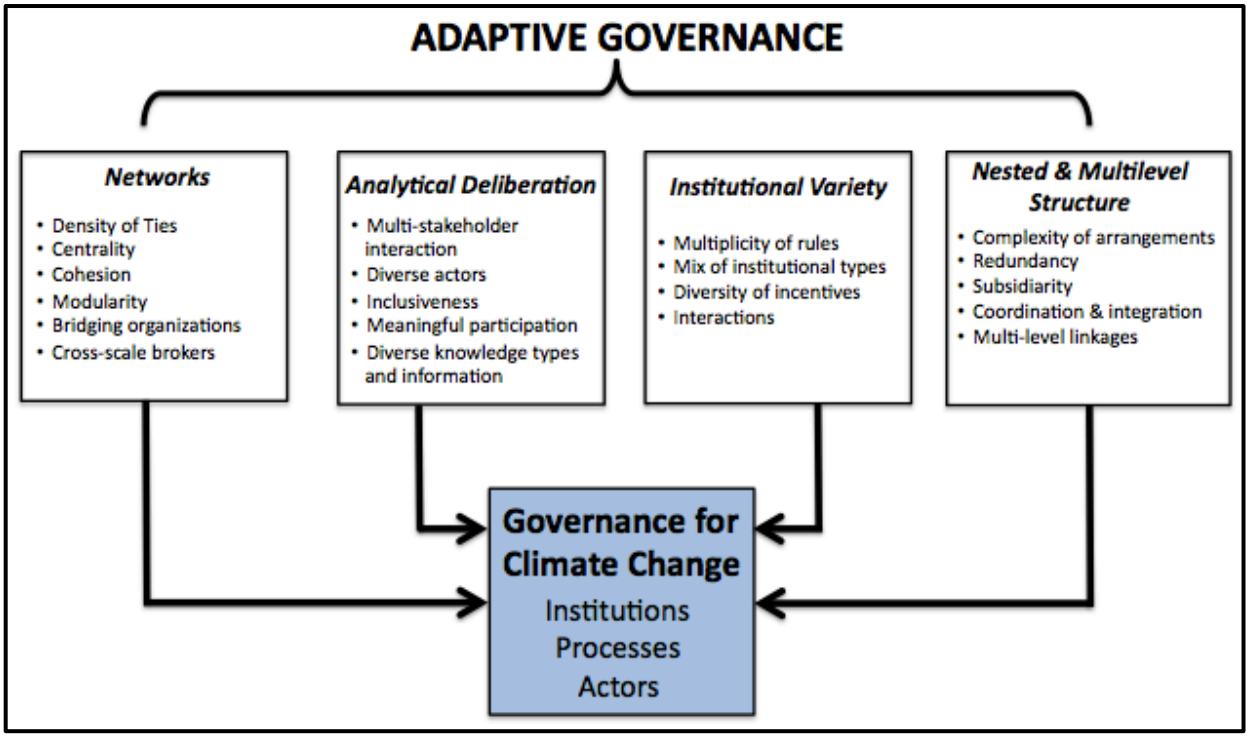

Figure 1 Analytical and Theoretical Framework

Research Context

Coastal-marine systems in Small Island Developing States (SIDS) of the Caribbean are highly vulnerable to both current and future environmental change, including climate change (IPCC 2014, CARSEA 2007). Increased storm intensity, sea level rise, coastal erosion, coral bleaching,

ocean acidification and declining marine fisheries threaten the region (Pulwarty *et al.* 2010; Nicholls & Cazenave 2010). Additionally, multiple drivers of change (e.g. coastal development) are producing cumulative effects that are complex, emergent and cross-scale (CARSEA 2007). At stake are the health of marine ecosystems and the livelihoods and wellbeing of millions of coastal people.

