

**Towards New Perspectives in Integrated Coastal Management: Prospects for  
Responding to Changes Affecting Coastal Area Tourism Systems**

by

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A thesis

presented to the University of Waterloo

in fulfillment of the

thesis requirement for the degree of

Doctor of Philosophy

in

Geography

Waterloo, Ontario, Canada, 2016

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## **AUTHOR'S DECLARATION**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

## ABSTRACT

During the last three decades, coastal management scholarship and practice have been shaped by both social and ecological drivers of change that have served to define different epochs during which the coast has been conceptualized and characterized as; a frontier transition zone, value-laden economic entity, a conservation area and a governance jurisdiction. In line with past conceptualizations, recent shifts in coastal management scholarship define the coast as a social-ecological system (SES) that reflects the linkages between terrestrial and marine subsystems and connections between these subsystems and littoral interests (e.g., interests in tourism, environmental conservation and fisheries). SES perspectives in coastal management highlight the nature and scope of the current and future cumulative impacts from climate and non-climate drivers of change on coastal social and ecological systems. SES perspectives also highlight new approaches for thinking about integration and for advancing integrated coastal management (ICM) research and practice.

While current coastal management scholarship acknowledges the value of integration as an underlying core principle. Coastal management scholars also accept that integration has not fulfilled its former promise and that it has been understudied. This claim is evident in the way ICM has been used to frame and analyze the impacts of climate and non-climate drivers of change on coastal social and ecological systems. In an effort to contribute to filling this research gap, in this study, I use the core principle of integration and three surrogate principles (*comprehensiveness, harmonization and cooperation and participation*), to conceptualize and examine the impacts of coastal water quality decline on coastal SES and the potential for integrated governance responses in coastal water quality management. This research is based on a case study of a marine protected area (the Buccoo Reef Protected Area, BRPA) and

surrounding coastal villages in southwest Tobago. Tobago is the smaller of the two islands in the republic of Trinidad and Tobago. The island has a peripheral coastal tourism economy. Coral reefs are an important component of this economy. However, recently coral reefs have been affected by climatic changes, e.g., rising sea surface temperature (RSST) and land-based pollutants that affect coastal water quality. In southwest Tobago, management of coastal water quality occurs within a multi-sector and national and subnational coastal management setting. Within this setting, coastal water quality decline has been managed using both single-sector approaches and collaborative approaches. Given these contexts, the aim of this research is to illustrate how trajectories of change related to coastal water quality decline affect coastal systems and coastal tourism and how such trajectories highlight challenges and opportunities for ICM. Additionally, I aim to understand how trajectories of change shape multiple-sector responses to declines in coastal water quality, within a national and subnational coastal management jurisdiction.

Firstly, I use the *comprehensiveness* principle and SES as a lens to frame the coastal system as a Coastal Area Tourism System (CATS). I then demonstrate how trajectories of change related to climate and non-climate drivers, e.g., rising sea surface temperature (RSST), or weak regulations that allow effluent discharge from hotels to enter coastal waters, result in declines in coastal water quality, secondary effects on contiguous marine systems such as coral reefs and feedback to tourism activities such as diving. Secondly, based on the principle of *harmonization*, I demonstrate the challenges and opportunities for integrating coastal water quality management within a sector-based and a dual-level coastal management jurisdiction. I use a typology of fragmentation as a lens, to frame and examine how conflicting, synergistic and cooperative linkages between the coastal management arrangements of three sectors (tourism,

fisheries and environmental protection) shape responses to coastal water quality decline. Here, I demonstrate how the inevitability of fragmentation found in sector-based coastal management arrangements limits harmonization. However, I also show how within sector-based coastal management opportunities exist that could serve to speed up management responses to coastal water quality decline. Thirdly, premised on the principle of *cooperation and participation*, I demonstrate how water quality decline shapes collaborative responses in integrated coastal water quality management, across agents and sectors with diverse institutional mandates. Here, drawing mostly from the literature in public administration, I frame and examine responses to coastal water quality decline, within an integrated collaborative coastal management framework.

The approach used in this research yielded several key findings: (1) water quality decline follows causal pathways, and trajectories of change and create effects across biological and physical coastal systems. For example, changes in water quality within the BRPA have resulted in declines in coral reefs. Relatedly, declines in coral reefs have been linked to rapid erosion. Because of knowledge gaps about the linkages between these features, responses to coral decline have not focused on mitigating the loss of coral cover. Rather, responses have focused on replacing the aesthetics of coral reefs, (2) mechanisms such as Memoranda of Understandings (MOUs) and Certificates of Environmental Clearance (CECs) play a significant role in coordinating current sector-based management approaches in issue areas related to land use and pollution control that have impacted coastal water quality. This shows that sector-based mandates that are loosely connected can be integrated based on mechanisms such as CECs and (3) in some instances, particularly for short-term coastal management projects, existing institutional arrangements and co-leadership within the same sector or across scales, serve to coordinate decision-making regarding coastal water quality declines without major conflicts.

## ACKNOWLEDGEMENTS

Having completed my Ph.D., I can affirm the unreserved assurance that “*the race is not for the swift nor the battle to the strong but he/she (my emphasis) that endures to the end.*” As I began to think about acknowledgments this verse of scripture immediately came into my thoughts. Consequently, I acknowledge the role of faith and my belief in God in providing direction in every aspect of my life. For me, endurance has proven to be the most endearing quality throughout the journey of my Ph.D. research.

Firstly, as a mark respect, I need to acknowledge the general advice of the members of my committee. Here, I must place special emphasis on the advice and guidance of my two supervisors, Johanna Wandel Ph.D. and Derek Armitage Ph.D. I benefitted significantly from their comments and feedback throughout this research, without which I would not have gotten to this point. I am extremely grateful to Johanna for taking me on as her first PhD student. I hope that my work justifies her selection. As an adjunct to my acknowledgment of Johanna, I must also acknowledge Dr. Ben Bradshaw, Johanna’s former colleague at the University of Guelph. It was he who introduced me, via email to Johanna. There is an interesting back story to this but time and space prevents the sharing of further details.

I want to thank the participants who willingly sacrificed their time to provide the data for my research, without their support this research would not be possible. I want to single out my former colleagues at the Division of Agriculture, the Department of Natural Resources and the Environment, and the Department Marine Affairs and Fisheries, in the Tobago House of Assembly, who in addition to providing critical data served as important contact persons for all aspects of my research.

I also have to acknowledge those who provided the emotional support, so necessary throughout the process of my Ph.D. research. Here, I acknowledge my wife Kathleen Sandy-Thompson and our daughter Abayomi Nuekie Thompson for being a constant source of encouragement and support. The time I spent with my family (apart from writing and thinking about my work) provided the calm I needed during the sometimes turbulent journey. Finally, I want to thank our dear friends Pastor Selby Nimblett and his wife Mrs. Kimmoy Reid-Nimblett. Kimmoy journeyed all the way from Tobago to Canada, to provide emotional support to my wife and new infant daughter (who was only two months at the time) when I traveled to Tobago to complete my field work. I will never be able to repay her for those two months (June and July 2014) that she provided comfort and support to my wife and daughter.

Obviously, space does not allow me to acknowledge everyone who contributed in some way to my Ph.D. research. To those who I have not mentioned, thanks for your support and prayers. An extensive listing of stakeholders involved in this research is provided in Table 3.

This research was generously supported by the Partnership for Canada-Caribbean Community Climate Change Adaptation (ParCA). Funding for the ParCA was provided by the International Development Research Centre (IDRC) and Social Science and Humanities Research Council (SSHRC).

## **DEDICATION**

I dedicate this research to my late grandparents, Lovinia Thompson and Joshua Benjamin Thompson. I also dedicate this research to my daughter, Abayomi Nuekie Thompson and my children not yet born. I hope that my ancestry and the dedication required to complete a Ph.D. will serve as a source of motivation for Abayomi and any other children I might father in the future. This dissertation serves as the testament that the only limits in life are those you set for yourself. So set lofty goals and believe in God that by faith you will achieve them.



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## LIST OF ABBREVIATIONS

AFECO	Ansformage Ecological and Conservation Organization
BRT	Buccoo Reef Trust
BMC	Buccoo Reef Marine Complex
BRPA	Buccoo Reef Protected Area
CATS	Coastal Area Tourism System
CBVA	Community-Based Vulnerability Assessment
CEC	Certificate of Environmental Clearance
CHANS	Coupled Human and Nature Systems
CSO	Central Statistical Office
DIPU	Department of Public Utilities
DMAF	Department of Marine Affairs and Fisheries
DNRE	Department of Natural Resources and the Environment
ESA	Environmentally Sensitive Area
ET	Environment Tobago
EU	European Union
EMA	Environmental Management Authority
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GEF	Global Environment Facility
GROTT	Government of the Republic of Trinidad and Tobago
ICM	Integrated Coastal Management
ICZM	Integrated Coastal Zone Management
IMA	Institute of Marine Affairs
IPCC	Intergovernmental Panel on Climate Change
IUCN	The International Union for Conservation of Nature
MOU	Memorandum of Understanding
NGO	NonGovernment Organization
NOAA	National Oceanographic and Atmospheric and Administration
ParCA	Partnership for Canada-Caribbean Community Climate Change Adaptation
PAHO	Pan American Health Organization
PWC	Pacific Warning Centre
RAMSAR	The Convention on Wetlands
RSP	Regional Seas Program
RSST	Rising Sea Surface Temperatures
SES	Social-Ecological System
SLR	Sea Level Rise
TEMA	Tobago Emergency Management Agency
TCPD	Town and Country Planning Division
UNEP	United Nations Environmental Program
UNCLOS	United Nations Convention on the Law of the Sea
UNCED	United Nations Conference on Environment and Development
UNSD	United Nations Stockholm Declaration
WASA	Water and Sewage Authority
WCS	World Conservation Strategy



## **1.0 CHAPTER ONE: Introduction**

### **1.1 Research Context**

Coastal management has undergone several distinctive shifts that have coincided with impacts from climate and non-climate drivers of change on coastal ecological systems (Cicin-Sain et al., 1995; Haines-Young & Potschin, 2011; Cullinan, 2006). Relatedly, the coastal area, the principle of integration and the practice of coastal management have evolved over time, to reflect the challenges of responding to the effects of these drivers on the biodiversity of coastal ecological systems (Vallega, 1999).

Regarding non-climate drivers, Nichols (1999) shows how concerns about the impacts of rapid economic development on the world's coasts led to the redefinition of the coast from a frontier transition zone between land and sea to a value-laden manageable entity. Relatedly, Nichols (1999) highlights a shift towards a more integrated political and ecological approach to coastal resource management and the regulation of coastal spaces for economic development. Further, Nicholls (1999) argues that the shift towards coastal spaces as regions of economic development led to the legislative provisions of the 1982 United Nations Convention on the Law of the Sea (UNCLOS), which legitimized the autonomy of nation states over the near-shore and marine space (see also Forst, 2009).

Concerning climate-related drivers, two other events have marked significant shifts in ICM. Firstly, in 1992, at Agenda 21 in Rio De Janeiro Brazil, faced with multiple and complex challenges related to biodiversity loss in coastal marine systems ICM scholars and practitioners agreed to a mandate of integration that focused on the complex interactions between ecosystems, economic development and sustainable human livelihoods (Vallega, 1999; Haines-Young &

Potschin, 2011). Agenda 21 (principle four, Section 17.5) reflected previous efforts at mainstreaming ICM, based on principles adopted at the United Nations Stockholm Declaration (UNSD) in 1972; UNEP's Regional Seas Program (RSP), in 1975; the Law of the Sea Convention in 1978; the World Conservation Strategy (WCS) of 1980 and the 1988 IUNC 17<sup>th</sup> General Assembly Resolution 17.38 (Kenchington & Crawford, 1993, Forst, 2009). Agenda 21 states in part that:

Coastal states commit themselves to integrated management and sustainable development of coastal areas and the marine environment under their national jurisdiction. To this end, it is necessary to, inter alia: provide for an integrated policy and decision-making process, including all involved sectors, to promote compatibility and a balance of uses: ...

(Kenchington & Crawford, 1993, p. 110)

Agenda 21 represented the culmination of a shift towards ecosystems-based perspectives that served “to improve the life of human communities that depend on coastal resources while maintaining the biological diversity and productivity of coastal ecosystems” (Burbridge, 1997, p. 177). Similarly, in 1995, the focus was placed on ICM after the Jakarta Mandate on the Conservation and Sustainability of Marine and Coastal Biological Diversity. At that time, the emphasis was placed on the sustainability of marine ecological systems, such as, fisheries. Then, it was believed that ecosystems-based perspectives should play a major role in coastal biodiversity conservation (Makino, 2011).

Another shift is currently occurring in ICM. In the advent of rapid social and ecological changes that currently affect coastal systems, integrated frameworks are seen as necessary for understanding and managing the diversity of impacts from climate and non-climate drivers of

change and their effects on coastal systems (e.g., Arkema et al., 2015; Leenhardt et al., 2015; Klein & Nicholls, 1999). This time, ICM scholars and practitioners are concerned with how the cumulative impacts of climate and non-climate related drivers and rapid and uncertain multiple trajectories of change associated with these drivers affect the sustainability of coastal systems (Olsen, 2000; Turner, 2000; Tol et al., 2008; Glavovic, 2016). Relatedly, ICM practitioners are concerned with how the coastal management arrangements for sectors such as tourism, fisheries, and environmental protection collectively respond to climate and non-climate drivers and their impacts, effects and feedbacks on coastal systems (Celliers et al., 2013; Cinner et al., 2012b; Charles, 2012; Defeo & Castilla, 2012; Nagy et al., 2015; Adger et al., 2009).

Coastal management literature is replete with case study examples of how rising sea surface temperature (RSST) and its effects on coral reefs have resulted in the loss of important habitat for marine species and opportunities for passive recreation in sectors such as tourism, e.g., diving and reef watching (Graham et al., 2014; Schuhmann et al., 2013; Ruckelshaus et al., 2013). Additionally, current coastal management and related literature highlights cases of how sea level rise (SLR), storm surges and changing weather patterns have resulted in the rapid coastal erosion of shorelines, declines in beach quality and impacts on coastal tourism infrastructure (Scott et al., 2012; McLachlan et al., 2013).

Based on the challenges related to managing climate and non-climate drivers and impacts of change on the biodiversity of coastal systems, the Intergovernmental Panel on Climate Change (IPCC) and United Nations Conference on the Environment and Development (UNCED) in 1992 (Olsen, 2000) endorsed ICM as a plausible framework for governing climate change. The Intergovernmental Panel on Climate Change at the symposium on rising sea levels, identified

ICM “as the most promising approach for the response to the change that is upon us” (Olsen, 2000, p. 332). UNCED’s endorsement was based on “broader environmental and social consequences of the mounting pressures on the world’s coast” (Olsen, 2000, p. 332). However, more than two decades after this endorsement and following several frameworks, guidelines and methodologies for assessment of coastal vulnerabilities and impacts (Post et al., 1996; Klein & Nicholls, 1999), there remain serious challenges for ICM scholarship and practice (see Portman et al., 2015).

A major challenge for ICM is the existence of sector-based approaches. ICM scholars agree that given the diversity of coastal interests and the complexity of interactions within coastal systems that affect these interests, single-sector coastal management approaches are ill-equipped to deal with coastal problems (Duda, 2016; Duda & El-Ashry; 2000; Frascetti, et al., 2011; Olsen et al., 1997). For example, Duda and El-Ashry (2000), show how single-sector coastal management approaches of multiuse resources lead to ecosystem degradation, due to misfits between policies and legislative arrangements and wider management goals. The findings of Duda and El-Ashry (2000) point to the need for integration of the goals and objectives of coastal management arrangements across sectors and levels of government. However, Sorensen (1997) argues that coastal management scholarship and practice has not always embraced the fundamental tenets of integration; i.e., the horizontal and vertical integration of sectors and units of government at different levels of coastal management. Sorensen (1997) asserts that “first, last, and always, horizontal and vertical integrated planning and management are necessary if practitioners are to effectively and efficiently plan and manage coastal systems” (p. 6).

Sorensen's (1997) assertion points to the challenges for integrating coastal management in response to the current and future climate and non-climate drivers and impacts of change on coastal systems. These impacts will demand that ICM researchers engage new ways of thinking about the coast and its management, in line with social-ecological systems (SES) scholarship and current challenges faced by diverse coastal sectors (see Bremmer & Glavovic, 2013, Glavovic, 2006; Vallega, 1999; Vallega, 1993; Coffey & O'Toole, 2012).

Already, ICM scholarship tends to capture the complex and dynamic social and ecological impacts and interactions within the coast (Caffin & Jobbins, 2003; Post & Lundin, 1996; Post et al., 1996). Much of the current coastal management scholarship now defines the coastal area from the perspective of a SES. This approach seeks to represent the interactions between marine and terrestrial subsystems and the trajectories of change that affect such systems, particularly, their socio-economic and governance components (Perry et al., 2011; Aswani et al., 2012; Charles, 2012; Taljaard et al., 2013; Hopkins & Bailly, 2012; Holland et al., 2011; Pollnac et al., 2010; Ferrol-Schulte et al., 2013; Glaeser et al., 2009; Glaser et al., 2012; Wu & Tsai, 2016; Paramio et al., 2015).

Moving forward with a SES perspective as a starting point for integration is obviously an important focus for ICM (Glaeser et al., 2009). Social-ecological systems scholarship is ideally suited for framing and analyzing the nature and scope of change affecting coastal systems, where impacts emanate from multiple climate and non-climate drivers, across marine and terrestrial ecological scales and where effects follow trajectories that feedback to economic and governance systems (Fisher et al., 2015; Butler et al., 2013; Nguyen et al., 2013; McFadden 2008). Within and across these spatial scales, coastal management must confront diverse sectoral interests in,

e.g., land use control in the coastal fringe and the hinterland (Olsen, 2003). Coastal management must also confront the regulation of wastewater discharge into the coastal nearshore (Wesmacott, 2001), concerns for the protection of coastal livelihoods and climate drivers such as RSST (Cinner et al., 2012a).

Understanding and responding to such challenges require matching system impacts and related management responses within designated management areas such as marine protected areas (MPAs) with impacts and responses from contiguous systems such as inland watersheds. These connections can be made by linking the impacts of common issue areas, e.g., coastal water quality decline across both scales (Alemu & Clement, 2014; Mallela et al., 2010; Butler et al., 2013). This approach will allow ICM scholars and practitioners to focus on how common issue areas impact coastal systems and how trajectories of change related to these impacts represent opportunities and challenges for integrating coastal management responses (McFadden, 2008). Because drivers and trajectories of change derive from social and ecological components of the coast, and from both the landward and seaward side, ICM scholars must continue to engage different ways of thinking across disciplines, without losing focus of the core emphasis of ICM identified by (Sorensen, 1997).

Current ICM scholarship provides an entry point for such inter-disciplinary thinking, using the fundamental principle of integration and related surrogate principles (Sorensen, 1997; Cicin-Sain & Belfiore, 2005; Stojanovic et al., 2004). Based on an extensive review of ICM literature, Stojanovic et al. (2004) show how the core principle of integration could be disaggregated into several surrogate principles. The observations by Stojanovic et al. (2004) are also implicit in other representations of integration in ICM literature (e.g., Sorensen, 1997;

Cicin-Sain & Belfiore, 2005; Christie, 2005) and emphasizes a logic and continuum of integration from systems impact, to management approaches and outcomes that are applicable to all levels of ICM, i.e. regional, national or local. Three of these surrogate principles include: the principle of *comprehensiveness*, the principle of *harmonization* and the principle of *cooperation and participation*.

Notwithstanding this logic in ICM literature, surrogate principles have not seemingly been used to conceptually frame and empirically examine issue areas such as coastal water quality decline. Additionally, it is not obvious in ICM literature whether these principles have been used to drive new ways of thinking about ICM. Using core and surrogate principles, to frame new ways of thinking about ICM research and to understand ICM practice serves to guide inter-disciplinary perspectives. This is important because ICM has no underlying theory; ICM is based largely on inter-disciplinary thinking that engages ideas that coalesce around similar concepts to integration, such as, aggregation, holism and isomorphism (Vallega, 1999).

Based on the background of the current shift in coastal management scholarship towards SES perspectives and the challenges for ICM scholarship I have identified above, I argue that rethinking the principle of integration could lead to new insight that can serve to advance coastal management practice. Here, I define ICM as a governance approach, based on clearly defined principles, related to the management of a specific issue area, e.g., coastal water quality decline, designed to overcome functional fragmentation in decision-making processes, within a sector or between sectors, at the same or different levels of coastal jurisdictions (cf. McKenna et al., 2008; Tobey & Volk, 2002; see also Cullinan, 2006).

In this research, I use a single-case, instrumental case study approach. Instrumental case studies serve to provide insight into a specific issue or several issues, to redraw generalizations or build theory (Stake, 1994). This research focuses on climate and non-climate drivers and trajectories of change affecting a marine protected area and surrounding villages in southwest Tobago. Part of the Republic of Trinidad and Tobago, Tobago is a small island in the eastern Caribbean. Tobago has a peripheral tourism economy (Weaver, 1998), with most of the tourism assets and activities concentrated within the coastal southwest region.

Following the logic of integration, I have identified above, my aim is to illustrate how trajectories of change related to coastal water quality decline affect coastal systems and coastal tourism and how such trajectories highlight challenges and opportunities for ICM. Additionally, I aim to understand how trajectories of change shape multiple-sector responses to declines in coastal water quality, within a national and subnational coastal management jurisdiction. I have identified four objectives for this research:

## **1.2 Research Objectives**

- 1) Examine how different conceptions of the core principle of integration and related surrogate principles serve to inform and advance thinking and improve coastal management practice in an era where coastal systems and sectors are severely impacted by multiple climate and non-climate drivers of change
- 2) Identify critical pathways and trajectories of change in coastal systems related to coastal water quality decline, to determine how these pathways and trajectories have shaped coastal management responses across multiple sectors and coastal jurisdictions.



- 3) Empirically examine linkages between the regulatory rules, policies and strategies for coastal water quality management between the tourism, fisheries and environmental protection sectors, to demonstrate how integrated coastal water quality management may be enabled or constrained by different types of conflicting, synergistic or cooperative governance linkages
- 4) Critically examine collaborative coastal management related to social and ecological impacts on coastal water quality decline, to determine how such impacts on coastal systems shape collaboration within existing governance arrangements, collaborative processes, new collaborative institutional arrangements and collaborative outcomes

### **1.3 Linking Objectives, Principles of Integration and Research Contribution**

The aim and objectives of this research are connected based on a common focus on coastal water quality decline and its management. Below, I show the linkages between the surrogate principles of integration (comprehensiveness, harmonization and cooperation and participation) as entry points and the three conceptual and analytical frames in chapters, four, five and six. Relatedly, I show how these conceptual and analytical frames serve to provide insight for responding to coastal water quality decline. Note also that objective one is used to guide the conceptual framework (*see Chapter three*) for the entire research and the conceptual background in each of chapters four, five and six.