Jamaica – part of the Greater Antilles and the third largest island in the Caribbean – is no exception. An island dominated by a mountainous topography with a narrow coastal plain, Jamaica has approximately 1,022 km of coastline. The coastal-marine environment includes several habitat types – beach, rocky shore, sea grass beds, mangroves and coral reefs – that provide a number critical ecosystem services. Coral reefs, for example protect the coastline, contribute to the sandy beaches central to tourism, and provide critical habitat for fish (CARSEA 2007). As with other Caribbean islands, Jamaica is highly dependent on tourism with projections from 2011 suggesting that it could provide close to one quarter of its gross domestic product (GDP) (Burke & Kushner 2011). In addition, reef-dependent fisheries contribute to the livelihoods of nearly five percent of the island's population and upwards of seventy-five percent of households' in some communities (Burke & Kushner 2011; Burke *et al.* 2011). Moreover, near shore artisanal fisheries provide close to ten percent of protein consumed by Jamaicans making it a matter of food security, especially for rural fishing communities (Waite *et al.* 2011).

However, the coastal-marine systems – including coral reefs – of Jamaica are highly vulnerable to the impacts of climate change and are similarly faced with multiple issues, including sedimentation, pollution, and overfishing (Burke & Kushner 2011). The current projected effects of climate change on Jamaica's coastal-marine systems are outlined in Table 1. Regional projections for changes in the frequency and intensity of hurricanes are unclear due to primitive modeling and confounding variables. However, there is relatively high certainty for other climate related changes including ocean acidification, sea surface temperatures and sea-level rise. The impacts of climate change have already been observed throughout the Caribbean and Jamaica. For example, the region experienced mass coral bleaching events in 1987, 1990, 1995, 1998, 1999 and 2005 (McWilliams *et al.* 2005). It is important to note that the climate change-related impacts to coastal-marine systems – as outline in Table 1 – will occur on different time scales ranging from years (e.g. coral bleaching events related to increases in SST) to multi-decadal (e.g. the deterioration of the structural integrity of coral reefs related to increases in acidity) (Cochrane *et al.* 2009)

The synergistic and cumulative effects of climate change may significantly alter the structure and function of coastal-marine environments, which in turn could influence their ability to deliver the critical ecosystem services currently supporting society. Moreover, the drivers could contribute to regime shifts – *i.e.,* a rapid transition to an alternative stable state – resulting in the loss of whole bundles of ecosystem services (Hughes *et al.* 2003; Cochrane *et al.* 2009). Accordingly, it is imperative to consider climate change adaptation.

Table 1 Climate change projections and potential impacts for coastal-marine environments of Jamaica and the Caribbean

Attribute	Projections	Confidence of Projections	Potential impacts on the coastal-marine environments of Caribbean & Jamaica
Hurricanes	• Increased intensity of events (incl. near storm rainfall and peak winds) but not necessarily an increase in storm frequency (Simpson *et al.* 2012)	• Moderate to high confidence of intensity increases • Low to medium confidence in frequency due to primitive modeling and confounding variables (Simpson *et al.* 2012)	• Infrastructure *Direct impacts* • Damage to coral reefs • Damage to mangroves (Simpson *et al.* 2012) • Blowouts in sea-grass beds *Indirect impacts to coral reefs and sea grass beds:* • Increased sedimentation • Increased pollution
Sea surface temperature	• GCMs project annual mean SST increases of 0.9 to 2.7 C by 2080s relative to 1970-99 avg. (Simpson *et al.* 2012)	• High confidence; increases already observed in some areas	• Contributes to coral bleaching (McWilliams et al 2005; Parry et al 2007) • Affects lifecycles of coral reef fish • Causes some species to shift range due to thermal tolerance • Corals often at upper thermal limit (Hughes *et al.* 2003; Cochrane *et al.* 2009)
Sea-level rise	• Increase of sea-level of 17-32 cm RCP2.6 or 19-33 cm RCP4.5 by 2046-2065; and 19-33 cm RCP2.6 or 32-63 cm by 2081-2100 (IPCC 2013)	• Medium confidence; increases already observed in some areas (Simpson *et al.* 2012; IPCC 2013)	• Beach loss • Salinization of wetlands • Inundation of low lying areas • Growth of reefs unable to keep up (Knowlton 2001) • Loss of total mangrove area due to inability to migrate landward • Change in mangrove structure & species composition
Ocean acidification	• Decrease in surface ocean pH by end of 21st century: 0.06-0.07 RCP2.6, 0.14-0.15 RCP4.5 (IPCC 2013)	• Virtually certain; though research here is in its infancy and the impacts are uncertain (Cochrane *et al.* 2009)	• Coral reefs and other marine organisms with carbonate skeletons (Parry *et al.* 2007) • Possible impacts to broadcast spawning marine species (Havenhand *et al.* 2008)

Climate change adaptation in Jamaica has emerged as a central issue in the past decade. While Jamaica became a Party to the United Nations Framework Convention on Climate Change in 1995, it has only been in the past few years that it has slowly become more formalized. For example, adaptation to climate change has been incorporated into *Vision 2030 Jamaica* as one of fifteen key outcomes. Currently, Jamaica is in the final stages of approving their *Climate Change Policy Framework and Action Plan* (McIntosh 2014). In addition, the government has recently established the *Climate Change Focal Point Network* which is to be comprised of 27 representatives from the various ministries, departments and agencies across the Government of Jamaica whom will collaborate with the Climate Change Division of the Ministry of Water, Land, Environment and Climate Change to coordinate the implementation of climate change adaptation strategies (McIntosh 2014). At the local level there has been a proliferation of climate change adaptation strategies piloted through international funded projects (e.g. *Adaptation to Climate Change and Disaster Risk Reduction*). The outcomes of these projects in coastal-marine environments have ranged from the restoration of mangroves and installment of artificial reefs to the establishment of an alternative livelihood grant program. While the implementing agency for these internationally funded projects are often at the national level (e.g. *NEPA*, *PIOJ*, *ODPEM*), it is community-based organizations and non-governmental organizations that are spearheading much of the work on the ground.

To better understand the role of local actors in multilevel adaptation, the communities of Bluefields and Whitehouse, in the parish of Westmoreland, were identified and included in this study. These communities are located along the southwest coast of Jamaica in the parish of Westmorland. The small rural community of Bluefields – estimated population 4,700 – was once known as the wealthiest and most productive 'sugar bowl' of Jamaica. However, post-Emancipation – from British rule – alternative industries were developed including the production of logwood, processing of pimento oil, and cattle farming (IOJ 2010). Unfortunately, by the 1990s, several of these industries had collapsed (IOJ 2010). Today, the predominate livelihood activities supporting the community of Bluefields include artisanal fishing, smallholder farming, and more recently tourism (*e.g.* community tourism, private guest houses, villas). In Whitehouse, artisanal and commercial fishing form the economic bases of the community. As the third largest fishing community in Jamaica, the landing site supports approximately 700 fishers (Murray & Aiken 2006). While a large percentage are fishing near shore on the south coast shelf (~40%), the majority travel to Pedro Banks (~60%) located 150 kilometers offshore to the south where they will stay at sea for two to three days (Murray & Aiken 2006). In addition to fishing, there are a growing number of community members employed in tourism due to the recently built Sandals Whitehouse European Villages and Spa.