#### **1.3.1 The comprehensiveness principle**

Integrated coastal management starts with a basic assumption that the coast is valuable from the perspective that its functions have some instrumental value to littoral and wider communities (Vallega, 1999). Consequently, coastal systems and causal pathways and

interactions within coastal systems should serve as the foundation for informing coastal management practice (Cicin-Sain et al., 1998). In the advent of the current changes affecting coastal systems, SES thinking has emerged as a conceptual framework (see Hopkins & Bailly, 2012; Reis et al., 2014; Ostrom, 2009), entry point and analytical tool (Binder et al., 2013; Fischer et al., 2015) for understanding drivers and trajectories of change. Additionally, SES has served to inform ICM responses that are commensurate with trajectories of change and coastal management praxis (Chuenpagdee, 2011). These developments in SES scholarship have begun to challenge the boundaries of ICM both in terms of thinking and practice. Much of this literature has sought to integrate systems to be governed with governance systems and interactions (e.g., Chuenpagdee, 2011; Chuenpagdee & Jentoft, 2009).

Anderies et al. (2004) define a SES as an “ecological systems intricately linked to and affected by one or more social systems” (p. 4). Further, Anderies et al. (2004) posit that an “ecological system can loosely be defined as an interdependent system of organisms or biological units. Social simply means tending to form cooperative and interdependent relationships with others of one’s kind.” Social systems can be thought of as interdependent systems of organisms. Thus, both social and ecological systems contain units that interact interdependently and each may contain interactive subsystems as well.” (p. 3). This thinking about SES helps to represent the coast as a comprehensive whole, thus providing a basis for empirical examination and analysis of different issue areas.

Following this conceptualization of SES above, in this research, I utilize SES as a lens for framing and analyzing the impacts of climate and non-climate drivers and trajectories of change related to declines in coastal water quality (*Objective two*). In this research, for example, I define

the coastal area as a Coastal Area Tourism System (CATS). In this way, I make connections between social and ecological drivers of change, e.g., institutional failures or RSST and their impacts, effects and feedbacks within the different components of CATS (see Vallega 1992).

An important contribution arising from this approach is the links it makes between coastal marine and terrestrial systems and coastal tourism activities, e.g., diving and reef watching, using a common issue area (e.g., water quality decline) that resonates with different coastal sectors and levels of coastal management. This conceptual framing and examination of CATS is an important first step for incorporating tourism within ICM and for responding to drivers of change connected to declines in water quality that impact on coastal tourism. Authors such as Farrell and Twinning-Ward (2004) have argued that a lack of systems perspectives in tourism research can impede progress in responding to social-ecological impacts on tourism. Social-ecological systems thinking focuses on relations between “resource system, resource units, governance system, actors, interactions, and outcomes” (Binder et al., 2013, p. 6). Therefore, thinking about the coast as a manageable entity, from the perspective of a SES provides the opportunity for matching trajectories of change with existing coastal management responses and for identifying the challenges and opportunities for managing those changes, using integrated approaches.

### **1.3.2 The harmonization principle**

Having identified trajectories of change and related coastal management responses to these trajectories in objective two, in objective three, I utilize the *harmonization* principle (Enemark, 2005; Christie, 2005; Dauvin et al., 2004; Cicin-Sain, 1993; Cicin-Sain et al., 1998; Pomeroy et al., 2015), to highlight the challenges to harmonization, particularly, for integrating

management responses to water quality decline, within sector-based and fragmented coastal management arrangements (Talijsaard et al., 2012). Here, harmonization refers to the process or practice of matching complementary goals and objectives of coastal management arrangements, for common issues across spatial scales, within and across sectors and levels of coastal jurisdictions (Christie, 2005). Complementarity refers to the extent to which the goals and objectives for coastal management pursue similar outcomes in common issue areas, e.g., coastal water quality management (see Christie, 2005; Laurans et al., 2013). Sector-based and fragmented coastal management suggest that across sectors or within a sector, across different agencies, the goals and objectives even if they relate to the same issue may differ, based on the outcomes they pursue (Westmacott, 2001; Glavovic, 2006; Tiller et al., 2012; Talijsaard et al., 2012). Coastal management arrangements refer to legislative and regulatory rules, policies or strategies that inform decision-making for related coastal issues.

Harmonization is often promoted as a plausible approach for integrating coastal management (see Cicin-Sain & Belfiore, 2005; Christie, 2005). However, because the management of issue areas, e.g., land use and effluent discharge that affect coastal water quality decline exists within highly sector-based and fragmented coastal management arrangements Cicin-Sain and Belfiore (2005) have argued that harmonization is easier said than done (see also Talijsaard et al., 2012; Westmacott, 2001). Other authors have accepted this fact but they also assert that sector-based and fragmented coastal management represent diverse governance settings that present opportunities for more flexible approaches for integration (see Arbo & Thuy, 2016; Talijsaard et al., 2012). Here, I define fragmentation as the extent to which linkages between the goals and objectives of coastal management arrangements for the management of

common issues are conflicting or synergistic, or the extent to which such linkages fosters cooperation among different coastal interests (cf, Biermann et al, 2009), across spatial scales, within or across different sectors or across different levels of coastal jurisdictions.

Given that coastal management exists within highly diverse and fragmented sector-based settings that present challenges for harmonization, I use a recent typology of fragmentation by Biermann et al. (2009) as the conceptual basis for examining how conflicting linkages between the goals and objectives of different coastal management arrangements, within and across different sectors (tourism, fisheries and environmental protection) and across two levels of government (national and subnational), constrain the integration of coastal water quality management. I also use the conceptualization of fragmentation to analyze how within and between these sectors, goals and objectives that are closely linked and those that are loosely connected could serve to enable integration of coastal water quality management. I refer to the examination of different types of linkages as an analysis of fragmentation.

### **1.3.3 The cooperation and participation principle**

Following from the emphasis in objective three on how loosely connected aims and objectives could contribute to resolving conflicts related to the management of coastal water quality decline, objective four focuses more specifically on collaboration as a strategy for integrating responses to coastal water quality decline. Linking responses to coastal water quality decline invariably leads to management overlaps between coastal interests and or coastal management responsibilities. Such overlapping interests and responsibilities are often conflicting. In such instances, it has been suggested that collaboration could be a meaningful strategy for integrating and managing such conflicts (Ernoul & Wardell-Johnson, 2013; Imperial,

2005). In this regard, collaboration can serve to negotiate trade-offs between conflicting priorities. Collaboration also serves to ratify resource power disparities within new collaborative institutional arrangements (Lubell et al., 2010). Here, collaboration is conceived as governance arrangements and processes that can foster cooperation and participation in decision-making, to inform and improve integrated coastal water quality management practice (cf. Emerson et al., 2012; see also Emerson & Murchie, 2010).

Current coastal management scholarship has a dedicated focus on co-management arrangements. Co-management emphasizes decision-making among different state agents with management responsibility for coastal areas, or among state and non-state agents with interests in coastal issues (e.g., Armitage et al., 2011). Invariably, the co-management literature draws on perspectives of collaboration from across disciplines, e.g., public administration scholars such as (Ansell & Gash, 2008), and addresses issues within a framework of environmental governance. More recently, several public administration scholars have been framing responses to environmental problems, using collaboration from a public administration perspective (e.g., Emerson et al., 2012; Leach, 2006; Imperial, 2005). Apart from shared responsibility and power relations, several public administration scholars examine collaboration from the perspective of the linkages between different deliberative spaces (Charbonneau, 2012), e.g., collaborative institutional arrangements, collaborative processes and the impacts on ecosystems that shape institutional responses and processes to collaboration. Saint-Onge and Armstrong (2004) refer to these spaces as arenas of collaboration.

In chapter six, to meet the goals of objective four, I integrate these spaces to form what Gray (1985) refers to as a collaborative decision domain. A domain level analysis provides

insight into how antecedent problems and existing institutional arrangements, shape collaboration across different sectors in response to coastal water quality decline.

#### **1.4 Organization of Dissertation**

This dissertation is organized into seven chapters. In *chapter one*, I locate the research firstly, in the research context, i.e., the evolution of ICM in response to important events that marked significant shifts in the approach to coastal management scholarship and practice. This layout of chapter one is in line with my strategy for inquiry, i.e., instrumental case study (*see Subsection 2.1 research methods*). In this case I am interested in how rethinking the core principle of integration and related principles, i.e., comprehensiveness, harmonization and cooperation and participation, can serve to inform coastal management practice, in an era where social and ecological changes pose serious challenges for coastal management. I use water quality decline, the impacts of this decline on coastal systems and coastal tourism and the management of these impacts as empirical targets, to illustrate the utility of the approaches I propose. Later in the chapter, citing Duda & El-Ashry (2000) Sorensen (1997) and Portman et al. (2012), I highlight the current challenges for ICM. I then show how three surrogate principles- comprehensiveness, harmonization and cooperation and participation could be used as an entry points to guide thinking in ICM research. In this chapter I also outline the research aim and objectives. Finally, I link the aim and objectives and three principles, to the conceptual and analytical frames in chapters four, five and six and show how the conceptual and analytical frame could provide insight for ICM practice related to coastal water quality management.

In *chapter two*, I justify and outline the research methods, together with the epistemological and logical bases for the research. I also justify the use of an instrumental single

case study approach as my strategy for inquiry. I draw primarily on the work of Vallega (1992, 1996, 1999 & 2000), to show how the coast could be conceived subjectively as a SES. This conception of the coast is used for the social construction and interpretation of integration, within the empirical contexts of the case outlined in chapters four, five and six. In this chapter, I also outline the case study approach. I place particular emphasis on single case multivariable studies and directed content analysis, to show its suitability and compatibility with the instrumental case study approach of inquiry. In the final section of the chapter, I outline some limitations to single case studies and demonstrate how I deal with these limitations.

*Chapter three* presents the conceptual framework of the study. In this chapter, I am primarily concerned with highlighting and synthesizing relevant ICM literature. Firstly, to capture the meaning of integration (Sorensen, 1997) and secondly, the links between this core principle and the three surrogate principles of ICM, namely; comprehensiveness, harmonization and cooperation and participation (Stojanovic et al., 2004). I also show the conceptual linkages between integration and its related principles to SES thinking, fragmented governance and collaboration. Each conceptual link serves as the basis for framing the empirical chapters *four, five and six*, based on the four objectives of this research. These chapters have been presented in a manuscript form for publication in peer-reviewed journals.

In *chapter four*, I frame and examine integration within the context of trajectories of change in a coastal SES (*Objectives two*). I define the system as a Coastal Area Tourism System (CATS), to capture the linkages and interactions between the marine, terrestrial, governance and socio-economic elements of the coast, i.e., tourism (see Anderies et al., 2004). I then use these linkages to identify how trajectories of change related to coastal water quality decline affect



coastal tourism and the challenges and opportunities presented by current coastal management arrangements for responding to these trajectories across sectors and coastal jurisdictions. Here, I invoke the *comprehensiveness principle* and show how coastal water quality decline could be integrated based on a comprehensive mapping of trajectories in coastal SES and by matching these trajectories with existing coastal management responses.

Matching trajectories of change in CATS in *chapter four* within existing coastal management responses helps to highlight the opportunities and challenges for integrating sector-based coastal management for issue areas related to water quality decline. Hence, in *chapter five* I use the issue of coastal water quality decline to frame and examine integration using the *harmonization principle* as an entry point. Using a typology of fragmentation adapted from Biermann et al. (2009), I highlight the challenges for harmonization. I show how within a coastal management jurisdiction the goals and objectives within and across sectors are highly diverse. For example, I demonstrate how the integration of legislation and regulations, policies and strategies related to coastal water quality management could be conflicting, presenting a challenge for harmonization. However, I show how some goals and objectives for the management of coastal water quality may be complementary, while others may be loosely connected, and how opportunities exist within complementary and loosely connected coastal management arrangements for integration.

In *chapter six*, I show how collaboration shapes outcomes in ICM related to declines in coastal water quality (*Objective 4*). This approach draws on the notion of integrating coastal management based on principles of *cooperation and participation* (Stojanovic et al., 2004). Drawing on literature mostly from public administration scholarship (e.g., Emersion et al., 2012;

Emersion & Murchie, 2010; Bryson et al., 2006), I show how collaboration integrates different coastal management arenas and how this shapes collaborative coastal management outcomes in issue areas related to declines in coastal water quality.

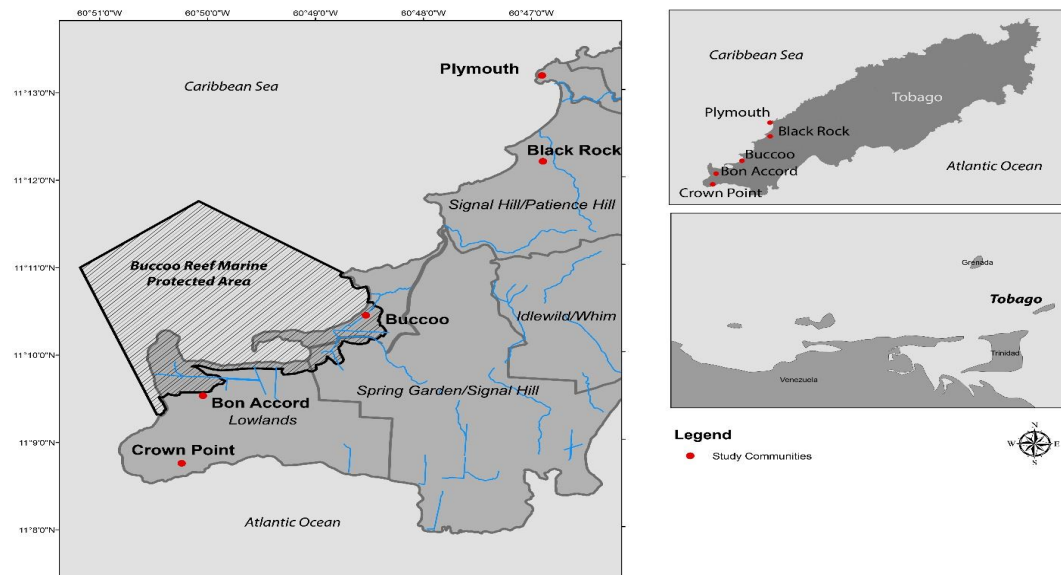
In *chapter seven*, I conclude the research. I revisit the key findings of the research, together with the major contributions related to integration both for conceptual thinking and coastal management practice. Finally, I highlight several key insights from the research and comment on how elements of these insights might contribute to charting the way forward in ICM research.

### **1.5 Geographic profile and case study context**

The case for this research is located within the context of coastal southwest Tobago. Tobago forms part of the twin island republic of Trinidad and Tobago, the most southerly of the eastern Caribbean islands. The smaller of the two islands, Tobago has a land mass of approximately 300 square kilometers and a population of 60,874 (Potts et al., 2004; GROTT, 2011b). Tobago lies approximately 29 km to the northeast of Trinidad, between latitudes 11° 8' and 11° 22' and longitudes 60° 30' and 60° 51'.

Southwest Tobago is a coastal area with several villages including Plymouth, Blackrock, Buccoo, Canaan/Bon Accord and Crown Point, located along its coastline (Figure 1-1). The geology of the coastal area in southwest Tobago is marked by coral formations and reef development over a volcanic substratum, resulting in a shallow limestone platform, referred to as the Buccoo Reef/Bon Accord Lagoon Complex (BR/BLC); an area of approximately 12.87 km<sup>2</sup>. Subsumed within this area is the Buccoo Reef Protected Area (BRPA); a 7 km<sup>2</sup> marine area (see Figure 1-1). The BR/BLC has been described as a contiguous mangrove-sea grass-coral reef

ecosystem, which serves as a natural barrier against storm surges and coastal erosion. This complex also forms a significant part of the economic assets of Tobago's tourism sector (Lapointe et al., 2010). Below, I outline the important contexts of the case. I also link each context with the four objectives of the case.



**Figure 1-1. Map of study area, with maps of Tobago and Trinidad and Tobago in the Caribbean Sea. Source: ParCA project**

### 1.5.1 Coastal tourism (Objectives two/chapter four).

Much attention regarding climate-related and non-climate related impacts on the coastal system in southwest Tobago has focused on coastal tourism. As is the case with other low-lying coastal islands, Tobago has a high concentration of tourism infrastructure in proximity to the coastal area. Tobago also has a high gross domestic product (GDP) related to the economic contributions from the tourism sector, and high levels of direct and indirect employment, closely linked to coastal resources (World Travel & Tourism Council, 2009). The disaggregated

macroeconomic data for Tobago in 2009 estimates that travel and tourism contributed 37% to the island's GDP. Much of this contribution has been attributed to coral reefs. For example, in 2006, the total economic contribution of reef-related tourism and recreation to Tobago's economy was estimated to be between US \$101 to \$130 million dollars, representing approximately 15% of Tobago's GDP (Burke et al., 2008).

The tourism sector in Tobago has benefitted from significant financial state support. Additionally, the tourism sector has been buttressed by high levels of spending by "domestic tourists" and diverse livelihood choices among persons employed in the tourism sector. Therefore, tourism has been characterized as part of the peripheral economy (Weaver, 1998). These factors have combined to spread any risk related to fluctuating economic conditions in external source markets. Consequently, Tobago's tourism product is not deemed to be as vulnerable to the impacts of changing climatic conditions when compared to other Caribbean islands (World Travel & Tourism Council, 2009; Tompkins & Adger, 2004). However, despite these internal buffers against exogenous shocks, a high level of vulnerability is still perceived to exist, given that 47.6% of employment in Tobago, 1 in every 2.1 jobs, is related to the tourism sector (World Travel & Tourism Council, 2009). The vast majority of these jobs are generated by economic activities within the coastal southwest region of the island.

### **1.5.2 Impacts on coastal systems** (Objective two/chapter four).

Over the past decade, the coastal area in southwest Tobago has been severely impacted by climate variability and change (Alemu & Clement, 2014; Mallela et al., 2010). These impacts have been attributed to exogenous forces, such as hurricanes, SLR and RSST (Alemu & Clement, 2014). However, they have been enhanced by anthropogenic forces, due in part to

coastal tourism development and human settlement patterns (Lewsey et al., 2004; UNEP, 1996) and more recently oil and gas exploration. These forces have combined to produce adverse effects on coastal systems, e.g., declines in coastal water quality, coral reefs and beach quality (Lewsey et al., 2004; Belle & Bramwell, 2005; Benjamin, 2010). For example, Mallela et al. (2010) have noted the impacts to coral reefs in Tobago emanating from human activities such as tourism development, sedimentation and sewage discharge. Additionally, coral bleaching in Tobago has been associated with increasing decadal sea surface temperatures, resulting in mean coral cover decline of approximately 25.2% between 2005 and 2010 (Alemu & Clement, 2014). Mallela et al. (2016) note that some coral colonies within the Buccoo Reef experienced 75 to 100% bleaching up to a depth of seven meters due to RSST in 2005 and 2006. This was significantly higher than the bleaching observed at other coral sites in the northeast end of Tobago. The resilience of reefs at these other sites was attributed to higher localized water quality (Mallela et al., 2016).

Claims of localized water quality contributing to the decline of coral reefs seem to be supported by other research. For example, Lapointe et al. (2010) have associated increased levels of nitrogen in the waters surrounding the Buccoo Reef in the rainy season from inland sediment runoff. They have found higher levels of macroalgal cover (up to 40%) around sewer outfall lines close to the Buccoo Reef. Coral cover at these sites was also 10% less at these sites compared to other sites. Earlier studies by Lapointe et al. (2003) also link increased levels of nitrogen to higher levels of macroalgal cover in the Buccoo Reef. They concluded that coral cover biodiversity and the value of coral reefs to tourism might be affected by sewage induced eutrophication.

There are a few qualitative studies in Tobago that seem to support the findings of authors such as (Lapointe et al., 2010; Mallela et al., 2010). Such studies have utilized the subjective responses of tourists actively engaged in water-related activities to make associations between water quality and activities such as snorkeling. For example, Beharry-Borg et al. (2009) and Beharry-Borg & Scarpa (2010) found that respondents who engaged in diving and snorkeling might be unwilling to engage in these activities if the water quality was perceived to be poor. In another Buccoo Reef study on perceptions of how water quality might affect tourism, Brown et al. (2001) found that 49% of respondents might still engage in water-related activities even with what they perceive to be a slight decline in coastal water quality.

How these findings relate to other aspects of coastal tourism, for example, tourist arrivals might have broader implications for the sustainability of the tourism sector. Some studies have explored these concerns using economic models. For example, Teelucksingh and Watson (2013) estimates that “deterioration of the marine protected areas by 1%, the terrestrial protected areas by 1% and the key biodiversity sites by one site, respectively, will result in a fall of 5.6%, 2.5% and 8.6% in tourist arrivals” (p. 13).

The importance of tourism to the Tobago economy, the concentration of tourism-dependent resources and related infrastructure within the coastal area, and the many competing interests and associated climate-related challenges, bring into sharp focus the scope of existing coastal management arrangements to deal with climatic and non-climatic drivers of change and their impacts on coastal water quality, coral reefs and beach quality. In such an environment, integrated approaches have been espoused as a plausible management framework (Olsen, 2000).

However, challenges for integration exists based on the current structure of issue areas related to coastal management.

### **1.5.3 Dual-level coastal management structure. (Objective three/chapter five)**

Tobago is governed by a semi-autonomous assembly. Given the degree of autonomy Tobago derives from the national constitution of Trinidad and Tobago, it is generally accepted that the Tobago House of Assembly (THA) operates at a sub-national level of government. Authority for issue areas related to coastal management at the subnational level derives from several laws, regulations and policies relating to different agencies at the national level and the Tobago House of Assembly (THA) Act 40 of 1996 (Potts et al., 2004).

This dual-level and sector-based institutional environment for coastal management in Tobago presents challenges for responding to the impacts of climate change, where competing interests for common resources abound and overlapping jurisdictions confuse lines of authority for resource control among legitimate coastal interests.

### **1.5.4 Institutional arrangements for issue areas related to coastal management.**

There are no legislative arrangements for ICM in Trinidad and Tobago; responsibility for issues related to coastal management resides with different agencies at the national level. Therefore, all legislation for coastal management issues derives from the national level. Coastal management in Tobago is subsumed within:

1. The general governance arrangements for issue areas related to coastal management in Trinidad and Tobago (the national level)
2. The specific legislative arrangements for the BRPA (the subnational level) and

3. The legislative and policy mandate of the THA Act 40 of 1996 (the subnational level).

#### ***1.5.4.1 General governance arrangements.***

Regarding point 1, Trinidad and Tobago has a national and subnational structure of government. At the national level, the Parliament of Trinidad and Tobago passes legislation for both levels. Potts et al. (2004) note that at the national level, there are approximately 29 pieces of legislation for issue areas related to coastal and ocean management. Most of these are unrelated to the subnational level. Therefore, in this research, I focus only on legislative arrangements for issue areas related to coastal management within the study area. The subnational level has limited authority to propose and adopt bills for some issue areas (see the fifth schedule of the THA Act 40 of 1996). However, for these same issue areas, legislative and regulatory authority is transferred from state agencies at the national level to state agencies at the subnational level via Memoranda of Understandings (MOUs). In some instances, national agencies operate a subnational office. Where this occurs, there is no transfer of authority.