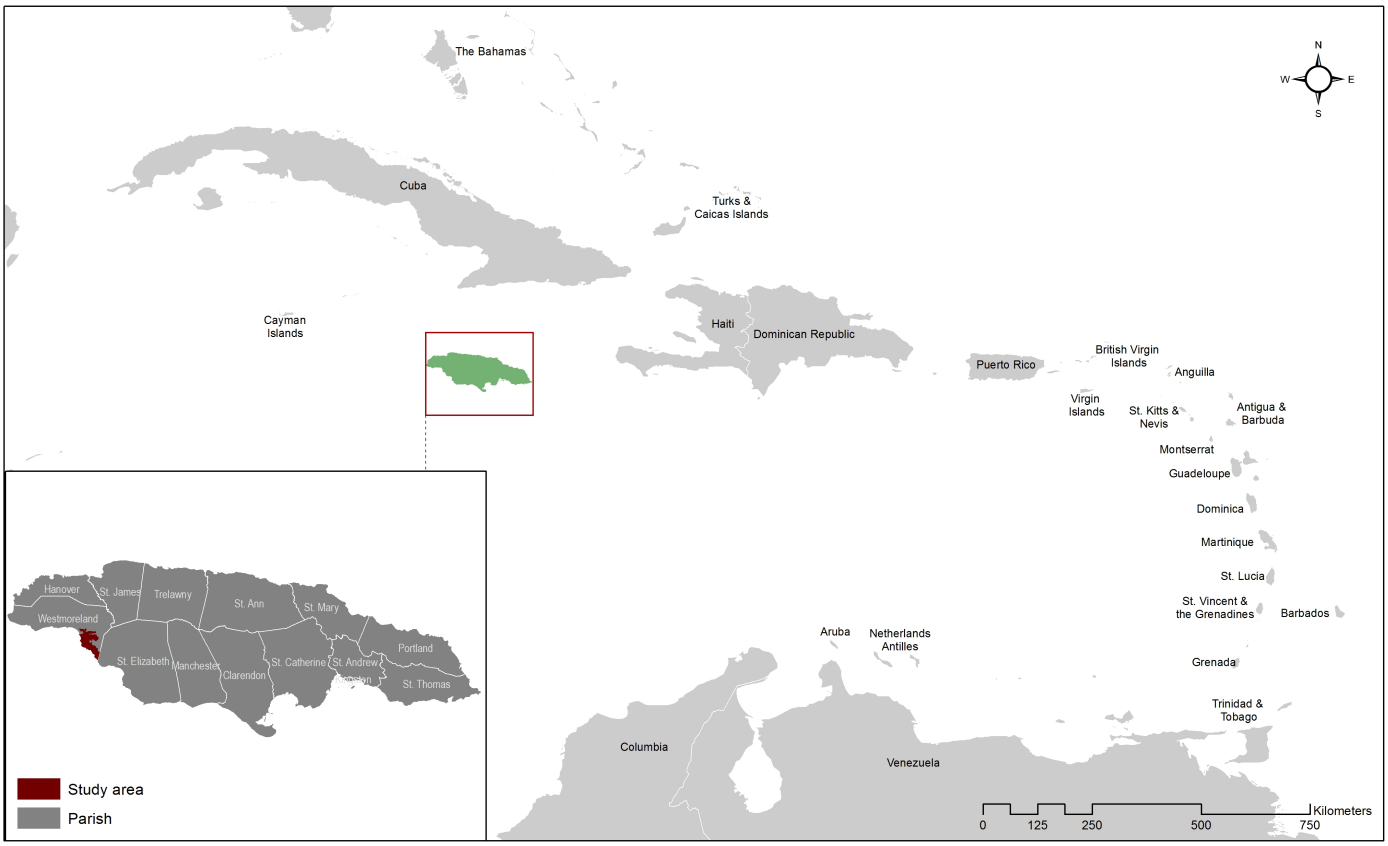

Figure 2 Jamaica and the Caribbean (map created by D. Campbell)

Methods and Data Analysis

We used a case study approach (Yin 2009) to identify the conditions that enable and/or constrain multi-level governance for climate change adaptation in Jamaica. Semi-structured interviews (n=24) with local community organizations, non-governmental agencies (e.g. local, national, international) and government agencies (e.g. parish and national) involved with coastal-marine governance and climate change adaptation were conducted during five-weeks of fieldwork in November and December 2012. Interviews lasted thirty to ninety minutes and were usually undertaken at the respondents' office. Semi-structured interviews (n=31) with fishers, fish scalers, fish vendors and seafood processors provided additional context and key insights. Respondents were selected using a snowball sampling technique, where each respondent was asked to provide contact information for other potential respondents (Hay 2005). To reduce bias in the sample, multiple snowballs were initiated. Initial respondents were identified by consulting local experts on the research team and reviewing grey literature and online materials. Interviews continued until all relevant governance organizations had been sampled, which was determined as the point when individuals from new organizations (e.g. agencies, divisions, departments, NGOs) were no longer being suggested as possible respondents in the snowball sample.