#### ***1.5.4.2 Legislative arrangements for the Buccoo Reef Protected Area***

Regarding the second point, the BRPA was established as a MPA in Tobago (the subnational level). The BRPA was established by the Marine Areas (Preservation and Enhancement) act 37:02 of 1970. The specific areas of responsibility for the BRPA are outlined in the Marine Areas (Preservation and Enhancement) Regulations, section 6 of the Marine Areas (Preservation and Enhancement) Act, which states in part.

1. These Regulations may be cited as the Marine Areas (Preservation and Enhancement) Regulations.



2. In these Regulations “fish” includes corals, crabs, lobsters, shrimps, turtles, turtle eggs and any species of marine fauna.
3. Except with the written permission of the Minister, or a person duly authorised by him in writing to grant such permission, no person shall (a) go in or alight upon a restricted area; (b) operate a boat or other vessel within a restricted area or cause or allow a boat or other vessel to enter such an area; (c) take or remove any fish or bird from a restricted area; (d) take or remove any mangrove from a restricted area; or (e) dig, dredge, or otherwise interfere with the seabed of a restricted area.

Authority for the management of the BRPA was transferred to a state agency, the Department of Marine Affairs and Fisheries (DMAF) at the subnational level. At one time the BRPA was managed by the Buccoo Reef Management Committee (BRMC), which was established as part of a larger proposal for the Buccoo Reef Management Plan.

#### ***1.5.4.3 Legislative and policy mandates of the Tobago House of Assembly Act.***

With regard to point 3, the THA is a semi-autonomous quasi-legislature (a body corporate), and executive corporation sole, established by an act of parliament (THA Act, 40 of 1996). The THA Act gives the subnational level limited legislative authority within the confines of six nautical miles seaward, pursuant to what the act refers to as Assembly Laws, i.e., a law related to section 29 of the Act. Section 29 of the THA Act gives the subnational level limited authority to establish regulations specific to Tobago. This provision states that: “In the exercise of its powers under this Act, the Assembly may propose and adopt Bills for the matters for which it is responsible under section 25”

Regarding the limits of this authority, *Section four* the THA Act states that:“ No provision of this Act or of an Assembly Law shall be construed or interpreted so as to authorise (a) anything which is inconsistent with, or contrary to or in derogation of the Constitution of the Republic of Trinidad and Tobago; or (b) any operation of any Assembly Law beyond the confines of the island of Tobago and such part of the territorial sea of Trinidad and Tobago comprising those areas of the sea having as their inner limits the baselines of Tobago as determined in accordance with *Section five* of the Territorial Sea Act, and as their outer limits, a line measured seaward from those baselines, every point of which is distant six nautical miles from the nearest point of those baselines unless the contrary is expressly stated therein; (c) any convention, declaration, treaty, protocol, agreement or any international compact of any sort whatever between the island of Tobago or the Assembly and any foreign State.

Note that the national jurisdiction extends to 12 nautical miles seaward from the baseline of Trinidad and Tobago. Section 25 of the THA Act gives responsibility for policy formulation in several issue areas to the subnational level. However, the authority for policy formulation and implementation is restricted by section 75 (1)<sup>1</sup> of the constitution of Trinidad and Tobago.

Section 25 states that:

“Without prejudice to section 75(1) of the Constitution, the Assembly shall, in relation to Tobago, be responsible for the formulation and implementation of policy in respect of the matters set out in the Fifth Schedule.”

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<sup>1</sup> <http://rgd.legalaffairs.gov.tt/Laws2/Constitution.pdf>

#### ***1.5.4.4 Areas of responsibility at the subnational level.***

The fifth schedule of the THA Act outlines all the areas of responsibility at the subnational level. In the fifth schedule, there is no reference to coastal management or coastal area. The areas of responsibility in the fifth schedule with some relation to coastal area management include state lands, lands and marine parks, tourism, agriculture, fisheries, forestry, town and country planning and the environment. According to Section 25 above, the subnational level only has responsibility for the formulation and implementation of policy. Although the THA has limited powers to pass assembly laws for the areas of responsibility in the fifth schedule, this provision has never been utilized for issue areas related to coastal management.

#### ***1.5.4.5 Transfer of authority for issue areas related to coastal management.***

Generally, authority for issue areas related to coastal management under the fifth schedule has been transferred from national to subnational agencies, using MOUs. The provisions for such transfer Section 26, *Subsection three*, which states:

“The Government or any statutory authority or State enterprise may, by way of MOU, authorize the Assembly to act as agent of the Government, statutory authority or State enterprise, as the case may be, in respect of any of its responsibilities in Tobago.”

However, some national agencies operate at the subnational level without transfer of authority. For example, the Town and Country Planning Division (TCPD), a national agency, retains responsibility for land use regulation at the subnational level. Where this occurs, there is no need for transfer of authority. MOUs are not required to establish and implement policies and strategies at the subnational level (*see reference to Section 25 of the THA act above*). However, as is the case with the legislative environment, there is no clearly documented policy for ICM.

Nevertheless, there are multiple policies for issue areas with some relation to coastal management. More details of this policy environment are provided in chapter five. The agencies listed in Table 1-1 share some responsibility for issue areas related to coastal management at the subnational level:

**Table 1-1. Agencies with responsibility for issue areas related to coastal water quality management within the study area**

<b>Level of government</b>	<b>Agency</b>	<b>Area of responsibility</b>	<b>Legislative authority</b>	<b>Mode of authority</b>
<b>Subnational</b>	The Department of Natural Resources and the Environment (DNRE)	Environmental regulation through the issuance of certificates of environmental clearance and environmental impact assessment; water quality monitoring; the DNRE through the forestry unit also has responsibility for watershed management	Environmental management act 2000 and subsidiary rules, e.g., water pollution rules Forestry Act 66:01 and subsidiary regulations	Authority transferred from national level through MOU with the Environmental Management Agency. The EMA remains the final signatory on matters for which it has transferred responsibility; authority is vested in a forest officer at the subnational level via the forestry act
	The Department of Marine affairs and fisheries DMAF	Regulation of activities within the BRPA	Fisheries Act and subsidiary regulations, Marine Areas (Preservation and Enhancement) Act 37:02 of 1970 and subsidiary regulations	Authority has been transferred via MOU with national agency
	The Department of Infrastructure and Public Utilities DIPU	Coastal protection	No documented policy (project approach)	collaborates with agencies with responsibility for issue areas related to coastal management, DNRE
	Division of Planning and Development	Land use and physical development policy	Town and Country Planning Act, 35:01	Acts as the final signatory for applications for development of land

<b>Level of government</b>	<b>Agency</b>	<b>Area of responsibility</b>	<b>Legislative authority</b>	<b>Mode of authority</b>
<b>Subnational</b>	The Tobago Emergency Management Agency TEMA (formerly the National Emergency Management Agency, NEMA)	Coastal disaster preparedness and response	Disaster Measures Act 16:50, comprehensive disaster management policy framework; note in this research consideration was given only to TEMA's disaster response strategies for coastal areas.	Formerly, NEMA a sub-agency. Currently, TEMA operates as semi-autonomous agency, within responsibility for coordinating disaster preparedness and response at the subnational level
<b>National</b>	The Town Country Planning Division (TCPD)	Regulation of land use in terrestrial coastal nearshore through development planning and control	Town and Country Planning Act and subsidiary regulations	TCPD retains its area of responsibility at the subnational level. However, Division of Planning and Development Acts as the final signatory for development approvals in Tobago
	The water and sewage authority (WASA)	Watershed management, and wastewater management	Water and Sewage Act 54:40 and subsidiary regulation, e.g., the Courland waterworks bylaws; PAHO standards for wastewater treatment	The WASA retains its areas of responsibility at the subnational level.
	The Environmental Management Authority (EMA)	Environmental regulation and protection through policy formulation and implementation	Environmental Management Act 35:05 of 2000 and subsidiary regulations	The EMA has transferred its authority to the DNRE. However, the EMA remains the final signatory on regulatory matters

### **1.5.5 Collaborative coastal management.** (Objective four/chapter six)

Except for the BRPA, legislatively, there are no statutory arrangements in Tobago geared towards comprehensive management of the coastal area.<sup>2</sup> However, there are legislative provisions for the management of different issue areas, e.g., land use and fisheries. This has led to many multiple stakeholder collaborations. Some of these arrangements have been backed by the necessary statutory provisions, with the associated authority, institutional arrangements and funding. Several coastal management initiatives, projects and programs have been undertaken in Tobago over the last decade. Many of these projects have formally adopted an integrated management framework, with the requisite procedural and institutional arrangements for management. Others, although not formally termed ICM, have been so oriented. Most of these efforts occur via formally constituted committees, comprising groups representing both state and non-state sectors. In chapter six, I examine collaboration within three ICM projects.

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<sup>2</sup> A management plan was developed for a proposed Buccoo Reef Marine Park (BRMP), however it has never been implemented, <https://docs.google.com/viewer?a=v&pid=sites&srcid=bWFyaW5lcGFya3Mub3JnfGJybWN8Z3g6NmVhMTE1NjdjNmU4NDM4Mw-Vol2TheManagementPlanFinal.pdf>

## 2.0 CHAPTER TWO: Research Methods

In this research, trajectories of change that affect social-ecological systems (SES) are understood based on the multiple perspectives of case study participants, epistemologies that are subjective and transactional (Lincoln & Guba, 2000) and data analysis methods that are hermeneutical and or dialectical (see Vallega, 1999; Vallega, 1992; Bremmer & Glavovic, 2013; Glaser et al., 2012). I use the integration principle and its surrogate principles as entry points and the coast as a social construct. Relatedly, I utilize the concept of fragmentation in coastal management arrangements (*Objective three/chapter five*) and integrated collaborative coastal management (*Objective four/chapter six*), to frame and examine responses to the impacts of climate and non-climate drivers and trajectories of changes on coastal systems. I framed collaboration from an integrated coastal management (ICM) perspective as opposed to a perspective that is grounded in a participative paradigm (Lincoln & Guba, 2000; see also Walker et al., 2001), to be consistent with the paradigmatic frame for chapters four and five.

Social-ecological systems, fragmentation and integrated collaborative coastal management represent logical approaches in line with social constructionism and postmodern thinking that are conjunctive and that can accommodate interdisciplinary thinking across the natural and social sciences (Vallega, 1999). A major interdisciplinary focus in coastal management is whether concepts such as integration can host ideas from both the natural and social sciences (Sorensen, 1997). Vallega (2000) notes that epistemologies that served as the basis for understanding frameworks related to general systems theory have led to the concepts, e.g., isomorphism that has been used to overcome the limitations of interdisciplinarity as a mere assemblage of disciplinary contributions, to more cross-fertilization of common ideas and ways

of thinking. In this way, both natural and social systems scholarship attribute the same meaning to core concepts in systems thinking.

Interdisciplinary principles such as integration and concepts such as trajectories of change and feedbacks help to describe and investigate linkages between society and nature as SES. This suggests that such systems “may only be comprehended (from the Latin *cum*, and *prehendere*: get together), based on interpretation of contextual meaning and not be merely explained (the Latin root is *ex*, and *plicare*: unfold, fold up), according to cause-effect reasoning” (Vallega, 2000, p. 247, 250). This thinking allows for a more comprehensive conception of interactions between nature and society. Additionally, understanding the interactions between the natural and social components of the coast and their management could be accommodated between the integration principle and the interdisciplinary approach. This approach is useful for understanding ICM using SES interactions (*Objective two/chapter four*), fragmentation (*Objective three/ chapter five*) and integrated collaborative coastal management (*Objective four/chapter six*), as conceptual and analytical lenses.

According to Vallega (1999), coastal management scholars in the past often used methods that represent a disjunctive logic that derived from structuralist modes of thinking. He argues that this approach cannot host principles related to aggregation and integration within interdisciplinary thinking. The latter is more constructivist in line with the postmodern paradigm, i.e., it seeks to represent “spatial realities according to logical constructivist backgrounds sensitive to holism, aggregation, teleological and other pertinent principles” (Vallega, 2000, p. 149). As such, coastal management scholarship has adopted a conjunctive logic, to understand



how a system works, not how it is made and “towards which objectives it moves” (Vallega, 2000, p. 247).

The principle of holism has served to inform the approaches and political agendas to coastal management advanced in Agenda 21 (Vallega, 2000). Current coastal management scholarship, for example that advanced by Chuenpagdee (2011) relating to governability that represents the coastal management more holistically from the perspective of systems to be governed, governance systems and systems of governance interactions, seems to be grounded in the conjunctive logic.

## **2.1 Instrumental Case Study**

This research utilizes an instrumental single-case study approach as its strategy for inquiry. Instrumental case studies are undertaken to advance understanding, by providing insight into some particular issue to “redraw a generalization” from a case (Stake, 2000). An instrumental case study is a relevant strategy in this case to the extent that the thesis seeks to locate and advance the understanding of the principle of integration in coastal management within different contexts of the case. The understanding is that the particular context of the case is used for empirical validation and examination of the instrumental value of conceptual thinking (see Vallega, 1999). This approach has important implications for the findings. Whereas the inferences of the findings relate to the specific context of the case, the concepts and methods can be applied in other cases where there exist similar circumstances (Krippendorff, 2012).

According to Stake (2000), a case study is a choice of what is to be studied. Yin (2009) on the other hand has characterized case study as a strategy for inquiry that arises from the need to investigate complex social phenomena. For Yin (2009) “as a research strategy, the

distinguishing characteristic of the case study is that it attempts to examine: (a) a contemporary phenomenon in its real-life context, especially when (b) the boundaries between phenomenon and context are not clearly evident. Johansson (2003) has labeled case study as a meta-method given that different methods can be utilized in the examination of a single case.

A critical element for the justification and use of a case study as a method of inquiry has been advanced by Flyvbjerg (2006), i.e., human learning is context-dependent and cases (single or multiple) provide a relevant context. Flyvbjerg (2006) has also advanced strong arguments supporting case study research with regard to building theory that is reliable and valid. He argues that the case study method provides a closeness to real life phenomena that allows the researcher to develop a nuanced view of reality, context dependent theory and knowledge. In this thesis, for example, the object of the case (the impacts of changing climatic and non-climatic conditions on coastal systems) serve as an important context from which insight can be gained to advance coastal management research and practice. These impacts are identified and examined from the perspective of the dynamic interactions between different systems within the marine, terrestrial and human interface of the coast (*Objective two/chapter four*). Relatedly, rethinking the principle of integration, i.e., harmonization (*Objective three/chapter five*) and cooperation and participation (*Objective four/chapter six*) for understanding and informing responses in managing the impacts related to changing social and climatic conditions, takes into consideration the coalescence of the perspectives of different coastal interests.

### **2.1.1 The case study approach**

Different approaches to case study have been used, however, Yin (2009) has identified five steps that can be applied to guide the case-study process. This case study follows these

generic steps to frame and investigate the problem in each of chapters four, five and six based on objectives one, two and three respectively.

Firstly, for each objective, I identify a fundamental premise based on a surrogate principle of integration, i.e., comprehensiveness, harmonization and cooperation and participation. Next, the problem context is used to define integration based on one of the principles above. The conceptual background of the case study is then framed around each principle using social-ecological systems (*Chapter four*), fragmentation (*Chapter five*) and integrated collaborative coastal management (*Chapter six*). The data analysis follows the steps outlined by Krippendorff (2012) for directed content analysis (*see Subsection 2.4.2 procedural steps in directed content analysis*). Further, the data analysis is guided by concepts related to the principle of integration in the conceptual background of each of the three chapters and by constant comparison (Fram, 2013; Boeije, 2002).

### **2.1.2 Limitations of case study research**

Although it has been used extensively in social science research, there are inherent limitations to case study research, particularly as it relates to the application of inference from the findings to other contexts. The concerns above have been a major impediment to the wide use of case studies in both quantitative and qualitative research. Authors such as Flyvbjerg (2006) have pushed back at this assertion arguing that inferences from case studies can have application to contextual conditions that are similar to that of a studied case. However, even Flyvbjerg (2006) agrees that what is lacking in many case studies is the rigorous research design and logic that serves as an underlying feature of experimental research.

This case study addresses several of these limitations. For example, this research utilized an instrumental case study approach. Instrumental case studies allow for greater focus on what to study in the case. According to Stake (2000), while the researcher examines the details of the case rigorously, he or she has a secondary interest in the case. To focus the case, the researcher frames the research question or the aim of the research around this secondary interest. This approach helps to focus the sub-questions or objectives on this secondary interest. It also helps to justify redrawing general inferences from the findings (Stake, 1994). The steps I have outlined above that guides the framing and analysis of different components of the case study in chapters four, five and six also provides a basis for examining a consistent logic in the case study.

Another perceived limitation to case study research used in this case was the single case approach. Single case approaches have been criticized for their limitations to a specific context and therefore the limits of inferences drawn from them (Johansson, 2003). Case study researchers have addressed the limitations of single case approaches generally by using multiple cases. However, single cases studies have been designed to have more rigorous appeal, by the utilizing techniques such as systematic combining (Dubois & Gadde, 2003) and explicative multiple variable analysis (Johansson, 2003). The latter approach utilizes many units of analysis and many variables within a single case. Although this case study was a single case it was conducted within three related but differently defined contexts each having multiple variables. The use of this approach helped to overcome some inherent biases of single case studies.

A highly top-down method of data collection was used in this thesis based on selective sampling (Patton, 2002). This approach was used to control both the source and size of the sample. Additionally, this approach allowed for targeted data collection in keeping with the

research aim and objectives. However, it has been noted that such highly selective and top-down approaches to sample selection lead to inherent biases in terms of the content of interview data and ultimately the inferences that can be drawn from such data analysis (Patton, 2002). To overcome these inherent biases, constant comparison method was used as a data analysis technique, to ensure that the perspectives of the participants guided the interpretation of the data. Fran (2013) has noted the use of constant comparison for this purpose. Using constant comparison was particularly useful when engaging in higher level analysis of data, where there is a greater propensity to lose the original intent of the textual data from the interviews.

Constant comparison is also used to ensure consistency in interpretation of textual data across data sets, based on the aim and objectives of the research (Stake, 2000, Boeije, 2002). Constant comparison was an important approach to data analysis in this case study given that the data was harvested from two different data sets. Data for this case was collected from a Community-Based Vulnerability Assessment (CBVA) data set of 140 semi-structured interviews conducted in June and July 2012, and a data set comprising 75 semi-structured interviews conducted in June and July 2014 (*see Subsections 2.2.1 and 2.2.2 below*).

The major limitation of data analysis, in this case, is the extent to which inferences drawn from the data related to the specific context of this research apply to other more general contexts. This is a major challenge for case study research let alone single case approaches. Qualitative inferences from textual data have been challenged from the perspective that different meaning can be derived from the same text based on the value the researcher brings to the data analysis (Krippendorff, 2012). Redrawing inferences from such data to different contexts or similar contexts elsewhere can be even more problematic. Instrumental case studies respond to this to

some extent by focusing not on the details of the case but rather on what insights the case offered related to specific constructs (Stake, 2000). For example, although this case examined in great detail, different aspects of coastal management related to southwest Tobago, the study focused primarily on how the concept of integration in coastal management could be constructed and reinterpreted. This focus was important to advance understanding of managing the impacts of social and climate-related changes on coastal tourism and coastal marine and terrestrial systems collectively.

Given that the conception of integration in these cases derived from existing scholarship, the analytical frameworks advanced in each of the three chapters and the insights could be applied to examine coastal management in other cases.

## 2.2 Data Sources and Collection Methods

Data was derived from both state and non-state agencies at the national and subnational levels of coastal management. Table 2-1 below outlines the sources of interview data.

**Table 2-1. Stakeholders with direct and indirect interest in the study area**

Scale	Types of stakeholders	Stakeholder	Influence	Interest in Study Area
National	State	Institute of Marine Affairs IMA	Policy	Research
		Environmental Management Authority, EMA	Regulation	Environmental protection
		Water & Sewage Authority, WASA	Regulation	Environmental protection
		Water Resource Agency, WRA	Regulation	Environmental protection
		Ministry of Works and Transport	Regulation	Coastal protection
		The Meteorological Office	Information	Weather forecasting
Non-state		Centrica Trinidad Ltd	Policy	Oil and gas exploration
		Caribbean Natural Resource Institute, CANARI	Advocacy	Conservation

Scale	Types of stakeholders	Stakeholder	Influence	Interest in Study Area
Sub-national	State	Department of Natural Resources & the Environment	Regulation	Environmental protection & water quality monitoring
		Division of public utilities & infrastructure	Regulation	Coastal protection
		Division of public utilities & infrastructure	Regulation	Coastal protection
		Tobago Emergency Management Agency, TEMA	Regulation	Disaster response
		Town & Country Planning Division, TCPD	Regulation	Development control
		Division of Tourism & Transportation	Policy	Recreation
		Department of Planning & Development	Policy	Land use planning
		Department of Infrastructure & Public Utilities	Regulation	Coastal protection
		Department of Marine Affairs & Fisheries, DMAF	Regulation	Protection of marine area
	Non-state	Tobago Tourism & Hotel Association	Advocacy	Recreation tourism
		Environment Tobago, ET	Advocacy	Conservation
		Save Our Sea Turtles, SOS	Advocacy	Conservation
		Reef Tour Operators Association	Advocacy	Coral reef health
		Buccoo Reef Management Committee BRMC	Advocacy	Research
		Village councils	Advocacy	Community livelihoods
		Southwest Tobago Fisherfolk Association.	Advocacy	Protecting community livelihoods
		Tobago Dive Association	Advocacy	Recreation tourism
		Tobago Tourism Hotel and Restaurant Association	Advocacy	Recreation tourism
		Tobago Chamber of Commerce	Advocacy	Business, Tourism

*Note that respondents from all the stakeholders listed here have been interviewed. Centrica Trinidad Limited declined my interview request*

### **2.2.1 Community-based vulnerability assessment**

Data for the CBVA was collected using a guide developed by the Partnership for Canadian-Caribbean Climate Change Adaptation (ParCA), project <sup>3</sup> (see Appendix A). The CBVA field guide clearly outlined the rationale, context and process involved in data collection. The CBVA focused on assessing the ways in which persons involved in fishing and tourism might be vulnerable to changing climatic conditions within the coast. While the CBVA focused on both fisheries and tourism, the data for this research was drawn mostly from interviews involving tourism stakeholders. The stakeholders represented tourism interests that were state and non-state from government agencies, NGOs, small guesthouse owners, hoteliers, restaurateurs and persons living in coastal villages. For the CBVA, data was only collected from stakeholders at the subnational level (see Table 2-1).

Data was collected using snowballing and saturation method and open-ended semi-structured interviews (Morse et al., 2014, Biernacki & Waldorf, 1981). The data collection focused on general biographical data on social and climate-related impacts and changes affecting coastal areas and strategies for responding to these impacts. This data formed an integral part of the data set that was used in chapter four. A summary guide to the CBVA is provided in Appendix A.

### **2.2.2 Additional interviews**

The second set of primary data targeting the same stakeholders at the subnational level in Table 1-2 above were collected in June and July of 2014. However, data collection also targeted stakeholders at the national level (see Table 1-2). This second set of interview data were

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<sup>3</sup> Field guide for community-based assessment of vulnerabilities and adaptive capacities related to the effects of climate change on tourism and fisheries industry in Tobago (Amanda Palmer and Johanna Wandel)



collected using purposive sampling (Patton, 2002). These semi-structured interviews (n=75) were also supported by an interview guide (see Appendix B). The interview guide contained several distinct but related categories including stakeholder profile, stakeholder engagement and categories related to stakeholder knowledge of changes in coastal systems, perceptions of climate-related risks and collaborative efforts to between subnational agencies and between national and subnational agencies geared towards responding to changes that affect coastal systems. (see André et al., 2012; Pahl-Wostl, 2005; Reed et al., 2009; Bakker et al., 1999; Ramirez, 1999). The interview guide allowed for consistency in data collection but more importantly, it allowed for data collection, analysis and synthesis according to distinct categories.

Semi-structured interviews were selected for this study as they allow for some measure of control of the information gathered, without limiting the responses of the participants. The number of interviews utilized from this dataset has been identified in the methods section of each of chapters four, five and six.

### **2.2.3 Participant selection**

For this case study, participants were treated as stakeholders (see Table 1-2) and were identified based on categories developed by André et al. (2012) and Bakker et al. (1999). Stakeholder categories were selected on the underlying assumption that stakeholders are affected differently by the impacts of social-ecological changes and the governance arrangements that attend to them. They are likely to have different knowledge bases regarding social-ecological changes. Therefore, the interactions between changing climatic conditions and socio-economic contexts and governance arrangements can be understood more clearly, by analyzing the perspectives of those experiencing the change (Larsen et al., 2012). Grimble et al. (1995) define

stakeholder analysis as "an approach to understanding a system, by identifying the key actors or stakeholders in the system and for assessing their respective interests in and perspectives of that system" (p. 3-4). Note that the stakeholder approach above was used only to establish the boundaries of the research and as a tool for case selection.

This top-down approach has its limitations, as categorization tends to marginalize certain groups; however, it is ideally suited to instrumental case study research, as it allows the researcher a measure of control of the sample (Reed et al., 2009; Patton, 2002). Categories are established based on certain attributes, relations and common interests in a particular problem or issue (Ramirez, 1999). Stakeholder categories serve to establish the boundaries of contextual conditions, while providing a platform for qualitative inquiry, and for gaining insight into phenomena from the perspective of the participant (Reed et al., 2009). Stakeholder dialogues have been endorsed as contributing to more effective responses to changes in climatic conditions by increasing the robustness of research, through direct engagement with the social context and the legitimization of decision-making related to those contexts (André et al., 2012).

Case study participants were identified based on the following categories involvement in issue areas related to coastal management; the level and context of action (e.g., nationally and sub-nationally); the institutions the actors represent; the role in issue areas related to coastal management (e.g., expert, users, managers, particularly important for key informants); capacity and motivation for engagement (e.g., knowledge, power, institutional capacity); thematic or functional linkages (e.g., water quality monitoring); and policy linkages (e.g., departments, associations, conservation groups) (André et al., 2012; Bakker et al., 1999; see also Table 1-2).

#### **2.2.4 Stocktaking survey**

Stocktaking surveys have been used in climate change adaptation research for mapping the institutional environment and governance arrangements (Steurer et al., 2010). In ICM, stocktaking surveys have been utilized to identify the actors, laws and institutions for a coordinated approach to developing strategies and policies, utilizing the principles of integration (O'Hagan & Ballinger, 2009). Stocktaking surveys are also useful for identifying interactions between different organizations and stakeholders, within and across scales (Bauer, et al., 2012).

Based on this background, a desk survey was used to conduct a stocktaking survey of legislative and policy documents related to coastal management and climate change in Trinidad and Tobago, to review how governance arrangements in Tobago (the subnational level) and the national level are related to coastal management and climate change adaptation. An outline of the survey template is provided in Appendix C. Emphasis was also placed on strategies or policies for economic development or natural resource management not necessarily related to coastal management or climate change. The stocktaking survey served to establish the boundaries of the research, in addition to the enabling environment for coastal management and climate change adaptation in Tobago (Environmental Protection Agency, 2006).

#### **2.2.5 Literature and document review**

Data was collected from both peer reviewed literature, legislative and government policy documents. Climate change adaptation is a current and topical issue in Trinidad and Tobago and to this end, many policy documents exist directly related to climate change adaptation. The Trinidad and Tobago government have developed several policies that are related to climate change adaptation, including;

1. The Trinidad and Tobago Climate Change Policy (2011)
2. The National Protected Areas Policy (2011)
3. The National Tourism Policy (2011)
4. The National Environmental Policy (2006)
5. The National Water Resource Management Policy (2005)
6. The Comprehensive Economic Development Plan for Tobago 2.0 (2013-2017)

Data was also collected from peer-reviewed literature related to Tobago. This literature relates to managing changes that affect marine ecology and coastal morphology resulting from natural and anthropogenic drivers (e.g., Adger, 2010; Tompkins & Adger, 2004; Tompkins & Adger, 2003; Alemu & Clement, 2014; Lapointe, et al., 2010; Mallela et al., 2010; Mallela et al., 2016).

## **2.3 Data Analysis**

### **2.3.1 Content analysis**

Data gained from the various modes of data collection were analyzed qualitatively using directed content analysis (Hsieh & Shannon, 2005; Krippendorff, 2012). According to Hsieh and Shannon (2005) “research using qualitative content analysis focuses on the characteristics of language as communication with attention to the content or contextual meaning of the text” (p. 1278). In this regard, directed content analysis is useful where existing theory or previous research about a phenomena exist. Content analysis through directed approaches seeks to extend conceptually or theoretically, existing research within different contextual settings (Hsieh & Shannon, 2005). For example, this research seeks to advance the principle of integration in

coastal management, within the emerging context of managing the impacts of social and climatic changes on coastal systems (*Objectives one and two*). Although research in integrated approaches to coastal management is extensive, impacts on coastal systems have presented new challenges for coastal management that require new ways of thinking about integration.

Directed approaches to content analysis also have implications for research design and logic. In this regard Hsieh and Shannon, (2005) identify several key areas:

1. More structured processes guide directed content analysis compared to conventional approaches. Here, researchers use existing theory or prior research, to identify key concepts or variables to be used as initial coding categories
2. Operational definitions for different categories derive from existing theory
3. Data collection is informed by questions or objectives from predetermined categories
4. Coding is based on research questions, objectives or premises and predetermined categories
5. Data not fitting predetermined codes are coded based on sub-categories of predetermined codes
6. Coding categories based on theoretical constructs from the research guide the discussion of research findings. This last step represents a modification of that of (Hsieh & Shannon, 2005).

Krippendorft (2012) identifies logic and process as two important dimensions of content analysis. Regarding logic, Krippendorff (2012) argues that content analysis acknowledges that the textualizing that occurs in the world of an analyst may or may not occur in the world of others. However, textual inferences could be guided by research questions, aims, objectives and

analytical constructs. Krippendorff (2012) suggests that research questions, aims or premises mirror hypotheses in experimental approaches to research and therefore research questions or aims serve as the targets of the researcher, through which he or she seeks to answer based on inferences from available texts. According to Krippendorff (2012), this is an important distinction for inferences from texts, based on research questions or premises as opposed to observations from hypothesizing.

“Whereas observations are registered or measured for what they are and hypotheses about observation phenomena amount to generalizations from observations, text informs an analyst about extra-textual phenomena about meanings, consequences or particular uses. Thus, whereas scientific hypothesis are accepted on account of a preponderance of evidence in favor of one at the expense of another hypothesis, in an ideally large number of observations that support one and rule out others, inferences from texts (although large numbers may play a role here as well) pertain to phenomena that are not observed during a content analysis, phenomena that are outside the texts and thus retain their hypothetical character until confirmed by validating incidences” (Krippendorff, 2012, p. 37).

Using research questions or premises contributes to greater efficiency and empirical grounding in research. Empirical grounding allows for sorting and reading of the text more expeditiously and for sampling relevant text to address a particular question. The question leads to the reading of the text for a specific purpose rather than being led by the text.

### **2.3.2 Procedural steps in content analysis**

In each chapter, Krippendorff’s (1989) procedural steps are utilized to frame the methods section. Krippendorff (1989) identifies a content analysis approach that utilizes six distinctive

stages; design, unitizing, sampling, coding, drawing inferences and validation. These stages guide the data analysis process.

The first step, *design*, involves a conceptual phase, where the context of the research and data are identified and an analytical construct was chosen that “formalizes the knowledge available about the data-context relationship, thereby justifying the inferential steps involved in moving from one to the next” (Krippendorff, 1989, p. 406). The second step, *unitizing*, involves the definition and identification of units of analysis and the volume of the data set. The third step, *sampling*, helps to avoid biases in the analysis of symbolic, material, to ensure that all material is represented of the phenomena under investigation. *Coding* classifies units with prescribed categories of analytical constructs.

Analytical constructs contextualize what is already known about a concept and therefore ensures that the analyst does not violate what is known about the circumstances pertaining to the text. Krippendorff (2012) argues that “analysts must make sure that their analytical constructions model the contexts they have chosen” (p. 41). In this way, analytical constructs ensure that the texts are sorted and analyzed in accordance with what is known.

Regarding *inference*, a general assumption is made by Krippendorff (2012) that text possesses meaning in relation to a particular context, discourses or purposes. Therefore, “the nature of text demands that content analysts draw specific inferences from a body of texts to their chosen context” (Krippendorff, 2012, p. 41). Hence the range of possible inferences is narrowed. Krippendorff (2012) suggests that inferences are hidden in the “human process of coding” (p. 41).

*Validation* entails limiting the results of the content analysis to the intentions of the technique, i.e., to say inferences can only be made from what can be observed directly not from

what is not readily available. This pattern of inference reinforces the point above that inferences possess meaning in relation to contexts, discourses and purpose. However, this does not mean that generalization cannot be redrawn from contextual inferences (Stake, 1994).

## **2.4 Research Ethics**

Ethical considerations for this research have been informed by the University of Waterloo guidelines. These guidelines are outlined in *TPCS 2 (2014) Tri-Council Policy Statement-Ethical Conduct for Research Involving Humans*. This research formed part of a larger project; the ParCA. The Partnership for Canadian-Caribbean Climate Change Adaptation received ethics approval to conduct research in Tobago, the site of the case study in this research. Additionally, ParCA applied for and was granted written permission from the Department of Natural Resources and the Environment (DNRE), in Tobago, to conduct research within the territorial waters of the island.

In keeping with the ethics agreement for this research, a letter was sent to the administrator of each division or department in the Tobago House of Assembly (THA), to gain permission for the staff of the division or department to participate in this research (Appendix D). Regarding the collection of data from other participants, introductory letters were given to each participant informing them of the nature and purpose of the research. The invitation letter also contained a consent form (Appendix E). The introductory letters informed participants that if they wished they could contact the University of Waterloo (UW) for further information on the research. Also, each participant was informed of the confidentiality of the information he or she provided and of the option to review the content of the interview when it was transcribed.



Care was taken to inform all participants that providing information for the research was optional. Additionally, they were informed that during the process of the interview they could refuse to answer any question or if they wished they could answer off-tape. The option was also provided for the full interview to be conducted off-tape. Participants were also informed that the data used in any publication would be presented in a form to preserve the anonymity of the interviewee.

### **3.0 CHAPTER THREE: Conceptual Framework**

The conceptual framework links four related bodies of scholarship; integration in coastal management, social-ecological systems (SES), fragmentation and collaboration mainly in public administration. Greater details of these connections are provided in the conceptual background in each of chapters four, five and six (*Subsection, 4.3, 5.3 & 6.3*). Integration serves as the overarching guiding principle for the framework. In (*Section 3.1*), after a brief introduction of the divergent views on the origin of integration, I locate the meaning of integration within an important event at the Xiamen workshop in 1996 (Sorensen, 1997). I then outline the fundamental principles of integrated coastal management (ICM); sustainability and integration (*Subsection 3.1.2*). In (*Subsection 3.1.3*), I show how integration as a fundamental principle of ICM has been reified in literature into three surrogate principles; comprehensiveness, harmonization and cooperation and participation. Each surrogate principle serves as an entry point to each of the three conceptual frames in *chapter four* (social-ecological systems), *chapter five* (fragmentation) and *chapter six* (cooperation and participation). In *Sections 3.2, 3.3 and 3.4*, I synthesize the connections between the scholarship related to these three conceptual frames in addressing the pertinent contextual issues in this research.

#### **3.1 Defining Integrated Coastal Management**

Coastal management literature highlights conflicting claims regarding the origin of integrated approaches. These claims relate to formal institutional frameworks, regional and global conventions and coastal management customary practice (Aswani et al., 2012; Cullinan, 2006; Vallega, 1999). For example, Aswani et al. (2012) link ICM to customary governance. Customary governance systems include cultural and historical practices that have evolved to

regulate the use of, access to, and transfer of local resources among diverse interests. Customary governance is informed by indigenous ecological knowledge “embedded in customary land and sea tenure institutions” (Aswani et al., 2012, p. 2). Embedded within customary governance are issues related to territoriality, based on systems of common property, resource conservation practices, e.g., minimum catch limits, and the establishment of marine closures (Aswani et al., 2012).

Regarding a formal approach to ICM, Cullinan (2006) identifies 72 conventions and treaties at different regional, national and local levels of coastal management as far back as 1954. However, a formal legislative environment for ICM is usually attributed to the United States and the establishment of the Coastal Zone Management Act of 1972 (Post et al., 1996; Vallega, 1992). The US Coastal Zone Management Act is often cited as the impetus that led to the global legislative framework for ocean governance, the 1982 United Nations Convention on the Law of the Sea (UNCLOS) (Vallejo, 1988). The UN Convention and other conventions and treaties have served as the basis for defining current ICM research and practice from global to local scales. For example, (Vallejo, 1988) notes that:

“During the decade of the seventies, there was a general recognition of the importance of marine resources for the economic growth of the states and increase in scientific research activities and for a sustained negotiation effort at the international level that culminated in the adoption of the UNCLOS. Growing importance was attached to the opportunities that resource exploitation could offer within the context and objectives of national economic social development. Concerns of developed countries over the quality of their coastal and marine environments prompted enactments such as the US Coastal Zone

Management Act of 1972, and some specific measures in various European countries.

These experiences although not formally replicated in the developing world had a profound impact and later became the basis for concepts and approaches developed to tackle the problems encountered in the coastal areas of developing countries” (p. 206-7).

More recently, some authors have identified several guiding principles that relate specifically to Agenda 21 that address the particular issue of development and inter-generational equity (see Cicin-Sain & Belfiore, 2005). For example, Mc Kenna et al. (2008) show how using the principles from Agenda 21, European Union (EU) countries devised eight guiding principles for the management of coastal zones in the EU. European Union principles have served to inform approaches such as the European Waterworks Framework Directive (EWFD), a management framework for the protection of coastal waters (Borja, 2005). Integrated coastal management literature highlights other guiding principles. Like the EU principles, some of these have been tailored specifically to regional or local contexts or issue areas. For example, Clarke et al. (1992) identify ICM principles developed by the Food and Agriculture Organization (FAO) of the United Nations (UN), that served as a guide for the development of basic strategies and methods intended to be used for the purpose of organizing natural resources management for coastal zones.

Much of the current ICM scholarship and practice has been shaped by Agenda 21. However, scholars such as Sorensen (1997) notes that ICM research and practice tends to lose focus of the core meaning and principle of integration. Below, I locate the meaning of the integration within a significant coastal management event that helped to clearly define integration and shape current coastal management research and practice.

Sorensen (1997) highlights an important event in the evolution of ICM at the Xiamen workshop in China in May of 1996 that clearly defines what ICM is. The findings of the Xiamen workshop also provide more clarity on the dimensions and principles of ICM. The findings of the Xiamen workshop serve as an important defining moment for ICM in that the outcomes of Xiamen represented a review of 30 years of ICM scholarship and practice. ICM scholars at Xiamen concluded that the term integrated when used in coastal management literature took on five dimensions:

1. The horizontal integration of separate economic sectors (such as fisheries, tourism, transportation) and the associated units of government, which significantly influence the planning and management of coastal resources and environments.
2. The vertical integration of all levels (national, state/province/region, local) of government and nongovernmental organizations, which significantly influence the planning and management of coastal resources and environments.
3. A planning and management perspective which combines land use and sea use processes.
4. Analyses and assessments which cut across scientific disciplines.
5. A program which consists of planning, management, education, and applied research components

The Xiamen workshop defined integrated coastal zone management as:

The integrated planning and management of coastal resources and environments in a manner that is based on the physical, socioeconomic, and political interconnections both within and among the dynamic coastal systems, which when aggregated together, define a coastal zone. An integrated approach requires both the horizontal (cross-sectoral) and

vertical (the levels of government and nongovernment organizations) coordination of those stakeholders whose actions significantly influence the quantity or quality of coastal resources and environments (Sorensen, 1997, p. 9).

In *Subsection 1.1*, I outlined several important antecedent agreements between 1972 and 1988 that served as defining moments in ICM. I also show how these antecedents influenced the guiding principle of integration in (*Section 17.5*) of Agenda 21 at the Rio Summit in 1992. Xiamen occurred after the Rio Summit of 1992 and Agenda 21. At Rio, clear guidelines and principles were established for ICM, to address specifically critical uncertainties for the management of the marine environment and climate change (UNCED, 1993). Therefore, the findings of the Xiamen workshop reflect the antecedents and subsequent research incorporated into the Agenda 21 guidelines. Since the Rio Summit and Agenda 21 several scholars have examined the progress of ICM.

Agenda 21 and other subsequent guidelines have influenced the concept of integration as a central organizing principle in coastal management (Portman et al., 2012). These guidelines have been adopted into conventions that formerly lacked a coast and ocean emphasis. For example, in 1995, under the Jakarta Mandate on Marine and Coastal Biodiversity and the UN Food and Agriculture Organization's Code of Conduct for Responsible Fisheries, principles were established for coastal development and protection in Europe using the fundamental tenets of ICM (Portman et al., 2015).

The findings at Xiamen confirmed that integration in coastal management places major emphasis on how governance arrangements should be configured to respond to the organization of coastal sectors related to interactions between coastal marine, terrestrial and social systems

(Sorensen, 1997). One of the major concerns emanating from the deliberations at Xiamen was that:

“One of the lessons that should be learned from the history of ICM is that practitioners keep losing sight of why horizontal and vertical integration is necessary for what they do. First, last, and always, horizontal and vertical integrated planning and management are necessary if practitioners are to effectively and efficiently plan and manage coastal systems. It is the coastal systems that largely determine the quantity, quality and distribution of coastal resources and environments” (Sorensen, 1997, p. 6)

Post and Lundin (1996) identify three features of governance that ICM must emphasize, including;

1. Moving beyond traditional approaches that tend to be sector oriented and fragmented in character
2. The involvement of important stakeholders to establish policies for the equitable allocation of space and resources in the coastal zone. An appropriate governance structure is essential for such decision making and oversight
3. The Integration of sectoral and environmental needs. ICZM (Integrated Coastal Zone Management) should be implemented through specific legal and institutional arrangements at appropriate levels of government and the community.

What is also evident in coastal management literature are several definitions that help at least to determine what ICM responds to (Sorensen, 1997; Christie, 2005; Cicin-Sain & Belfiore, 2005; Kenchington & Crawford, 1993). Although Portman et al. (2015) note that “definitions of the approach to ICM have evolved over time and vary, often depending on policymakers,

specific objectives or the particular conditions and problems to be addressed” (p. 31). Tobey and Volk (2002) note that “a central goal of ICM is “overcoming the policy and functional fragmentation that occur in the governance of coastal areas” (p. 291). Relatedly, GESAMP (1996) defines ICM as a “continuous and dynamic process that unites government and the community, science and management, sectoral and public interest, in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources” (p. 3).

Here, I define ICM as a governance approach, based on clearly defined principles, related to the management of a specific issue area, e.g., coastal water quality decline, designed to overcome functional fragmentation in decision-making processes, within a sector or between sectors, at the same or different levels of coastal jurisdictions (cf. McKenna et al, 2008; Tobey & Volk, 2002; see also Cullinan, 2006). The GESAMP (1996) definition is cited widely in ICM literature. However, the definition I use in this research differs from GESAMP (1996), based on its emphasis on integration for the management of a specific issue area. Focusing on an issue area allows for a clear identification of what is to be integrated, the opportunities available for integrating that issue area and the challenges for integrated responses. Focusing on an issue area also serves to guide the conceptual framing of the research using the three surrogate principles of integration and the conceptual lenses (*Sections 3.2, 3.3 and 3.4*).

Here, I limit the extent of coastal jurisdictions to national and subnational boundaries. In this research, I use the term decision-making processes to relate specifically to responses to climate and non-climate drivers of change and impacts on coastal systems in issue areas such as coastal water quality decline. I use the term functional fragmentation (see Tobey & Volk, 2002),



to mean disconnections between ecosystem conditions and coastal management responses and disconnections between the core mandates and objectives of coastal management arrangements, e.g., legislation, regulations, policies and strategies and coastal management practice, for the same issue area.

### **3.1.2 Fundamental principles of integration**

In this research, I view governance within the tradition of environmental governance as a process that enables decision-making related to environmental problems (Lemos & Agrawal, 2006). I also view governance from the perspective of the collective of governance arrangements that influence decision-making, within one or more jurisdictions (e.g., Biermann et al., 2009; Biermann et al., 2010). Governance also includes collaborative processes that enable decision-making related to common environmental problems (e.g., Ansel & Gash, 2006; Emerson & Murchie, 2010). Here, I make no distinction between ICM and governance, both are conceived as processes within which state and non-state agents make decisions about environmental problems, guided by underlying principles or rules (e.g., Cullinan, 2006).

For example, in the context of ICM, I view decision-making from the perspective of a set of principles. According to Cullinan (2006), “governance systems are ultimately based on fundamental values. These values give rise to structured sets of propositions that can be used to evaluate human conduct. These general propositions are usually referred to as principles” (p. 25). Cicin-Sain and Belfiore (2005) note that “ICM involves the application of a set of principles: overarching principles, principles related to environment and development, and principles related to the special character of oceans and coasts” (p. 855).