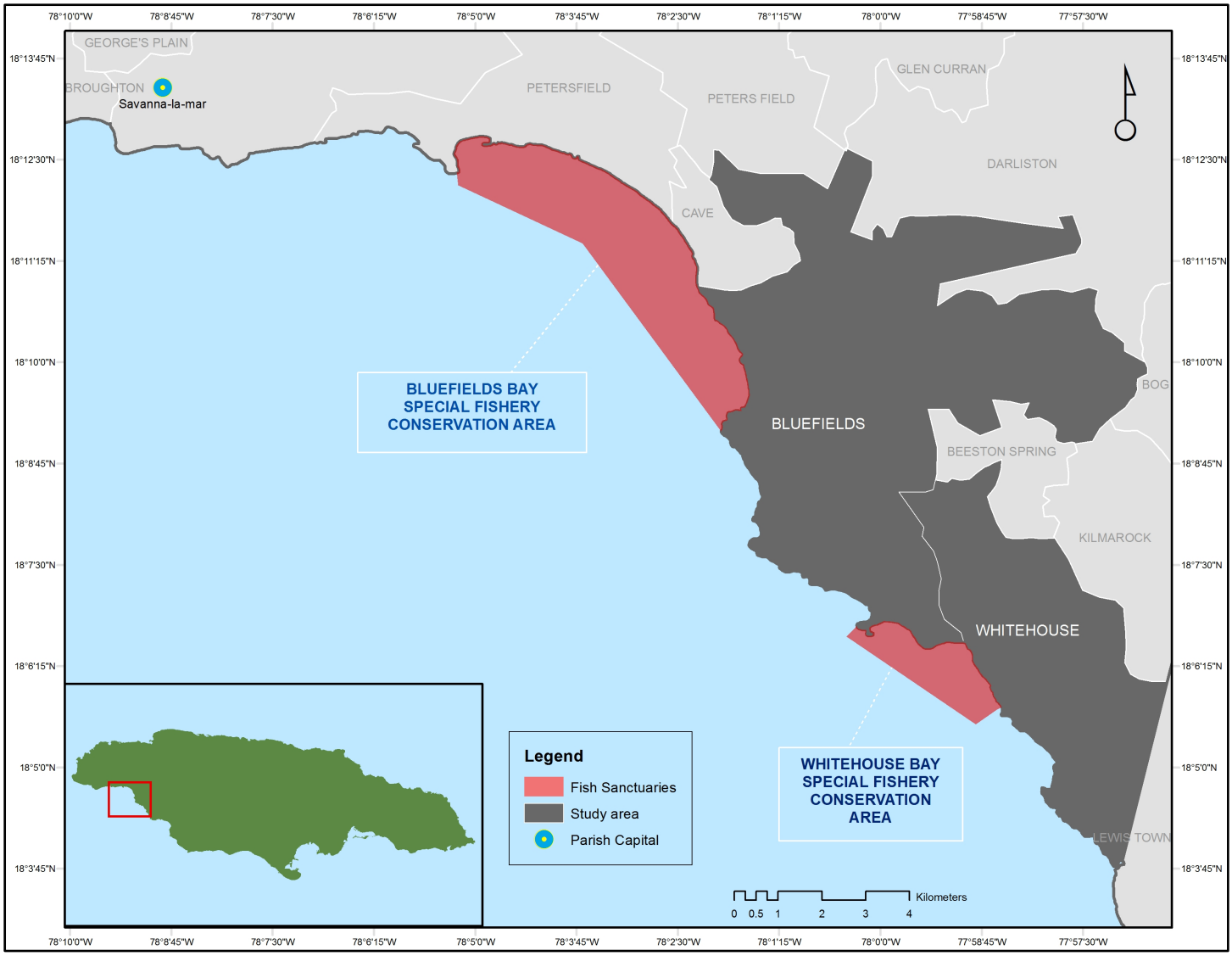

Figure 3 Bluefields Bay and Whitehouse Jamaica (map created by D. Campbell)

The interview guide contained open-ended questions designed to cover the main factors related to adaptive and multilevel governance including: i) analytical deliberation; ii) institutional variety; iii) nested and multilevel structure; and iv) actor networks (see Appendix 1). Interviews were digitally recorded and transcribed. They were then analyzed using qualitative content analysis in NVivo 10 (QSR International). The coding process was both inductive and deductive such that an initial set of codes was developed based on the theoretical framework (see Figure 1) yet additional codes were allowed to emerge from the interview data (Gilgun 2010). Specifically, coding occurred in three distinct phases. The first structured the interview data according to predefined and emergent theoretical categories. The second involved axial coding, identifying linkages between categories. The third phase refined initial rounds of coding in light of the insights that surfaced. Traversing these phases allowed for primary information about multilevel governance for climate change adaptation to be both grounded in existing theories from the literature but also in the interviews themselves. This primary information was

complemented and triangulated with secondary sources, such as grey literature and peer-reviewed publications.