The overarching principles of ICM include sustainability and integration. The principle of sustainability focuses primarily on resource outcomes, particularly, how degraded ecosystems remain sustainable in the face of changes in biodiversity, resulting either from natural causes or from those induced by humans (Cicin-Sain & Belfiore, 2005). Closely connected to the sustainability principle are principles adopted by United Nations Conference on Environment and Development (UNCED) in 1992 related to the protection of the environment in the face of development. A primary focus of this principle is inter-generational equity (Cicin-Sain & Belfiore, 2005). In the context of this research, tourism stakeholders and other interests are concerned with the possible impacts of declining water quality on coral reefs and feedbacks to activities such as reef watching or recreational bathing. Burke et al. (2008) show the value of coral reefs to the tourism sector in Tobago. Additionally, in a study on tourism in Trinidad and Tobago, Teelucksingh & Watson (2013) used a Hausman-Taylor Model, to show the linkages between incremental losses in tourist arrivals and declines in protected area biodiversity. However, water quality decline and impacts on marine systems as coral reefs emanate from different spatial scales and multiple sources, where each source might be the management responsibility of different agents within a sector or across sectors.

Therefore, sustaining coastal systems such as coral reefs will require integrating management responses across sectors in issue areas that can affect coastal water quality. Firstly, integration seeks to match linkages and interactions between marine and terrestrial ecosystems and social systems (Cicin-Sain & Belfiore, 2005). Secondly, the integration principle matches these interactions with existing arrangements for coastal management or it seeks to identify opportunities for governance responses, where new challenges may emerge beyond the ambit or

regulatory reach of existing coastal management arrangements. Here, integration is concerned with vertical and horizontal linkages of spatial scales, levels of government, sectors and related coastal management arrangements (Cicin-Sain & Knecht, 1998). Cicin-Sain and Knecht (1998) identify five categories of integration in coastal management:

1. *Inter-sectoral integration*: bringing together agencies and groups from different sectors such as fisheries, tourism and oil and gas development.
2. *Intergovernmental integration*: bringing together the several levels of government: national, provincial, local, which typically have authority in the coastal zone and ocean.
3. *Spatial integration*: bringing together management issues concerning the land side of the coastal zone (including up-river issues related to watersheds and river basins) and issues related to the ocean side.
4. *Science-management integration*: applying practical knowledge from the natural and social sciences to managerial decisions about the oceans and coasts.
5. *International integration*: especially in cases where there are important transboundary issues that cross national boundaries.

### **3.1.3 Surrogate principles of integration**

In the ICM literature, the core principle of integration has been further classified and reified into surrogate principles that capture the fundamental logic of ICM research and practice. For example, Stojanovic et al. (2004), based on an extensive review of ICM literature have classified integration into several surrogate principles. Other authors have also pointed to principles that are subordinate to the core principle of integration (see Christie, 20005). Three of these surrogate principles include; comprehensiveness, harmonization and cooperation and

participation. Table 3-1 summarizes the fundamental tenets of each surrogate principle. Although these surrogates are not formal principles of ICM, they are implicit in the framing of integration in ICM scholarship and practice, at all scales.

**Table 3-1. Surrogate principles of integrated coastal management**

<b>Surrogate principles</b>	<b>Fundamental tenets</b>
Comprehensiveness	Connections and interactions between coastal marine and terrestrial systems, forged by causal pathways that link such systems, across functional landscape scales that shape interactions within littoral, other communities and governance systems
Harmonization	Complementarity between the goals and objectives and institutional mandates for the management of common issue areas, across sectors, coastal jurisdictions spatial scale, in response to climate and non-climate impacts on coastal systems contribute to effective coastal management
Cooperation and participation	Cooperation and participation among coastal sectors serves to resolve coastal management conflicts that are difficult to manage by other means Cooperation and participation may also include the sharing of technical capacity or research on critical issues related to coastal areas

*Adapted from Stojanovic et al. (2004) and Cicin-Sain and Knecht (1998).*

Using surrogate principles is a critical approach for guiding ICM research given that there is no defining theory of ICM. Integrated coastal management scholarship utilizes concepts and theories from multiple disciplines (Cullinan, 2006), based on a common epistemology of isomorphism. “Isomorphism is an individual concept used by various natural and social disciplines that attribute the same meaning to it” (Vallega, 2000, p. 250). According to Vallega (2000), the concept of isomorphism evolved from general systems theory proposed by von Bertalanffy (1968). von Bertalanffy proposed the general systems theory, “not only as a general view of reality but also as a general approach from (sic) science” (Vallega, 2000, p. 249). The

concept of isomorphism was first adapted to integrating the biological sciences. However, it has since been adapted to interdisciplinary thinking between the natural and social sciences, through concepts such as complex systems, holism, aggregation and integration (Vallega, 2000). This common epistemology is used to advance ICM scholarship and practice, based on knowledge across natural and social sciences that seeks to link the complexities and uncertainties that exist within the coast, with diverse coastal management arrangements (Cicin-Sain & Knecht, 1998; Sorensen, 1997; Vallega, 2000, Vallega, 1999).

The application of surrogate principles in ICM research could serve as a useful approach for reviewing coastal management literature. Because coastal management occurs within different contexts, with different goals and objectives, the use of the term integration in coastal management literature could at times be somewhat nebulous (Portmann et al., 2015). For example, at times integration could refer to the linkages between different processes in a specific ICM project cycle (Olsen, 2003). In some instances, integration might be used to refer to the interdisciplinary approach for bridging social and natural science perspectives in coastal management research (e.g., Turner, 2000). In other instances, integration might be used in reference to the connections within coastal management institutional networks (e.g., Tompkins et al., 2002). Given this diversity in application, the surrogate principles identified by Stojanovic et al. (2004) are also useful for guiding ICM research related to common issue areas, e.g., water quality decline, based on a sequential logic of integration, starting from linkages and interactions between coastal systems and ending with coastal management responses based on those interactions.

Below, using comprehensiveness, harmonization and cooperation and participation as guiding principles, I synthesize and connect the key ideas and issues that serve to frame the conceptual backgrounds in each of chapters four, five and six. In this way, I show how SES thinking, fragmentation and collaboration host the three surrogate principles of integration and how within the current epoch of climate and non-climate related drivers and impacts on coastal systems these bodies of scholarship can serve to advance thinking and practice in ICM. Table 3-2 presents the key definitions of concepts used in the following sections.

**Table 3-2. Selected definitions of key concepts**

Key definitions	References
<b>Integrated Coastal Management:</b> A “continuous and dynamic process that unites government and the community, science and management, sectoral and public interest, in preparing and implementing an integrated plan for the protection and development of coastal ecosystems and resources”	GESAMP, 1996, p. 3
A governance approach, based on clearly defined principles, related to the management of a specific issue area, e.g., coastal water quality decline, designed to overcome functional fragmentation in decision-making processes, within a sector or between sectors, at the same or different levels of coastal jurisdictions	Thompson, 2016
<b>Social-ecological systems (SES):</b> “Ecological systems intricately linked to and affected by one or more social systems. SES to refer to the “subset of social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and non-human biological units.	Anderies et al., 2004, p. 4
<b>Governance architecture:</b> “The overarching system of public and private institutions, principles, norms, regulations, decision-making procedures and organizations that are valid or active in a given issue area”	Bierman et al., 2010, p. 281
<b>Harmonization:</b> refers to the process or practice of matching complementary goals and objectives of coastal management arrangements, for common issues across spatial scales, within and across sectors and levels of coastal jurisdictions	Christie, 2005

Key definitions	References
<b>Fragmentation:</b> the extent to which linkages between the goals and objectives of coastal management arrangements for the management of common issues, across spatial scales, within or across different sectors and across levels of coastal jurisdictions are conflicting or synergistic or the extent to which such linkages fosters cooperation among different coastal interests	cf. Biermann et al., 2009
<b>Fragmentation:</b> A “patchwork of public and private institutions that differ in their character, constituencies, spatial scope, subject matter, and objectives”	Zelli, 2011, p. 256
<b>Fragmented architecture:</b> Different types of linkages between diverse governance arrangements that are synergistic, or cooperative, or conflicting.	Biermann et al., 2009
<b>Collaboration:</b> Collaborative governance integrates structures for decision making, deliberative processes, leadership and information, to resolve and manage difficult public policy problems”	Emerson & Murchie, 2010, p. 2

### 3.2 The Coast as an Integrated Social-Ecological System

Here, a SES refers to “ecological systems intricately linked to and affected by one or more social systems” (Anderies et al., 2004, p. 4). Anderies et al. (2004) also use SES to refer to the “subset of social systems in which some of the interdependent relationships among humans are mediated through interactions with biophysical and non-human biological units” (Anderies et al., 2004, p. 3). Social-ecological systems are defined based on the causal pathways that connect different system components (Fazey et al., 2011). Based on these interactions, Hopkins and Bailly (2012) have proposed a systems-based approach--a Systems Approach Framework SAF--to ICM. For them, a systems-based approach has a conceptual focus that starts with system interactions that can affect the sustainability of coastal resource use. This approach emphasizes common issue conflicts and obstacles to effective coastal governance due to unplanned approaches to policy (Hopkins & Bailly, 2012).

A systems approach suggests that fundamentally, ICM begins with the basic assumption that management solutions must respond to a set of comprehensive linkages and interactions, within and between different components of coastal systems, based on some common issue (Cicin-Sain et al., 1998). Integrated coastal management should then proceed from:

- (1) “Appreciating the degree of connectivity between this common coastal zone issue”  
(Hopkins & Bailey, 2012, p. 2)
- (2) Understanding how this connectivity affects ICM responses, particularly how connectivity creates conflicts, between existing coastal management arrangements and
- (3) Understanding how conflicts could be integrated and mediated, within collaborative coastal governance arrangements

In the advent of rapid global, regional and local drivers of changes that affect the coast and in line with the comprehensiveness principle of integration, coastal management and other scholars have sought to redefine the coast as a social-ecological system (see Hopkins & Bailly, 2012; Anderies et al., 2004) that interacts through pathways that integrate both social and ecological components. Much of this literature demonstrates how drivers of change and impacts from those drivers follow these pathways (Hopkins & Bailly, 2012; Holland et al., 2011; Thiele et al., 2005; Moreno & Becken, 2009; Livingston et al., 1998; Lapointe, 1997; Turner et al., 1996; Vallega 1999, p. 20; Glaser et al., 2012; Glaser et al., 2010; Glaeser et al., 2009; Cinner, 2011; Lloyd et al., 2013; Ferrol-Schulte et al., 2013). A SES approach provides another opportunity in ICM for a comprehensive framing of the coast in line with current systems thinking (Vallega, 1999).



Recent coastal management research also points to greater uptake of SES thinking that aligns more with responding to trajectories of change related to multiple climate and non-climate drivers (Butler et al., 2013; Barbier, 2014; Cinner et al., 2015; Cullen-Unsworth et al., 2014; Graham et al., 2014). Other researchers (e.g., Berkes, 2012) also note the need for a shift in the conceptualization in coastal systems, e.g., fisheries, as SES. Berkes (2012) points to the complex nature of challenges with maintaining sustainability in marine fisheries and the suite of governance arrangements that would be required to respond to such challenges. Hence, in this research, I conceive of the coast from the perspective of a SES as a Coastal Area Tourism System CATS (*Chapter four, subsection 4.3*). This conception of the coast serves to advance understanding of social-ecological interactions within coastal systems related to water quality decline from climate and non-climate related changes. Interactions within coastal SES also serve to match governance structures, governance performance and outcomes (*Objective two/chapter four*) (e.g., Armitage & Marschke, 2013; Glaser et al., 2012; Woodroffe & Murray-Wallace, 2012; Ferrol-Schulte et al., 2013).

However, two challenges confront responding to changes such as water quality decline in coastal SES. Firstly, coastal SES are impacted by multiple drivers and trajectories of change that interact in ways that are unpredictable and complex. For example, Barbier (2014) shows how declines in coral reefs due to rising sea surface temperature (RSST) result in increases in wave velocity and consequently coastal erosion. Coral decline is also associated with the enrichment of coastal waters in the nearshore from effluent discharge from hotels (Alemu & Clement, 2014). Additionally, coral decline could also be affected by sedimentation resulting from changing land use in inland watersheds (Mallela et al., 2010). This level of interconnectedness and interaction

between multiple drivers and trajectories of change highlights a major challenge for the integration of governance arrangements across sectors with responsibility for issue areas that impact coastal water quality. This challenge derives from the high levels of diversity between institutional mandates across different sectors (horizontally) and associated units of government (vertically) (see Olsen et al., 1997). This level of diversity leads to mismatches between the mandates of legislative and other regulatory rules, policies and strategies that derive from a sector-based coastal management approach (Duda & El-Ashry, 2000).

Secondly, “ICM does not replace traditional sector-by-sector management, but rather provides an additional dimension to the governance process by examining and acting upon the interactions and interdependencies among human activities, and the ecosystem processes that link coastal lands with the coastal ocean” (Olsen et al., 1997, p. 12). Here, sector-based coastal management refers to approaches within a single jurisdiction where different sectors operate within their own institutional mandates and pursue their own goals and objectives that support that mandate (see Wesmacott, 2001). Here, institutional mandate refers to the core focus of a sector. Invariably, the core institutional mandate for some sectors, e.g., tourism might be unrelated to the sustainability of coastal systems. Mandates for the protection of coastal systems usually reside within the environmental protection sector. However, notwithstanding the challenges for integrating coastal management within such diverse institutional settings, some coastal management literature, e.g., that related to issues such as shoreline protection (Lamberti & Zanuttigh, 2005) and coastal water quality decline (Ehler, 2003), often represents integration from the perspective of harmonization, i.e., complementarity and synergies between goals and objectives across sectors and levels of government (Enemark, 2005; Christie, 2005; Dauvin et

al., 2004; Cicin-Sain, 1993; Cicin-Sain et al., 1998; Pomeroy et al., 2015; Wever et al., 2012; Hershman et al., 1999).

Other ICM scholars, for example Tailjjard et al. (2012) and Müller (2009) and Christie et al. (2005), note the difficulties associated with harmonizing coastal management arrangements and the necessity for finding solutions for coastal management problems, utilizing existing legislative and policy arrangements. For example, Müller (2009), in the context of provincial coastal management in South Africa notes the complex institutional environment within which coastal management exists. He argues that harmonizing responses to coastal management problems in such an environment would require new legislation; a process that could be extremely time-consuming. Müller (2009) criticized the idea of institutional reform as the appropriate response to the (sector-based) fragmentation viewed by many as the primary challenge facing environmental governance in South Africa. Instead, he views “the emergence of the smaller nimble postmodern organization, with a lower level of hierarchy and control” as a possible remedy able to cope with the “fast-changing technologies and environments characteristic of the modern age” (p. 92) (cited in Tailjjard et al., 2012). Similarly, Christie et al. (2005) in the context of ICM in the Philippines note that “institutional and legal frameworks that mandate governance reform are lagging behind the pace of ICM project evolution, to the point that sustained progress is being undermined.” Further, they note that “the divisions between municipal and national agencies and between various national sectoral agencies remain largely intact and therefore limit the expansion of ICM across these institutional boundaries.” (p. 475). These coastal management challenges can slow down and frustrate management responses to urgent and pressing problems (Müller, 2009).

### **3.3 Fragmentation in Coastal Management**

Coastal management is inherently sector-based and fragmented (Olsen et al., 1997). Although the concept of fragmentation is not widespread in coastal management literature, fragmentation is implicit, based on the attention placed and challenges arising from sector-based coastal management (Taljaard et al., 2012). In the coastal management literature fragmentation relates mostly to sector-based management conflicts caused by disparate institutional mandates (Taljaard et al., 2012; Hofmeester et al., 2012; O’Riordan et al., 2006; Balgos, 2005). Often, this type of fragmentation is framed as a problem for multi-sector and multi-level governance (Ehler, 2003; Cicin-Sain, & Belfiore, 2005). This thinking is in line with the conceptualization of fragmentation by Zelli (2011). For Zelli (2011), fragmentation represents policy domains marked by a “patchwork of public and private institutions that differ in their character, constituencies, spatial scope, subject matter, and objectives” (p. 256). Zelli’s (2011) definition highlights the inevitable disconnections that exist within coastal governance systems. However, it deemphasizes the fact that within such systems synergies might exist between the subject matter and objectives of governance arrangements related to similar issue areas, across different sectors and levels of government. It also deemphasizes the loose connections that may exist within sector-based management goals and objectives across sectors and spatial scales (Hassanali, 2015).

Other authors have presented a more nuanced view of fragmentation, within a wider framework of governance architecture. Biermann et al. (2010) define governance architecture as “the overarching system of public and private institutions, principles, norms, regulations, decision-making procedures and organizations that are valid or active in a given issue area” (p. 281). Note, that Biermann et al. (2010) define architecture from the perspective of a given issue

area. In this research, integration, like architecture, is defined from the perspective of an issue area. In this research, I defined ICM as a governance approach, based on clearly defined principles, related to the management of a specific issue area, e.g., coastal water quality decline, designed to overcome functional fragmentation in decision-making processes within a sector or between sectors, at the same or different levels of coastal jurisdictions (cf. McKenna et al, 2008; see also Cullinan, 2006). The highlighting of an issue area is an important distinction in defining ICM. This is important because at times the literature on ICM does not always distinguish between whether integration refers to a specific issue area or the integration of several issue areas (see GESAMP, 1996, p. 3-4). The identification of a specific issue area is an important feature of defining fragmentation. This distinction is not obvious in Zelli's (2011) definition of fragmentation.

Using an issue area as a defining feature, Biermann et al. (2009) show how within fragmented governance arrangements opportunities exist that might serve to speed up decision-making between multiple levels of government in response to global climate change, for issue areas such as RSST. Biermann et al. (2009) developed a typology of fragmentation, based on several predetermined criteria. These criteria include the degree of institutional overlap between decision-making systems, existing and conflicting norms and different types of constellation among actors. Biermann et al. (2009) assert that the inevitability of multiple governance arrangements across different levels and the complexity of global environmental change mean that plausible solutions may only be found using fragmented approaches.

Biermann et al. (2009) present the criteria above from the perspective of assessing fragmentation across global, regional and local levels of governance. However, these criteria are

scalable for application and analysis of fragmentation at lower levels, e.g., national and subnational and other types of governance arrangements, i.e., regulations, policies and strategies in coastal management (Shipman & Stojanovic, 2007). For example, within the context of multiple drivers and trajectories of change that impact coastal SES, fragmentation provides the foundation for analysis of the interactions between the goals and objectives of coastal management arrangements for a common issue such as water quality decline (De Freitas et al., 2013; Fidelman et al., 2013; Grillo, 2011; Glaser et al., 2010; Ehler, 2003).

Table 3-3 presents a typology of fragmentation developed by Biermann et al. (2009). The typology has been modified to include policy alignment and strategic agreement. Both form key elements of governance architecture in coastal areas. Biermann et al. (2009) have not addressed these two arrangements in their framework. The typology in Table 3-3 below has been further modified in chapter five (Table 5-1). A more detailed discussion of conflicting, cooperative and synergistic linkages is also provided in chapter five.

**Table 3-3. A Typology of fragmentation of governance architectures**

	<b>Synergistic</b>	<b>Cooperative</b>	<b>Conflicting</b>
Policy alignment	Overarching policy framework for coastal management	Policies for related issue areas loosely integrated	Different unrelated policies
Strategic agreement	Major strategies agree with common goals and objectives	Strategies closely related to common goals and objectives	Strategic goals and objectives unrelated
Institutional nesting	One core institution with other institutions being closely integrated	Core institutions with other institutions that are loosely integrated	Different largely unrelated institutions
Norm conflict	Core norms of institutions are integrated	Core norms are not conflicting	Core norms conflict
Actor constellations	The same institution governs all relevant actors	Major actors are governed by different institutions; decisions are made through collaboration	Major actors are governed by different institutions

*Adapted from: Biermann et al. (2009).*

A typology of fragmentation could serve to frame and analyze how different linkages between the goals and objectives of coastal management arrangements could enable or constrain coastal management decision outcomes (Bierman et al., 2009). This typology is based on the assumption that while integration is intended to create harmony, i.e., synergies between different governance arrangements that govern common issue areas, to create that harmony integration also has to respond to existing mismatches between the mandates of legislative and other regulatory rules, policies and strategies. Where synergies exist, integration of governance arrangements related to a common issue area is hardly ever an issue. Synergies allow for almost seamless transition from sector-based approaches, to integrated management approaches (see Serrao-Neumann et al., 2015). However, in jurisdictions where different agencies with varying interests pursue different objectives in the management of a similar issue, sector-based approaches have been known to result in conflicts due to policies and legislative arrangements that may be disconnected from the wider coastal management goals (Duda & El-Ashry, 2000).

Arbo and Thủy (2016) refer to such regulatory environments as mixed constellations with multiple objectives, actors and management settings. Often, in such coastal jurisdictions, conflicts exist between one set of coastal management arrangements, within the same sector, e.g., regulatory rules, while synergies exist in other arrangements, e.g., general conservation policies. Hassanali (2015) shows the existence of these mixed coastal management contexts in Trinidad and Tobago, where coastal management occurs across a national and subnational jurisdiction and where managing the impacts of coastal water quality decline on coral reef health straddle the goals and objectives of regulations, policies and strategies related to several sectors.

Additionally, Taljaard et al. (2012) point to the use of mechanisms such as Memoranda of Understandings (MOUs), to regulate conflicts between different coastal interests. For example, Taljaard et al. (2012) show how MOUs transfer authority between sectors and levels of government, to facilitate decision-making related to common coastal problems. Further, Taljaard et al. (2012) show how Certificates of Environmental Clearance (CECs), serve as mechanisms that regulate decision-making across sectors with loosely related institutional mandates for common issue areas but different institutional authority and sometimes different regulatory standards.

The observations by Taljaard et al. (2012) and Hassanali (2015) highlight the existence of case evidence where opportunities have been exploited for integration even within diverse sector-based and multi-level coastal management jurisdictions. Coastal management within such diverse institutional environments might offer solutions for overcoming the legislative and policy mismatches and conflicts noted by scholars such as Müller (2009), and the functional conflicts that occur in the governance of coastal areas resulting from these challenges (see Tobey & Volk, 2002).

### **3.4 Integrating Coastal Management Through Collaboration**

Fragmented approaches are not a panacea for integrating coastal management. Because coastal management is practiced largely within a sector-based and fragmented institutional setting, collaboration has also been suggested as an alternative strategy for integration (Cunningham & Cobbold, 2015; Ernoul & Wardell-Johnson, 2013). The coastal management literature highlights instances where conflicts that emanate from disparate and fragmented coastal management arrangements could perhaps only be resolved via collaboration. Here, I use



collaboration following Emerson and Murchie (2010), who state that “collaborative governance integrates structures for decision making, deliberative processes, leadership and information, to resolve and manage difficult public policy problems” (p. 2). The characterization of collaboration by Emerson and Murchie (2010) is useful for thinking about collaboration between different sectors affected by similar problems that affect coastal ecosystems. It is also valuable for framing and understanding management conflicts that arise where the rights and responsibilities for the management of a similar issue area are shared between different state agencies or between state and non-state interests (Crowder et al., 2006; van Leeuwen et al., 2014). The definition of Emerson and Murchie (2010) is also a useful starting point for connecting different arenas of collaboration.