Social Network Analysis (SNA), as a set of methods, examines network components - nodes (actors) and linkages (e.g. information flows, legal relations) - along with network structure (e.g. centrality, heterogeneity, density) revealing both formal and informal governance arrangements (Wasserman & Faust 1994). In addition, a structural perspective of networks reveals specific characteristics (e.g. density, reachability, betweenness, centrality) that have been linked to governance attributes (e.g., trust, social cohesion) and processes (e.g., knowledge exchange, collaboration) (Bodin *et al.* 2006) implying that different network structures are beneficial in different ways (Newman & Dale 2005; Bodin & Crona 2009). As such, SNA directly aided in the identification of network structures and governance arrangements that may facilitate or constrain multi-level governance for climate change adaptation. Actor network data was gathered by asking respondents to recall key organizations and agencies they collaborate with when addressing challenges related to the use and management of coastal-marine resources. Collaboration was taken to mean sharing of information, coordinating action or strategies, and formally partnering on projects or initiatives (Osterblöm and Bodin 2012; Galaz et al. 2012). Gephi – free open-source network analysis and visualization software – was used for social network analysis.

Betweenness centrality measures how frequently an actor lies between two other actors in the network when considering the shortest distance (Prell 2012). Accordingly, betweenness centrality measures the potential control individual actors have with regards to the flow of information and resources (Wasserman & Faust 1994). In this way, the measure provides insight into key bridging ties and those actors whom may serve as brokers or gatekeepers. The betweenness centrality algorithm used by Gephi comes from Brandes (2001).

Results

Actor networks (formal and informal) are central to multi-actor governance arrangements (e.g., co-management) and have been repeatedly cited as a key attribute in the broader adaptive governance literature. Here we draw upon and present results from social network analysis and key informant interviews. Combining formal SNA with qualitative data derived from interviews has repeatedly been noted for providing significant benefits for the interpretation of network data – *e.g.,* contextual background, specifics regarding the content and meaning of individual ties (Cross *et al.* 2011; Bodin & Prell 2011; Prell 2012). Accordingly, mixing methods and results provides a depth and quality to the final analysis and interpretation.

The actor network was derived based upon 24 interviews representing 20 organizations (i.e. CBOs, NGOs, Gov. agencies). The resulting governance network is comprised of 70 actors with approximately 46% being state actors (i.e. federal, parish) and approximately 54% being non-state actors. An analysis of relational ties among only the state actors reveals that the "state" is composed of numerous actors in the form of various ministries, agencies and departments. In addition, a comparison of betweenness centrality reveals WRA, MoWLECC, and DoFish as

having the highest values[1]. Accordingly, this suggests the possible coordinating and/or bridging role that these actors play within the network.

Analysis of governance ties among state and non-state actors provides additional insights. When the network boundaries are expanded – i.e. whom is considered an actor – additional actors and new roles emerge. Actors span from community-based organizations like the Bluefields Bay Fisherman's Friendly Society to international funding bodies such as the Global Environment Facility. Furthermore, a comparison of betweenness centrality reveals DoFish as having the highest value. When coupled with the types of actors DoFish connects, it suggests an important bridging role connecting community organizations to other national agencies.