Coastal management scholars suggest that common coastal management problems can be overcome to some extent through processes and principles that promote cooperation and participation (Stojanovic et al., 2004). Such problems can be resolved through “a continuous and dynamic process that requires the active and sustained involvement of the interested public and the many stakeholders with interests in how coastal resources are allocated and how conflicts are mediated. The ICM process provides a means by which concerns at local, regional, and national levels are discussed and future directions are negotiated” (GESAMP, 1996, p. 3).

Management of common environmental problems that impact different interests in coastal systems requires agreement between different sectors across two or more jurisdictions (see Nielsen et al., 2013; Imperial, 2005). Often, such collaboration also requires building new institutional capacity, with the requisite authority for decision-making and successful implementation of ICM programs (Imperial, 1999). In this environment, whether or not the goals

of collaboration are achieved could depend on how trade-offs are negotiated between rights and responsibilities and divergent interests (Pomeroy et al., 2007; Steins & Edwards, 1999; Tompkins et al., 2002). Collaboration could also be influenced by trade-offs between antecedents claims on coastal resources as well as the value of coastal resources to wider public interests (Johnsen & Hersoug, 2014). For example, in Tobago-the focus of this case study-collaboration and collaborative outcomes between fishermen, private oil and gas interests and government have been shaped by trade-offs between the rights of access to fishing grounds by local fishermen and the value of oil and gas resources to the wider economy of Trinidad and Tobago (*Member, Southwest Tobago Fisherfolk Association, Personal Communication, June 16, 2014*). Without such trade-offs, collaboration might be impeded within the collaborative process itself, where factors such as power, leadership and accountability, serve as the main determinants of collaborative outcomes (Sullivan et al., 2012; Huxham & Vangen, 2000; Ansell & Gash; 2008; Lane et al., 2004; Lockwood et al., 2009).

When examined within an ICM setting, coastal challenges that serve as the underlying motivation of collaboration, e.g., protection of coastal water quality, shared rights and responsibilities among divergent interests, the negotiation of elements such as power within collaborative processes and new collaborative institutional arrangements, represent deliberative spaces or arenas of decision-making (Charbonneau, 2012). These arenas collectively represent a collaborative domain, with interconnected elements (Saint-Onge & Armstrong, 2004). Analysis of collaboration within such a domain offers great scope for understanding how collaborative outcomes are shaped by linkages and interactions between the functional elements, e.g., leadership, power, existing institutional arrangements (Tobey & Volk, 2002; Saint-Onge &

Armstrong, 2004), across different arenas (Sutton & Rudd, 2014; Imperial, 2005; Bryson et al., 2006; Emerson & Murchie, 2010; Emerson et al., 2012). For example, Sutton and Rudd (2014), in the context of collaborative fisheries management, show how the local contextual knowledge of a leader and his or her closeness to the community helps to build trust and enhance collaborative decision-making among community groups. A domain level approach represents a significant departure from the current ICM literature that focuses primarily on resolving coastal management conflicts through co-management, i.e., the sharing of rights and responsibilities. However, Gray (1985) notes that “a domain level focus is essential for understanding and solving collaborative problems” (p. 912).

## **4.0 CHAPTER FOUR: Challenges and Opportunities for Managing Trajectories of Change Affecting Coastal Area Tourism Systems**

### **4.1 Abstract**

Tourism forms an important component of the coastal system because coastal ecological systems such as coral reefs, bays and beaches hold significant use value for tourism. Consequently, climate and non-climate drivers and trajectories of change that affect coastal marine and terrestrial systems eventually affect coastal tourism. Therefore, understanding the linkages between tourism and coastal biophysical systems is a critical aspect of integrated coastal management (ICM). Using a case study approach of a marine protected area, and a social-ecological systems perspective, this study examined how declines in coastal water quality affect coastal tourism activities such as reef tours. Further, the study identified and examine the challenges and opportunities for responding to the effects of declines in coastal water quality within existing coastal management arrangements. The results revealed that coral reefs have been severely affected by climate drivers such as rising sea surface temperatures (RSST) and land-based pollutants, e.g., sewer discharge from hotels. However, declines in coral health have not had any major impacts on tourism activities such as reef tours. Conversely, changing weather patterns and sedimentation from inland sources have negatively impacted activities such as recreational diving. Because of the lack of evidence of clear connections between the impacts of change on coastal systems and significant effects on coastal tourism activities such as reef tours, the tourism sector has focused mostly on socio-economic drivers that influence tourist arrivals. The absence of clear evidence that links tourism arrivals and some activities to declines in coastal water quality has seemingly led to complacency among tourism interests, regarding the need for greater involvement in coastal management. Additionally, coastal management that

focuses on the aesthetic value of coastal systems to tourism and the lack of informed policy responses to coastal water quality decline has led to maladaptive responses to coral reef declines. In terms of responding to drivers and trajectories of change, new approaches to watershed management that link land use in watershed with coastal water quality declines provides an opportunity for linking watershed management with water quality management in coastal areas.

**Keywords:** trajectories of change, coastal water quality, coastal tourism, coastal systems, coral reefs, ICM

## 4. 2 Introduction

Recent literature on tourism systems has focused on aligning tourism more closely with social-ecological systems (SES) perspectives (e.g., Metcalf et al., 2015; Cullen-Unsworth et al., 2014; López-Angarita et al., 2014). Some authors have applied systems frameworks to studying the impacts of climate and non-climate drivers of change on tourism (e.g., Strickland-Monroe et al., 2010; Becken, 2013). This body of scholarship has focused largely on resilience in social-ecological coastal systems (e.g., Petrosillo et al., 2006; Baggio & Sainaghi, 2011). However, SES scholarship also provides the basis for understanding and responding to impacts from climate and non-climate driver of change on the tourism sector, based on the reciprocal interactions between coastal ecological systems and coastal tourism activities (Binder et al., 2015). Here, SES scholarship serves as an important conceptual tool for identifying causal pathways of change and for mapping trajectories of social-ecological changes between coastal tourism activities and coastal ecological systems along these pathways (e.g., Binder et al., 2015; Fazey et al., 2011; Holland, et al., 2011; Hopkins & Bailly, 2012). More importantly, SES scholarship provides an avenue for identifying and analyzing the coastal management challenges

and opportunities associated with responding to trajectories of social-ecological changes (Anderies et al., 2004; Cinner et al., 2012b).

Using an instrumental case study approach and a SES perspective, I demonstrate how different drivers of change connect coastal ecological systems, contiguous terrestrial systems and coastal tourism, through social, biophysical and institutional impacts, effects and feedback trajectories. Relatedly, I show how these connections serve to shape coastal management responses. Firstly, I develop a conceptual framework that represents the coast as a Coastal Area Tourism System (CATS). Secondly, I use this framework to establish causal loops that serve to identify and critically examine drivers and trajectories of change related to declines in coastal water quality. I identify drivers and trajectories related to sedimentation emanating from inland watersheds and effluent discharge from tourism development within the coastal near shore. These trajectories can create secondary effects and feedback on coastal tourism activities, e.g., diving and reef watching. I then use these trajectories to highlight the challenges and opportunities for responding to changes in coastal water quality within existing coastal management arrangements.

#### **4.3 Conceptual Framework of Coastal Area Tourism Systems**

A critical first step in the conceptualization of CATS entails the characterization of the structure of the coastal system and coastal area from a SES perspective. Here, a SES refers to an “ecological systems intricately linked to and affected by one or more social systems” (Anderies et al., 2004). In the context of CATS, ecological systems include both marine and terrestrial components. Social systems include both economic and governance arrangements (Anderies et al., 2004). From a normative perspective, SES scholarship emphasizes the interdependence of both social and ecological components (Perry et al., 2011; Folke et al., 2005). Consequently,

several authors have used SES as a lens, to study the dynamic interactions between both components. This approach serves to advance understanding of how linked systems can be managed in the face of changing social or ecological conditions (e.g., Berkes et al., 2000; Cinner et al., 2012; Cote & Nightingale, 2012; Larsen et al., 2011; Ommer et al., 2012; Ruiz-Ballesteros, 2011).

Following the definition of SES by Anderies et al. (2004), a coastal area tourism system is defined as a coastal system linked by the interactions between biotic, abiotic and social elements, within the limits of a bounded coastal area and management jurisdiction. A Coastal Area Tourism System possesses three fundamental components: the coastal area, the coastal marine and terrestrial system, and the coastal tourism organization.

Inherent systems interactions occur between different elements of CATS. These interactions follow causal pathways that link coastal marine or terrestrial systems with coastal tourism activities (Hopkins & Bailly, 2012). Social and ecological changes mimic these pathways and is traceable, from initial drivers of change to impacts, secondary effects and feedbacks (Cinner et al., 2015). These interactions may emanate from one component of the system with secondary effects and feedbacks within that component. Interactions emanating from any one component may also cross system boundaries, creating secondary effects and feedbacks in other components. These different pathways acknowledge the existence of multiple interactions within a system (Persha et al., 2011). Here these impacts, effects and feedbacks are represented as trajectories of change (cf. Fazey et al., 2011). A trajectory of change is defined as a source of a driver of change in one component of CATS, to a point of impact, its secondary effect and or feedback (see Fazey et al., 2011). The following review of literature seeks to

identify different causal pathways that trajectories of change follow, within and between the three components of CATS.

#### **4.3.1 Coastal marine and terrestrial systems**

Both marine and terrestrial systems form important elements of the coastal ecology and interact in ways that have significant implications for coastal area management. Multiple reciprocal interactions link these components. For example, coral reefs serve as habitats for marine turtles, while, foraging turtles manage subaquatic vegetation in coral ecosystems. (León & Bjorndal, 2002; Stadler et al., 2014). The structure and health of coral reefs are linked to sea surface water temperature, while the structure and extent of coral reefs regulate tidal flow rates and wave action nearshore (Ferrario et al., 2014; Barbier, 2014; Mumby et al., 2004). Based on these interactions coral reefs contribute to shoreline stability (Huang et al., 2012; Sheppard et al., 2005). Here, I refer to these natural linkages and interactions as causal pathways. I define a causal pathway as linkages through which components in SES are connected to and interact with each other (see Persha et al., 2011; Österblom et al., 2013). Both climate and non-climate drivers of change can be traced through these pathways, based on impacts, effects and feedback between different subsystems. For example, increased wave velocity has been associated with severe erosion of coastal beaches during periods of storm surges (Barbier, 2012). Relatedly, Baldock et al. (2014) show how even under sea level rise (SLR) the surface area turbulence created by coral reefs contribute to decreasing wave velocity. These interactions link the impacts of SLR, storm surges and coastal erosion with coral decline due to rising sea surface temperature (RSST) and anthropogenic impacts. Impact areas and systems within these areas also share connections with terrestrial systems in the hinterland, through estuaries and rivers (Nguyen et al., 2013;



Chuenpagdee et al., 2013). Anthropogenic impacts on coastal marine systems, e.g., sedimentation occur through these linkages (Lapointe et al., 2010).

Coastal tourism also shares close ties with coastal marine and terrestrial systems, through impacts on important social and ecological systems on which tourism depends (Alemu & Clement, 2014; Belle & Bramwell, 2005; Hopkins & Bailly, 2012; Mallela et al., 2010), or based on the economic and leisure value derived from such systems (Barbier 2012; Ruckelshaus et al., 2013). In a Caribbean context, for example, Lapointe et al. (2010) and Lapointe (1997) have demonstrated how anthropogenic drivers such as deforestation and the development of human settlements result in sedimentation of watercourses, decreases in the growth of submerged aquatic vegetation and declines in coral reef systems. Ecological changes attributed to these drivers have also been linked to their underlying institutional dimensions (Storbjörk & Hedrén, 2011). These effects eventually feed back to both tourism niches and activities, based on the use value of beaches and marine water quality and coral reef aesthetics (Holland et al., 2011; Thiele et al., 2005; Barbier, 2012), and their economic value (Burke et al., 2008; Teelucksingh & Watson, 2013).

#### **4.3.2 The coastal tourism organization**

Coastal areas have been characterized by their social and economic structure, particularly the manner in which economic sectors are connected to and derive benefits from coastal ecological systems (see Vallega 2002, 1999; Nicholls, 1999). Vallega (1999) characterizes this as the coastal economic organization. Using this characterization, the coastal tourism organization can be defined based on the linkages of coastal ecological systems to tourism niches and activities, e.g., reef tourism and activities such as reef tours or diving (Jurado et al., 2012;

Sijtsma et al., 2012). These connections may be internal or external to the coastal area tourism system.

Both tourism and coastal management scholars have established cogent empirical linkages between tourism and coastal marine and terrestrial systems, based on the use or aesthetic value of the latter to the former (Fonseca et al., 2014; Onofri & Nunes, 2013). For example, Teelucksingh & Watson (2013), using a Hausman-Taylor Model, in a study of tourism in Trinidad and Tobago, link incremental losses in tourist arrivals to declines in protected area biodiversity. Other connections have been made based on cross-scale international, regional or national market drivers and impacts. For example, seasonal population mobility in supply markets has been associated with visitor flows to a destination (Charles-Edwards & Bell, 2015). Additionally, clear empirical linkages have been made between economic declines in supply markets and a reduction in seasonal arrivals at destination markets (Browne & Moore, 2012). Climatic events affecting supply markets have also affected seasonal flows of visitors, creating cross-scale effects on the tourism organization at a destination (Amelung et al., 2007). For example, Scott and Lemieux (2010) show how changes in weather patterns in supply markets lead to increases in visitor arrivals at destination markets.

### **4.3.3 The coastal area**

The coastal area as a component of the coastal area tourism systems serves to define the coastal jurisdictional limits and the boundaries of analysis. The coastal area could be defined based on impact areas, e.g., marine areas and the coastal fringe as designated management areas, and the coastal management jurisdiction (Chuenpagdee et al., 2013). Coastal marine and terrestrial ecosystem impacts and effects interact within marine areas, the coastal fringe and

protected area. Given the links between coastal impact areas and inland terrestrial systems, often, the source of impact derives from jurisdictions outside of the immediate management area (Nguyen et al., 2013). Hence, the coastal area is important for the establishment of jurisdiction or administrative limits and the analysis of different issue areas and system interactions within those boundaries (Schofield & Freestone, 2013). Here, boundaries are interpreted to mean the limits within which management responses have effect. Bounded SES serve to represent contextual conditions, within clearly defined limits, without prejudice to exogenous boundary effects (Kittinger et al., 2012). Setting the limits of coastal management within different boundaries, e.g., designated management areas, sectors and levels of coastal management, contributes to analyses of the reach of management responses to trajectories of change (see Celliers et al., 2013).

In some instances, ICM related to climate and non-climatic impacts and their impacts on coastal marine and terrestrial systems may create the need for new management arrangements. However, in other instances, responses to trajectories of change could be formulated within existing coastal management arrangements, based on patterns of interconnectedness (Taljaard et al., 2012; Aswani et al., 2012; McFadden, 2010; Brander et al., 2012; Cheablum & Shrestha, 2015). Within these contexts managing trajectories of change would also mean navigating linkages in the management responsibilities of different sectors and levels of coastal management (cf. Cinner et al., 2015; Aswani et al., 2012). A social-ecological systems approach provides the basis for identifying and responding to change based on these linkages.

#### **4.4 Research Methods**

This research utilized an instrumental case study approach and a SES lens, to examine trajectories of social-ecological change, based on the conceptualization of a CATS in southwest Tobago. Instrumental case studies, unlike other case studies, “provide insight into an issue or helps to refine a theory or in this case a concept” (Stake, 1994, p. 237). The concept of CATS was used as a framework to map the climate and non-climate drivers and trajectories of change between marine and terrestrial systems, inland terrestrial systems, the institutional dimensions of these changes and coastal tourism niches and activities (see Kittinger et al., 2012). Trajectories of change relate to climate and non-climate drivers and impacts on coastal water quality and beach quality, and effects and feedbacks on coastal tourism activities. The conceptualization of CATS also allowed for the alignment and examination of stakeholder responses to drivers and trajectories of change and with existing coastal management arrangements (Kittinger et al., 2012).

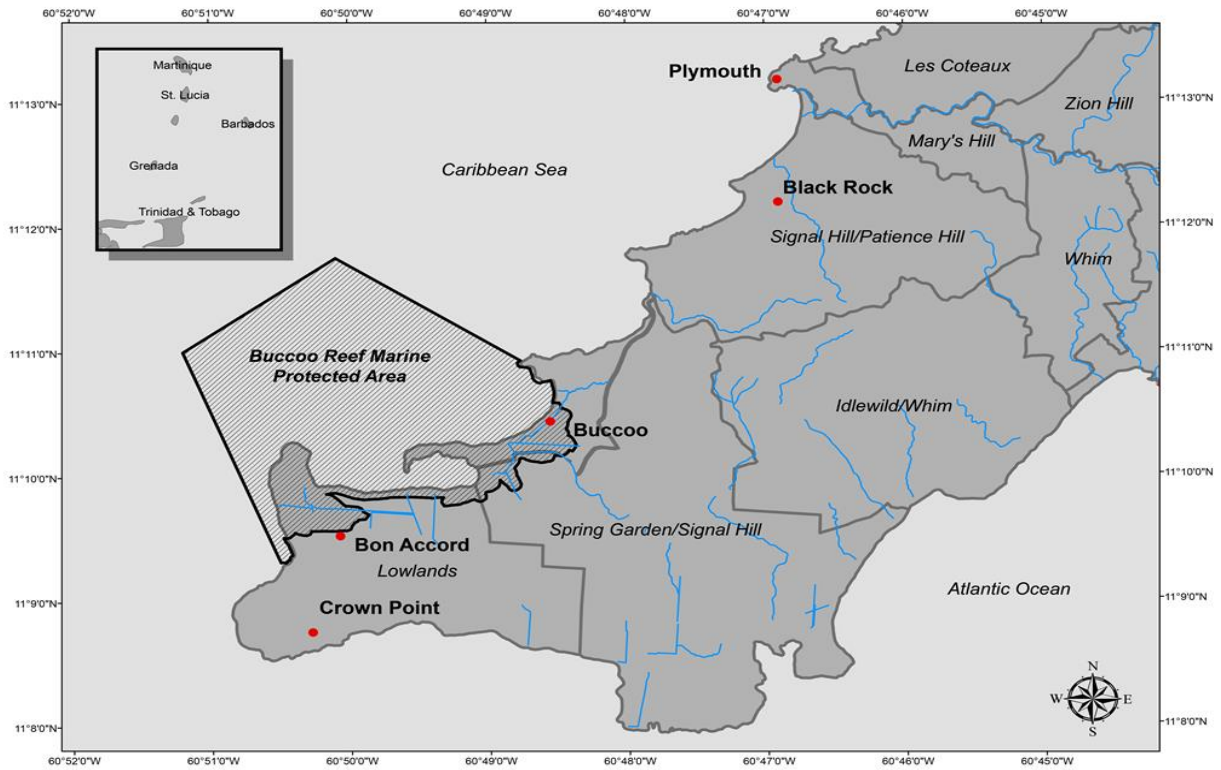
Stakeholder responses are shaped by their experiences of change but also their perspectives of such changes. Therefore, analyzing their perspectives provides an avenue for understanding the interactions between the contexts of social-ecological change and decision-making regarding those changes (see Larsen et al., 2012; Bennett, 2016). Stakeholder perspectives have been linked to more effective responses to changes in climatic conditions. For example, stakeholder perspectives serve to increase the robustness of research by directly engaging with the social context and legitimizing decision-making related to those contexts (André et al., 2012; Belle & Bramwell, 2005; see also Kittinger et al., 2012). Legitimization of decision-making is further enhanced by combining research from biophysical sciences, e.g.,

climatology, geomorphology and oceanography, with the interests, values and perspectives of stakeholders within and across several sectors (Belle & Bramwell, 2005). This approach helps to validate the views of respondents (see Morse, 2002).

#### **4.4.1 Case study context**

The case focuses on the southwestern coastline of Tobago, along a stretch of coastal villages, from Plymouth in the north to Crown Point (see Figure 4-1). Tobago is the smaller of the two islands in the twin island republic of Trinidad and Tobago, the most southerly islands in the Caribbean Sea. Tobago has a land mass of 300 km<sup>2</sup>. Approximately, 56% of Tobago's population of about 60,000 is concentrated within the southwestern area (GOTT, 2011a). The transitory tourism population from different source markets adds to this figure (see Figures 4-2 and 4-3). Coastal management in Tobago occurs within a dual-level structure of government, where regulations and policies from the national level also apply to the subnational level. Additionally, the subnational level has authority to formulate policy within a limit of 6 nautical miles.

Within this general southwest area is the Buccoo Reef /Bon Accord Lagoon Complex (BR/BLC) an area of approximately 12.87 km<sup>2</sup>. Within the BR/BLC is nested the Buccoo Reef Protected Area (BRPA) within an estimated area of 7 km<sup>2</sup> (Potts et al., 2004; see also Figure 4-1). The BR/BLC comprise marine ecological enclaves, including mangroves, lagoons, beaches and extensive coral reef formations, with significant social and economic value to Tobago's economy (Lapointe et al., 2010; Burke et al., 2008). The southwestern coastal area supports Tobago's core tourism infrastructure, e.g., hotels, villas and guest houses and a diversity of tourism activities; including, reef tours, recreational diving and bathing.



**Figure 4-1. Map of Buccoo Reef Marine Protected Area in southwestern Tobago, with Trinidad and Tobago inset. Source: ParCA project**

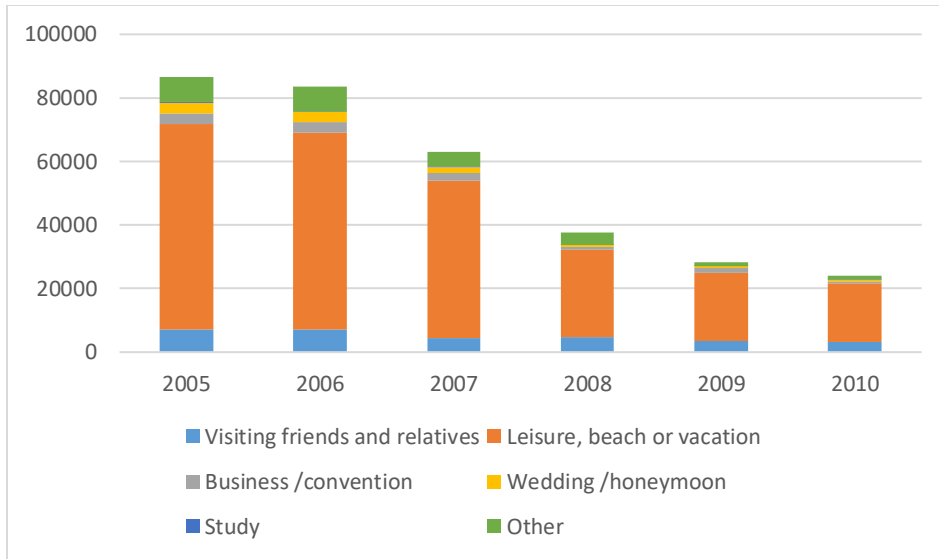
The economy of Tobago is part of the larger oil and gas economy of Trinidad and Tobago (Lewis & Jordan, 2008). However, unlike Trinidad where the oil and gas economy is the major contributor to Gross Domestic Product (GDP), tourism remains a major driver of the internal core service economy of Tobago (see Weaver, 1998), accounting for TT\$1.86 billion of the island's GDP.<sup>4</sup> Recent reports have estimated employment in the tourism sector at about 57 % of the island's workforce of 33,000<sup>5</sup>. Coastal tourism in southwest Tobago can be classified largely

<sup>4</sup> <http://thetobagonews.com/eng-en/index.php/home/headlines/item/360-54-of-tobago-workforce-employed-by-tha>

<sup>5</sup> <http://chamber.org.tt/articles/tobagos-tourism/>

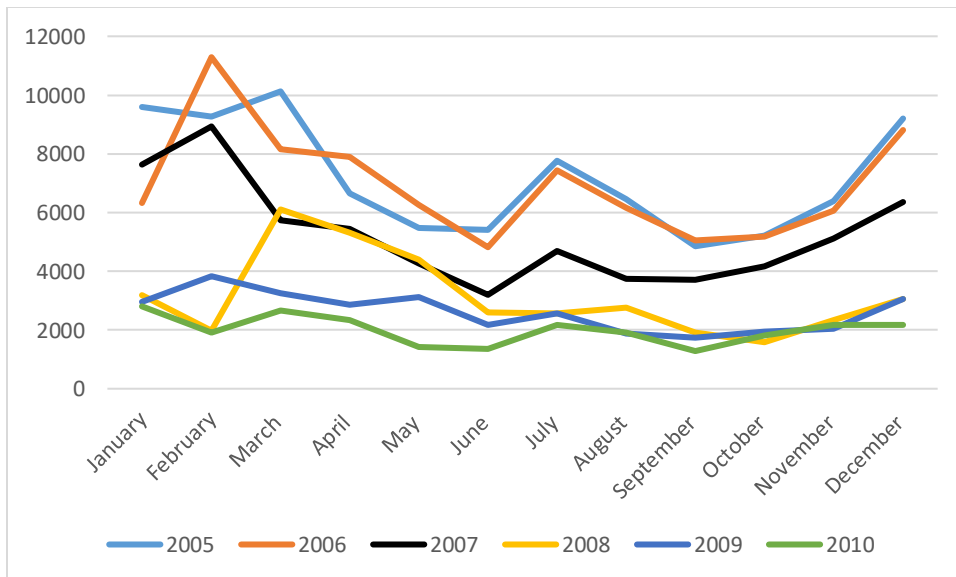
as reef-related tourism and beach tourism, supporting activities in tourism niches such as reef tours, snorkeling, diving and recreational bathing (Beharry-Borg & Scarpa, 2010; Burke et al., 2008). The value of coastal ecological systems has been a major selling point for tourism in Tobago. Therefore, the BRPA has been a primary source of attracting tourists. Leisure and beach related activities have also been associated with significant visitor arrivals to the island. For example, in 2006, estimates of the total economic contribution of reef-related tourism and recreation to Tobago's economy ranged between US \$101 and \$130 million dollars (Burke et al., 2008; see also Table 4-1).

Tobago tourism depends mainly on visitors from international and national markets. International visitors represent the major component of arrivals. International visitor arrivals usually coincide with the peak tourist season from November to April (see Figure 4-3). Local visitor flows from Trinidad occur year-round, mainly on weekends. However, peak visitor traffic from local tourists coincides mostly with periods related to school vacation and sometimes slow international visitor traffic during the months of July and August (see Figure 4-3).



**Figure 4-2. Stopover visits to Tobago 2005-2010**

*Source: Tourism Development Company Ltd<sup>6</sup>*



**Figure 4-3. Monthly stopover visits to Tobago 2005-2010**

*Source: Tourism Development Company Ltd<sup>7</sup>*

<sup>6</sup> <http://www.tdc.co.tt/pdf/StopoverVisitorstobyPOVtob.pdf>

<sup>7</sup> <http://www.tdc.co.tt/pdf/StopovertoEachDestinationMth2002toDec2010.pdf>



**Table 4-1. Impact of reef-related tourism and recreation in Tobago (based on net revenues and transfers to the economy)**

<b>Activities</b>	<b>Revenues (\$US million)</b>
Reef-related visits	40
Accommodation	24.7
Reef recreation-diving	1.3
Reef recreation-snorkelling and glass bottom boats	1.5
Miscellaneous visitor expenses	16
Indirect revenue (using multiplier of 1.8-2.2)	58-86
<b>Total</b>	<b>101-130</b>
<i>Values not always captured by economy</i>	
Consumer surplus	1.1
Local use	13-44

*Source: Burke et al. (2008) Tourism and inclusive growth in small island developing states*

Current empirical and anecdotal evidence from within the study area suggests that the coastal ecological systems that support coastal tourism have been experiencing significant biophysical changes (e.g., declines in water quality and coral bleaching) for more than 15 years (Mallela et al., 2016). These changes have been associated with a diversity of impacts, from global climatic forces, changing seasonal weather patterns, coastal development related to tourism and other anthropogenic forces further inland (Mallela et al., 2010). These impacts and their associated effects and feedbacks have been seen as a primary driver of change in the coastal marine and terrestrial ecology within the BR/BLC and surrounding villages. These have also been associated with adverse effects in coastal tourism.

The importance of coastal tourism to the Tobago economy, the concentration of tourism-dependent ecological systems and related infrastructure within the coastal area, and associated climate-related challenges, serve to focus this case study on the scope of existing coastal management arrangements to deal with probable social-ecological changes on coastal tourism. These changes can be linked mostly to how climate and non-climate drivers affect coastal water quality decline. Addressing issues related to the source and nature of these impacts and the likely effects and feedbacks on coastal area tourism form essential elements of identifying challenges and opportunities that can impede or improve coastal management responses.

#### **4.4.2 Data collection and analysis**

The data for this paper was drawn from 140 semi-structured interviews from a Community-Based Vulnerability Assessment (CBVA) conducted within the study area during the months of May and June 2012. The CBVA data was collected using snowballing and saturation (Morse et al., 2014; Biernacki & Waldorf, 1981). The data set also included 75 semi-structured interviews from follow-up fieldwork in the study area in June and July 2014. This sample was selected purposefully and based on referrals (Patton, 2002) (see Appendix F).

The CBVA targeted tourism and fisheries stakeholders and sought to capture in part threats from the impacts of changing climatic conditions and non-climatic sources of change. The 140 CBVA interviews also included 10 key informant interviews with leaders and mid-level supervisors in the Department of Natural Resources and the Environment (DNRE), Department of Marine Resources and Fisheries (DMAF), Tobago Emergency Management Agency (TEMA). These 10 interviews also included leaders in non-government organizations, e.g., the Buccoo Reef Trust and Environment Tobago. These 10 key informant interviews focused on

understanding the governance arrangements within which government and non-government agencies operated and how these arrangements are connected to outcomes in coastal management. For example, in the case of NGOs, the interviews focused on collaborative linkages with government departments and how these might be linked to responses to changes captured by the CBVA.

In total 50 interviews from the CBVA were selected for this study (see Namey et al., 2008). The CBVA interviews were used mainly to establish biophysical drivers of change, the effects and feedbacks associated with those drivers and how the trajectories link different components of CATS. The 50 interviews represent persons involved in formal associations, but also village dwellers, e.g., persons living close to the coastline, fishermen not attached to any organization and restauranteurs and guesthouse owners who were not attached to any organization. This data served as the basis for developing the model of trajectories of change in Table 4-2. The model represents the perceptions of change as experienced by respondents and the documentation of such changes as is consistent with related literature (see Bennett, 2016; Belle & Bramwell, 2005).

Interviews from the follow-up fieldwork targeted stakeholders in tourism niches such as recreational diving, reef tours, hotels, villas and guest house owners. Twelve interviews from the follow-up fieldwork were utilized in this paper. These 12 key informant interviews provided more in-depth information on biophysical impacts on tourism. More importantly, these interviews provided data on the impacts of international regional and national drivers and changes on the coastal tourism sector in Tobago. This was not a major focus of the CBVA. These interviews served to identify socio-economic drivers of change that might affect coastal

tourism. These interviews also served to locate coastal tourism within the wider context of the tourism sector in Tobago.

Data from both sets of interviews were analyzed using directed content analysis (Krippendorff, 2012; Hsieh & Shannon, 2005) and constraint comparison (Fram, 2013). Directed content analysis involved utilizing clearly identified categories to sort and analyze data. This process was guided by the purpose, objectives and analytical framework of the case study. Here, constant comparison refers to the sequential process of adding subsequent data to the initial data analysis, by matching the findings in the previous analysis to the new data that is added. This approach has been deemed important for ensuring that the perspectives of participants are included in the analysis and presentation of data (Fram, 2013). Constant comparison was also important for comparing interview data across the two data sets (Boeije, 2002).

Firstly, the search tool in Microsoft word was used to identify terms such as SLR and RSST in the interview data (La Pelle, 2004). Using this approach, data from the 50 CBVA interviews were extracted based on causal categories or drivers of change. Concomitantly, the extracted data was read to identify management responses to these drivers of change. The same process as above was used to determine impacts and secondary effects, using search terms such as coastal erosion and storm surges. The data was extracted from the 12 follow-up interviews using a similar procedure as above. Additionally, each interview was also sorted by reading the entire transcript.

For both sets of interviews, the reliability of the linkages that form trajectories of change was determined based on patterns of aggregation of responses, relating to the associations made between impacts, effects or feedbacks. This approach is especially useful given that saturation

determined the sample size for the CBVA. Saturation ensured a measure of consistency and reliability among responses (Morse et al., 2008). While this approach provides some measure of reliability to the findings, it makes no claim based on the strength or weakness of cause and effect relations. In this way, it accepts that other confounding variables may contribute to social or ecological outcomes (cf. Butler et al., 2014; Fazey et al., 2011). It also acknowledges that the information provided by respondents represent perceptions of drivers and trajectories of change (Belle & Bramwell, 2005; see also Bennett, 2016). Consequently, the results have been corroborated using research findings that examined more directly the biophysical aspects of drivers and trajectories of change related to the case (e.g., Mallela et al., 2010, Mallela et al., 2016; Lapointe et al., 2010).

Secondly, drivers and trajectories of change and coastal marine and terrestrial systems were sorted to form causal clusters, by connecting impacts, effects and feedbacks, with marine and terrestrial systems and activities related to the coastal tourism organization (see Table 4-2). Some authors, for example Fazey et al. (2011), refer to these as causal loops. Figure 4-4 presents causal loop diagrams for different trajectories of change. A third layer of analysis utilizing the same causal categories from the first data sorting focused on opportunities and challenges for managing social and ecological changes within CATS, within the three boundaries of existing coastal area management arrangements, i.e., BR/BLC, national and subnational coastal management jurisdictions (see Table 4-2).

Perspectives from respondents identified with the letter A represent data drawn from the CBVA interviews. Perspectives from respondents identified with the letter B represent data from the follow-up interviews.

## 4.5 Results and Analysis

Section A in Table 4-2 presents the components of CATS, while sections B and C presents trajectories of change in CATS. In section B and C trajectories of change should be read along each column. Section B and C were developed primarily from the CBVA data.

**Table 4-2. Model of trajectories of change of Coastal Area Tourism System**

Section A			
<i>Coastal area</i>	<b>Marine area</b> (coastal foreshore)	<b>Coastal nearshore</b> (up to high water mark)	<b>Terrestrial area</b> (coastal fringe, i.e., areas contiguous to coastal nearshore) & inland watersheds
<i>Management jurisdiction (National level)</i>	Extends to 12 nautical miles seaward and represents the limits of the national jurisdiction for coastal management		Jurisdiction for management of terrestrial areas derives from regulations related to land use planning, forestry and environmental management
<i>Management jurisdiction (Subnational level)</i>	Limited to six nautical miles seaward. Used to define the limited legislative responsibility and executive reach of coastal management at the level of Tobago <sup>8</sup>		
<i>Protected area</i>	Buccoo Reef Protected Area (7 km <sup>2</sup> ) <sup>9</sup>		
<i>Coastal marine and terrestrial systems</i>	Coral reefs & sea grass beds, sea turtles	Beaches and bays	Terrestrial systems in coastal fringe, e.g., lagoons & contiguous terrestrial areas inland, e.g., watersheds
<i>Coastal tourism organization</i>	Reef tours, diving	Passive and active recreation, e.g., bathing and water sports	Tourism infrastructure development in terrestrial areas in nearshore
Section B			
<i>Trajectories of change</i>			
<i>Climatic drivers</i>	Rising Sea Surface Temperatures (RSST)	Seasonal shifts in weather, Sea Level Rise SLR, ( <i>increase in storm</i>	Seasonal shifts in weather ( <i>increase in rainfall January to</i>

<sup>8</sup> See section 29 and schedule five of the Tobago House of Assembly act 40 of 1996, [http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs/25.03.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs/25.03.pdf)

<sup>9</sup> Buccoo Reef Protected Area is regulated by the Marine Areas (Preservation and Enhancement) Act Chapter 37:02, <http://faolex.fao.org/docs/pdf/tri4482.pdf>

		<i>surges November to June)</i>	<i>June)</i>
<i>Non-climatic drivers</i>	Institutional deficits, e.g., low standards for effluent discharge within the coastal nearshore	Institutional deficits, e.g., coastal armoring related to tourism development	Institutional deficits result in land use change in inland terrestrial systems, e.g., protected watersheds
<i>1<sup>st</sup> level climatic impacts</i>	Coral bleaching	Storm surges	Increased runoff & sedimentation of inland water courses
<i>1<sup>st</sup> level non-climatic impacts</i>	Increased, fecal counts and other substances, phosphates	Coastal erosion	Sedimentation of coastal waters in the nearshore
<i>2<sup>nd</sup> level climatic &amp; non-climatic impacts</i>	Coral decline/dieback growth in seagrass beds declines in sightings of sea turtles	Coastal erosion and accretion of sand along beaches	Declines in coastal water quality
<i>Direct effects on tourism</i>	No direct effect on reef tours	Declines in water sports <i>Declines in visits to reef</i>	Difficulty locating suitable diving sites and declines in diving days
<i>Non-climatic feedbacks</i>	Effluent discharge and hotels and guesthouses affect coral reefs and bathing water quality.	Institutional weakness that allows coastal armoring to protect tourism development cause erosion of beaches	Lack of linkages between watershed and coastal management lead to sedimentation of coastal water courses.

### Section C

Trajectories of change			
<i>Socio-economic drivers</i>	Seasonal nature of tourism	Negative cross-scale economic impacts from international markets	Positive cross-scale climate-related impact from regional markets supported by transportation links with national market (i) Reduction in inter-island travel time via ferry
<i>Socioeconomic impacts and effects</i>	Peaks in international and tourist local arrivals <i>(November to April)</i>	Declines in international tourist arrivals <i>(June to October)</i>	Increase in tourist arrivals from regional market (i) the increase in tourist arrivals from the national market
<i>Direct effects on coastal tourism</i>	Increase in niches, e.g., dive tourism and reef tours	Probable declines in coastal tourism activity	Increase in visitor arrivals (i) Increase in reef visits

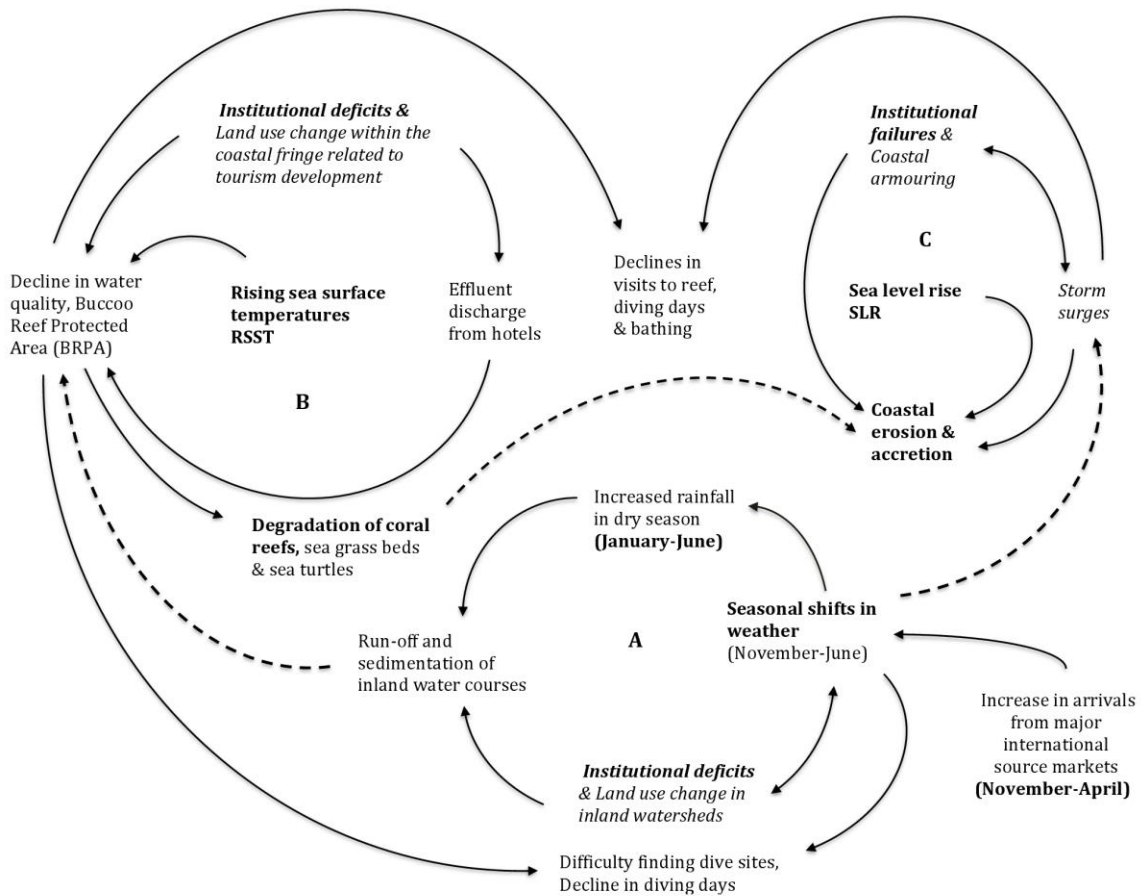
**Table 4-3. Summary results of intra and inter-loop trajectories of change for water quality decline**

The results are presented based on drivers and trajectories of change represented in loops A, B and C in the causal loop diagram. Each loop represents one climate and one non-climate driver and the trajectories of change. Impacts emanating from land use change are also linked to institutional failures. Non-climate drivers of change also include institutional dimensions, e.g., weak regulations or lack of enforcement of existing regulations.

Loop A presents two drivers and trajectories of change related to coastal water quality decline, seasonal shifts in weather and land use change in inland watersheds. In loop B the drivers and trajectories of change relate to SLR and coastal armoring and impacts on coastal erosion. Loop C present trajectories of change related to RSST and land use change within the coastal fringe and impacts on coastal water quality decline.

The results focus on two categories of linkages; intra-trajectory and inter-trajectory linkages. Intra-trajectory linkages derive from drivers and trajectories of change for declines in coastal water quality or coastal erosion, within the same loop. Inter-trajectory linkages derive from more indirect connections between components in different loops connected to water quality decline or that connect water quality decline to degradation of coral reefs and coastal erosion. The results also show how linkages between the seasonal nature of the tourism sector and the temporal dimensions of trajectories of change.





**Figure 4-4. Causal loop diagram of trajectories of change for coastal water quality decline and coastal erosion within Buccoo Reef Protected Area**

#### **4.5.1 Rising Sea Surface Temperatures, land use change and seasonal shifts in weather**

Water quality declines connect drivers and trajectories of change in loop A, with drivers and trajectories of change in loop B. Loop A shows how linkages between land use change in inland watersheds, institutional failures related to these changes, seasonal shifts in weather and increased rainfall in the dry season (January to June) are connected sediment run-off that affects coastal water quality in the BRPA and tourism niches such as diving. Loop B shows how

linkages between land use related to tourism development in the coastal fringe and institutional failures related to effluent discharge from hotels, lead to declines in coastal water quality, within the BRPA, degradation of coral reefs and declines in sea turtles and seagrass. This loop also identifies RSST as a driver of change that leads to coastal water quality decline.

References to rising RSST represent claims associated with previous knowledge of research on the impacts of RSST on marine species and systems, e.g., sea turtles, seagrass and coral reefs (Bennett, 2016; Belle & Bramwell, 2005).

Using this previous knowledge Respondent (A 16) attributed declines in turtle population to RSST based on *“an overabundance of seagrass within the Buccoo Reef Marine Park Complex and virtually no green turtles in there to eat it.”* (cf. Barbier et al., 2011 for association between seagrass growth and declines in fisheries). Effluent discharge and land use change related to tourism development in the coastal fringe is also associated with impacts on coastal water quality that terminate in effects such as coral bleaching, but also the growth of subaquatic vegetation, e.g., seagrass (Lapointe et al., 2010, 2001; Lapointe, 2003; Mallela et al., 2010; Hein et al., 2015). This research seems to support the claims that:

*“.... the development of the hotel industry around the Buccoo area would have resulted in damage to the reef ...because of the sewer outlets ...that would have impacted negatively on the beaches and on the reef” (Respondent A 17).*

Recognition of the impacts of tourism development on the coastal area has led to stronger enforcement measures for coastal development using existing legislation, e.g., the Three Chains Act.

*“...an old colonial law that is still enforced vigorously, .. ...it prevents people from having privately owned property along the coastlines up to the beach front...”*

*(Respondent A 5).*

However, land use change in inland watersheds is also associated with effects in coastal areas (Nguyen et al., 2013). These claims derive from both local knowledge and empirical research and represent both temporal and sector specific effects.

*“... On a yearly basis, you have fire burning the hillsides, ...so this is one major cause for concern” (Respondent B 38).*

*“At the beginning of the rainy season like now, a lot of top soil is removed.. Further to that, along our streams they are clearing bamboo and in clearing the bamboo more debris and other things get into the stream. The unfortunate thing here is a lot of this get into the sea, and the reefs.....” (Respondent A 6).*

Some respondents make claims that seem to identify the temporal dimensions that link land use change to sedimentation in coastal waters and effects on tourism based on impacts on activities such as diving.

*“.... Twenty years ago if you had rainfall on the island it wouldn't affect the dive sites very much, but now with a little bit of rainfall you have a lot of runoff from the land and it affects the visibility and diving days” (Respondent B 33).*

Lapointe et al. (2001) show how land use change in the inland areas in southwest Tobago lead to sedimentation in the coastal waters and impacts on the Buccoo Reef. Respondents connected to reef tours have not associated water quality decline due to sedimentation from runoff with significant effects on reef tours. However, Park et al. (2002)

using snorkeling visits show where tourist have alternative sites they are likely to choose those sites over others of lower quality. Previous research within the BRPA supports the willingness of some visitors to pay to visit the reef even if water quality declined moderately (Brown et al., 2001).