Three major themes emerged from the interviews with regards to the actor network. The first is the dynamic nature of the governance network characterized by shifting roles and relational ties through space and time. Several respondents noted that depending upon the specifics of a given project their role could range from coordinator to technical advisor to project implementer. Similarly, as different projects emerged so too did the frequency of the interactions between a given set of actors. A second theme to emerge was the important role of interagency committee's for bringing actors together. While the mandate and focus of these committees were not directly concerned with climate change adaptation (e.g. Protected Areas Committee, Beaches and Coastal Resources Committee), they provide a regular forum and platform for face-to-face interactions among actors to exchange knowledge and perspectives while addressing emerging issues.

A third theme concerns additional bridging roles. For example, EFJ noted its role in representing NGOs on national committees and at workshops. Similarly, MoLG seeks to ensure there is an effective vertical flow of information from the national level to the Parish and community level. In addition, the MoLWECC is poised to play an even greater role with the recent announcement and establishment of the *Climate Change Focal Point Network*. The network is to be comprised of 27 representatives from the various ministries, departments and agencies across the Gov. of Jamaica. These representatives will collaborate with the Climate Change Division of the Ministry of Water, Land, Environment and Climate Change to coordinate the implementation of climate change adaptation strategies (JIS 2014).

Discussion

The establishment of the *Climate Change Focal Point Network* provides a great opportunity to create and strengthen horizontal ties between government agencies while at the same time establishing a forum for repeated interactions, dialog, and coordination specifically concerning climate change adaptation planning, policy, and implementation. However, at the same time it is important to engage emerging actors and strengthen key ties. This includes: i) strengthening vertical ties between different levels of governance to facilitate the flow of knowledge and resources; ii) leveraging new public-private sector partnerships that build capacity for adaptation in coastal communities; and iii) strengthening opportunities to facilitate the sharing

[1] A network diagram will be produced.

of knowledge of coastal change in support of learning and adaptation.

Vertical network ties to higher levels of organization (*e.g.,* jurisdictional, political) have also been noted as an important mechanism for both accessing and leveraging resources, ideas, and information (Bodin and Crona 2009; Marin *et al.* 2012) often critical for climate change adaptation. Moreover, vertical network ties play an important role connecting actors from different administrative and/or jurisdictional levels where the functions related to climate change adaptation can be quite distinct but complementary (e.g. policy vs. planning vs. implementation). This finding is consistent with results from research in natural resource management and conservation contexts (see Bodin & Crona 2009; Guerrero *et al.* 2013; Mills *et al.* 2014). The recently established *Climate Change Focal Point Network* is currently exclusively composed of representatives from the various ministries, departments and agencies across the Gov. of Jamaica. Accordingly, it has yet to include any civil society groups, community-based organizations, and parish level actors. While there has been a clear intention to expand network membership to include civil society groups, it is important to be both critical and systematic with regards to how they reach out and include these additional actors.

There has also been a noted rise in the number of public-private partnerships that reflects a broader governance trend (Newell *et al.* 2012). Two such examples include the Sandals Foundation's involvement in the Boscobel and Whitehouse Special Fishery Conservation Areas, and NEPA's Development Assistance Centre which partners with the private sector to provide guidance and advice in an attempt to streamline the application process for development across the island. Such partnerships have the potential to build significant capacity for climate change adaptation in coastal communities. However, with the emergence and establishment of such partnerships it is critical that appropriate mechanisms to address issues of legitimacy and accountability are established (Armitage et al 2012; Pittman et al in press). Furthermore, a concerted effort is necessary to ensure policies are in place that encourages the establishment of such partnerships (Agrawal 2010).

Social learning and knowledge exchange have emerged as critical processes for fostering sustainable development and contributing to effective climate change adaptation (Kristjanson *et al*. 2014). Accordingly, it is imperative to both establish and strengthen opportunities to facilitate the sharing of knowledge concerning coastal change in support of learning and adaptation. This could take such forms as establishing *communities of practice* and facilitating learning exchanges across the island and region.

The preliminary findings and insights emerging from this research suggest clear avenues for how current governance arrangements could be leveraged for climate change adaptation. However, additional analysis is currently underway to better understand the three other key aspects of adaptive governance including: i) analytical deliberation; ii) institutional variety; and iii) nested and multilevel structure. Accordingly, the research has significant potential for illustrating Plummer's (2014) proposition that existing co-management arrangements could be re-purposed for climate change adaptation.

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