*“What happens is that there is more domestic tourism and the locals do not give into what we see as the natural beauty of the Buccoo Reef. They.... are more interested in the spirit of the moment, the music, the drinks, the boat ride. Whereas the international tourist goes for the beauty; fish coral and clean water...” (Respondent B 21).*

#### **4.5.2 Sea level rise, seasonal shifts in weather and storm surges**

Declines in water quality in loop B connect drivers and trajectories of change in loop C, based on claims of the impacts of RSST and effluent discharge on the degradation of coral reefs (Lapointe et al., 2010). Large surface areas of coral cover have been credited with slowing down wave action (Sheppard et al., 2005), even in the face of SLR and during of periods of storm surges (Barbier, 2014; Baldock et al., 2014). Thus, declines in coral cover could be linked to coastal erosion (Barbier, 2014). Significant declines (about 25%) in coral cover in the Buccoo Reef occurred between 2005 and 2010 (Mallela et al, 2010). This period also coincides with increased storm surges and rapid erosion. Here, like RSST, references SLR are based only on anecdotal claims provided by respondents of the high water mark during normal tides. Again, these claims derive from both local knowledge-based on interviews with those who lived in the area more than 60 years and empirical data.

Anecdotal claims have dated changes in shoreline profiles to a period before the development of a coastal tourism in the mid-1950s. One respondent cited empirical data that dated these changes to the mid-1960s.

*“We have studied Pigeon Point going as far back as aerial photographs from 1964 and coming forward, so we really have a handle as to what has been happening over time and we would have sought to develop an approach a model” (Respondent B 18).*

Sea level rise forms intra-trajectory linkages with storm surges, coastal armoring and institutional failures are associated with coastal armoring (Jin et al., 2015; Kriebel et al., 1985). Therefore, claims of SLR provide a contrast between recent and intermittent coastal erosion (within the last 5 to 10 years), with erosion that has occurred over longer timeframes. For example, Respondent (B 43), a coastal resident stated that:

*“It has been a gradual change over I would say the last 10 years, and if you speak to older people that lived here that are older than me they would say that the beach is entirely different from what it used to be.”*

Similarly, (Respondent B 32), a resident of the coastal village of Black Rock stated:

*“When I came down there in 2000 and looked at the land and look at it now it is a different piece of land. About fifteen (15) feet has gone to erosion, fifteen (15) feet.”*

The claims by respondents B 43 and B 32 are supported by data on changes in beach profiles along other coastal beaches, e.g., Pigeon Point.

*“I would say with the benefit of aerial shots, I mean personally I only noticed it when started working in the department but there is evidence suggesting that maybe the last ten years there has been changes in the coastline in that particular area” (Respondent B 4).*

Accounting for gravitational and geological factors current IPCC reports estimate SLR in the Caribbean between 1.2 to 1.4 m (Scott et al., 2012). Additionally, projected estimated for SLR in Trinidad and Tobago from 1990 to 2100 is 1.25m to 2.15m (Jeppesen et al., 2015). This data refutes the accounts of respondents who report stories that suggest significantly higher levels of SLR. Therefore, claims of significant erosion could be attributed to storm surges (Cambers, 1997).

Anecdotal claims also associated storm surges with seasonal shifts in weather, particularly over the last six years (Respondent B 43; see loop A). This association between seasonal shifts and storm surges provides the basis for distinguishing between erosion associated with seasonal events, e.g., storm surges (Kriebel et al., 1985) and feedbacks induced by anthropogenic and institutional drivers, e.g., coastal armoring (Jin et al., 2015). Additionally, the perspectives of many respondents link seasonal shifts in weather with storm surges and connect these shifts with rough seas and rapid erosion along some beaches and declines in tourism related activities, e.g., bathing. Singh (1997) notes that the incidence of choppy seas and coastal erosion is prominent in the southern Caribbean between the months of December and May, and the erosive impacts beach profiles on the northeast coast of Trinidad. These effects have been observed in southwest Tobago.

*“November and December occasionally through January on the south eastern side since 2004/5 almost every year we’ve had the sea coming over onto some of the road that goes*

*to Pigeon Point and Grange, two notable areas where tourist bath a whole lot”*  
*(Respondent A 6).*

November to April represent periods of peak tourism arrival (see Figure 4-4 and loop A). Consequently, rough seas have the potential to decrease visits to the beach and popular sites such as the Buccoo Reef (McLachlan et al., 2013). But respondents claim that storm surges now occur during normally calm periods.

*“November, January and February. Those four (4) months you will have rough sea depending on the moon. But now it could be anytime” (Respondent B 32).*

Coastal armoring as a response measure to erosion caused by storm surges has been linked to institutional failures, e.g., lack of enforcement (Jin et al., 2015). There is regulation in Tobago that prevents construction within 60 meters from the high water mark.<sup>10</sup> However, disregard for these legislative arrangements has led to unregulated coastal tourism development (Respondent A 5). Such developments have been associated with exacerbating the impacts of storm surges, creating erosion effects and feedbacks to coastal tourism, e.g., declines in beach quality.

*“Anecdotal evidence from a family who have lived in that area several generations suggest that the construction of the breakwater, that Coco Reef Hotel (sic) would have put in destroyed the beach....” (Respondent A 18).*

Such declines in beach quality are supported by associations of erosion induced by the construction of sea walls in other areas (see Rangel-Buitrago et al., 2015). For example, as Respondent A 32, a resident of the coastal village of Black Rock stated;

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<sup>10</sup> See Three Chains (Tobago) Act 57:04,  
[http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs\\_old/57.04.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs_old/57.04.pdf)

*“When we built our property we built the sea defense wall and we built a big curve with the walkway.... The first sea wall we set back like 10 feet... we built that in 1999, that one was taken 5yrs ago” (Respondent B 32).*

The results above demonstrate how water quality declines serve as an inter-trajectory link that connects drivers and trajectories of change in loop A, with drivers and trajectories of change in loop C. Relatedly, declines in water quality in loop B serve as an indirect inter-trajectory link to loop C based on the probable impacts of degradation of coral reefs on coastal erosion. Below I connect trajectories of change to broader tourism interests.

#### **4.5.3 Connecting trajectories of change in CATS to cross-scale tourism drivers**

The evidence, in this case, suggests that tourism in Tobago is organized largely around the seasonal nature of tourist arrivals from foreign markets, mainly in Europe and North America (see Figure 4-3). Therefore, climate or non-climate related impacts and effects must be linked to more important concerns for tourism. Although there are clear trajectories of change that link impacts on coastal systems to coastal tourism activities, e.g., diving and recreational bathing, it is difficult to link these trajectories to more immediate concerns in the tourism sector, e.g., arrivals from source markets (Amelung, 2007). However, changing seasonal weather patterns provide an avenue for linking the impacts, effects and feedbacks of these changes to the seasonal nature of visitor arrivals to Tobago and specific instances of cross-scale international and regional impacts (Amelung et al., 2007).

##### ***4.5.3.1 Seasonal nature of tourism and temporal dimensions of change***

Visitor arrivals from the main source markets occur mainly during peak periods from November to April (see Figure 4-3).



*“In November you will get up sixty percent (60%), seventy percent (70%) capacity, eighty percent (80%) capacity and you run through until March/ April, then you taper off” (Respondent B 41).*

This period overlaps with the latter part of the rain season (the rain season is June to December) and the entire dry season (January to June). January is the start of the dry season in Tobago, which *“coincides with the North American and European winter, which is November through to end of April” (Respondent B 49)*. This corresponds with the busy tourism winter inflows from Europe and North America (see Figure 4-2).

Recently, tourism has also depended on visitor arrivals from the national market that has increased as a result of improvement in the transportation linkages between the two islands. This has made *“movements between the islands more seamless” (Respondent A 29)*. These visits occur mainly during two months in the rain season (July to August) and a three-week school vacation period during the dry season (March/April). Respondents claim that during these two periods most of the tourists—about 30%--arrive from Trinidad (*Respondent B 41*).

*“The local market would bring in 30% of visitor arrivals” (Respondent B 29).*

While there is no evidence that some of the impacts on CATS highlighted earlier affect regular visitor arrivals to Tobago, two events provide an entrée of how visitor arrivals are affected by cross-scale impacts and how these impacts could coincide with the seasonal nature of coastal tourism, to create effects on coastal tourism activities.

#### *4.5.3.2 Cross-scale impacts on coastal tourism from international, regional and national tourism markets*

Visitor arrivals seem to be extremely vulnerable to economic cross-scale global impacts (Acevedo Mejia et al., 2016; Laframboise et al., 2014; Durbarry, 2004). This is because tourism is sensitive to price and income in source markets. Additionally, the average per night cost at a Caribbean destination is higher than at other destinations around the world (Laframboise et al., 2014). For example, tourism stakeholders in Tobago have reported feeling the impacts of the rapid decline in tourist arrivals from Europe following the global financial crisis in 2007/08. During and after this period, several respondents agree that annual visitor arrivals to the island declined rapidly, have fluctuated or have remained low.

*“We did 88,000 tourists back in 2005, our occupancy was around 80%” (Respondent B 15)*

*“We’ve never come back since then, we’ve gone from 2006, 2007, 85, 86,000, down to somewhere between 20 and 30,000” (Respondent A 4; see Figure 4-2 and 4-3).*

Similar claims have been made for locations that have experienced catastrophic ecological events. For example, (Respondent B 41) indicated that *“in 2004 along came Hurricane Ivan that destroyed Grenada and caused havoc in some of the other English-speaking Caribbean territories and we were left as one of the only games in town.”* Then, transportation linkages between Grenada and Tobago were credited for increasing tourist arrivals in Tobago (Acevedo et al., 2016). Despite these claims, data on tourist arrivals in Trinidad and Tobago show only a marginal increase of international and regional visits over the period cited by respondent A 4. For example, in 2004, total international and regional arrivals to Tobago

excluding Grenada totaled 77,980. In 2005, the total arrivals excluding Grenada was 85,584 (Central Statistical Office, n.d.).

Whereas respondents make these connections between global cross-scale economic impacts and regional cross-scale ecological impacts on tourist arrivals to Tobago, they do not make such linkages between tourist arrivals to Tobago and negative impacts on ecological systems at the local scale. Many respondents have made clear linkages between climate and non-climate related changes and tourism related activities (Jarvis et al., 2016). However, the tourism interests that seem to be affected tend to depend on activities that involve active recreation, e.g., diving and reef tours. Research conducted in Tobago show that different scenarios have yielded different responses for how declines in water quality affect interest in coral reef related activities. For example, Brown et al. (2001) report that 49% of respondents would still engage in activities such as snorkeling with a moderate decline in water quality. In this case run-off and sedimentation was associated with poor visibility and loss of diving days (Respondent B 33). However, the anecdotal evidence also suggests that although some tourists make destination choices based on activities related to coastal systems, those choices are sometimes related to passive rather than active associations (Hicks et al., 2009). For example, tourists who engage in activities such as snorkeling often make destination choice based on water quality (Uyarra et al., 2005). The perspectives of respondents in this case align with choices based on passive associations (Hicks et al., 2009). For example, (Respondent B 15) stated that:

*“The majority of the people that come from colder climates come for the weather, relaxing, sun. A lot of them don't leave the hotel, ....”*

*“Those people they just want peace and quiet they...” (Respondent B 29).*

The assertions by Respondents B 15 and B 41 and the findings of (Hicks et al., 2009) suggest that destination choices based on passive associations might not be affected by the quality of coastal systems related to water quality decline. Tourists who are actively involved in activities such as recreational bathing may however be overly concerned with water quality (Uyarra et al., 2005; Beharry-Borg et al., 2009; Beharry-Borg & Scarpa, 2010). In their studies of water quality in Tobago, Beharry-Borg et al. (2009) and Beharry-Borg & Scarpa (2010) found that the trade-off between the choice to indulge or refrain from indulging in water related activities based on perceptions of water quality was influenced by joint or single choices, gender and type of use, e.g., snorkelers and non-snorkelers.

The apparent dichotomy between the social-ecological impacts on coastal ecological systems, the effects on passive activities and the connections to tourist arrivals remain a major challenge for the management of change in coastal area tourism systems. The dichotomy seems to support the notion that for coastal tourism, coastal ecological systems possess both tangible use value but also aesthetic or emotional value (Hicks et al., 2009). At least, the anecdotal or empirical evidence that links aesthetic or biological declines in the BRPA to visitor traffic, seem to be lacking and the link between coral bleaching and declines in reef visits is still unclear.

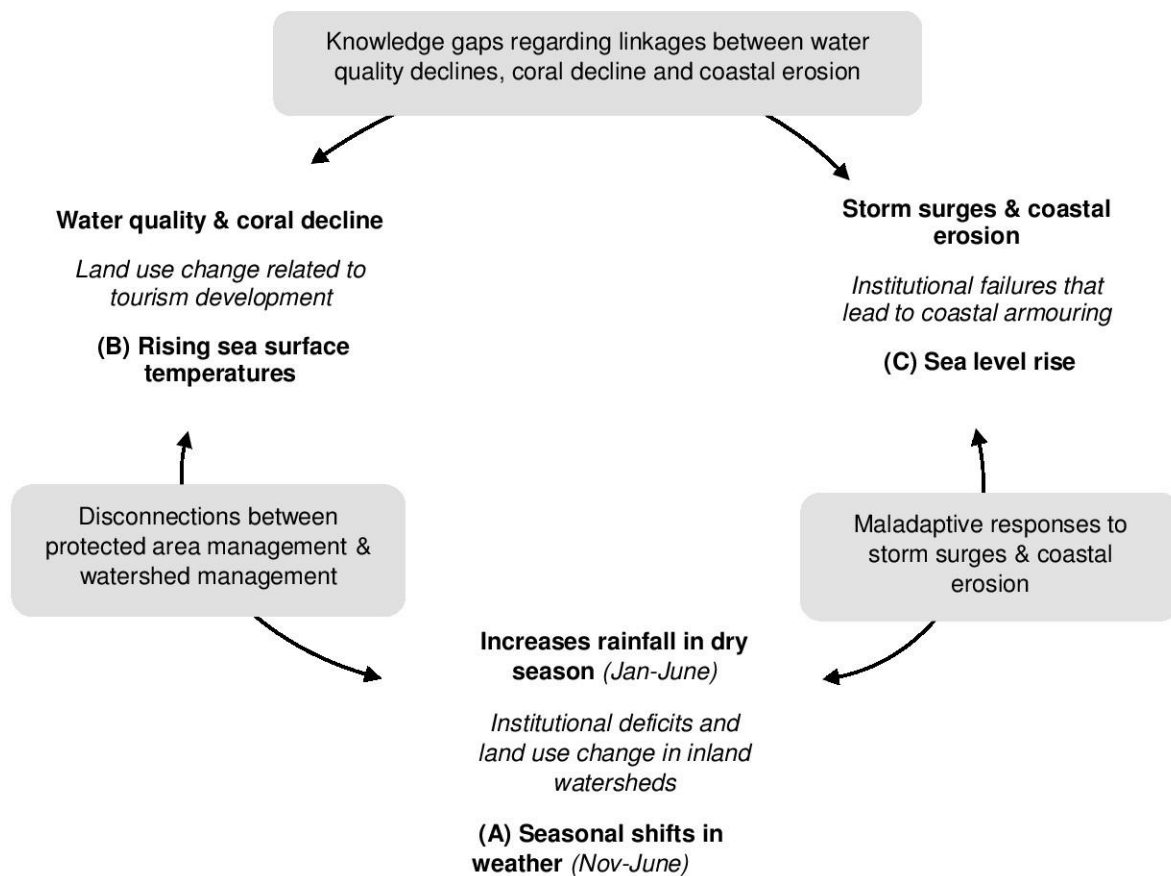
#### **4.6 Discussion**

The inevitability of multiple drivers and trajectories of change across different components of coastal area tourism systems means that coastal management must consider a complex mix of responses across sectors and or coastal management jurisdictions, to determine

how the spatial and temporal dimensions of these multiple trajectories create impacts on coastal tourism and present challenges or opportunities for coastal management.

In the causal loop diagram (Figure 4-4), I identify three main loops; two that show linkages related to declines in coastal water quality (Loops A & B) and one that shows linkages related to coastal erosion (Loops C). I also show three inter-trajectory linkages between these loops, two related to coastal water quality decline and effects on coastal systems, e.g., coral reefs and one related to the link between declines in coastal water quality, declines in coral reefs and coastal erosion and coastal tourism. These linkages also show the connections and temporal dimensions between seasonal shifts in weather, storm surges and coastal erosion and the connections and temporal dimensions between changing land use practice in the inland watershed, increased rainfall in the dry season and coastal water quality decline. Here, I highlight and discuss challenges for coastal management responses, based on the three inter-trajectory linkages in Figure 4-4.

Using Figure 4-5, I discuss three major issues for coastal management; maladaptive responses to storm surges and coastal erosion, knowledge gaps regarding linkages between water quality decline, coral decline and coastal erosion and disconnections between watershed management and protected area management.



**Figure 4-5. Challenges for responding to trajectories of change in CATS**

#### **4.6.1 Maladaptive responses to storm Surges and coastal erosion**

Based on the observations of respondents, storm surges due to changing weather patterns share causal pathways with SLR, coastal erosion and accretion. However, as Leatherman et al. (2000) note, “gaining insight into coastal erosion processes is difficult because of the transient impacts of storm surges on shoreline position” (p. 55). Additionally, shorelines can recover from the erosive effects of storm surges within a short period. A problem arises from the transient impact of severe storms on shoreline position (Leatherman et al., 2000). This suggests that

erosion and accretion attributed to one or the other can be differentiated based on their impact timeframes highlighted by respondent. For example, claims of storm surges emanating from seasonal shifts in weather patterns coincide with catastrophic effects that emerge within short timeframes between November and January. Claims of impacts related to SLR seem to be more protracted. Trajectories of change from SLR or storm surges due to changing weather patterns are also associated with feedbacks from institutional failures credited to coastline construction of guesthouses and coastal armoring intended to protect these structures and the institutional vacuums that fail to regulate coastal armoring (Hegde, 2010; Scott et al., 2012). Therefore, management responses to storm surges need to take into account interactions between institutional failures and coastal armoring. This requires aligning agencies with responsibility for the regulation of coastal development and those with the capacity to intervene with hard structures for coastal armoring. These interventions have already occurred between agencies with responsibility for environmental protection. For example, the DNRE has been able to work in close cooperation with the Division of Infrastructure and Public Utilities (DIPU). The DNRE provides data on changing beach profiles which the DIPU uses to inform coastal restoration projects, e.g., the establishment of coastal defense systems (*Respondent B 4*).

In some instances, coastal armoring has been effective, where natural hard structures such as boulders have been used to slow onshore wave action, in areas where there is no coastal development. However, where coastal development exists close to the high tide, coastal armoring utilizing other structures such as sea walls is believed to have contributed to further erosion and accretion in other areas (Jin et al., 2015). Respondents believe that these effects might have been exacerbated by the unseasonal and unpredictable intensity of storm surges

during the months of November to June (Singh, 1997; see also Figure 4-4 Loop A). Coastal armoring as a response to SLR and storm surges represent maladaptive responses (King et al., 2016; Neumann et al. 2015), with effects that feedback to tourism (King et al., 2016). Firstly, intervention with solid sea defense structures reinforces institutional failures. Secondly, the construction of sea defense systems exacerbates the erosion effects of storm surges (Jin et al., 2015). Eventually, the sea walls that were built to protect tourism infrastructure fail.

Existing governance arrangements that link the national to the subnational levels within responsibility for disaster management could be useful to institute storm surge forecasts. For example, coastal disaster management at the subnational level utilizes early warning systems that incorporate forecasting of severe weather events in response to the seasonality of storm surges. However, given the severity of storm surges over the past five years, one solution could involve intermittent and seasonal retreat. The obvious solution seems to be permanent relocation. Private homeowners have already contemplated this action as a response strategy (Respondent B 32 & B 43).

#### **4.6.2 Knowledge gaps in management of linkages between water quality, coral declines and coastal erosion**

Storm surges share causal pathways and trajectories of change with SLR (Neumann et al. 2015). More ambiguous are the connections between storm surges and RSST. Rising Sea Surface Temperatures share trajectories of change with storm surges in that RSST contribute to coral bleaching and decline. Relatedly, the loss of coral cover exacerbates the effects of storm surges and on coastal erosion. In the causal loop diagram, I identified this as an inter-trajectory linkage.



Baldock et al. (2014) have demonstrated how coral cover serves to mitigate the impacts of erosion related to storm surges, by decreasing wave velocity and coastal erosion effects.

Concerns related to storm surges and coastal erosion in this case also coincide with RSST, the rapid decline of coral cover in the Buccoo Reef that resulted from the bleaching event in 2005 and 2010 (Mallela et al., 2010; Mallela et al., 2016). The major challenge for responding to the linkages between coral decline and coastal erosion, however, is the failure of many stakeholders to see these linkages, particularly, those with the authority to make decisions to bring about such changes. Often, making such connections is difficult given their different biological and physical dimensions (McFadden, 2008). However, filling such knowledge gaps is important for ensuring that coastal management is adaptable to social-ecological linkages, across different issue areas and sectors (Armitage et al., 2015).

Some coastal interests have recognized the role of coral reefs in mitigating the effects of coastal erosion. This recognition has led to efforts to install artificial reefs to offset the declines in coral cover in the Buccoo Reef (*Former Board Member, Pigeon Point Heritage Park Management Committee, Personal Communication, July 2, 2014* ). However, these measures have not been implemented. Conversely, a lack of understanding of connections between water quality and coral decline and coastal erosion has served to misdirect responses to water quality declines with attendant effects on coral reefs. For example, within the BRPA efforts to replace coral reefs focus on sustaining recreational opportunities for reef watching rather than increasing coral cover to slow down wave action (Baldock et al. (2014; Williams, 2016). This represents another subtle form of maladaptation, especially if novel approaches to restoring degraded coral reef present livelihood choices that can sustain tourism activities such as reef tours (see Graham

et al., 2014). However, such approaches to reef restoration may not serve to mitigate the erosive effects of coral reefs on coastal erosion (Baldock et al., 2014).

#### **4.6.3 Disconnections between protected area management, land use and watershed management**

Rising Sea Surface Temperature, given its impact on water quality share trajectories of change with land use change from within the coastal fringe and inland watersheds and seasonal shifts that result in increased rainfall during the dry season (Rabalais et al., 2009). Perspectives on these trajectories highlight connections between watershed management, land use management in the nearshore terrestrial areas and protected area management.

Managing change related to RSST and anthropogenic stressors would mean understanding the linkages and differentiating between impacts that can be attributed to either driver. This would require isolating one effect from the other and managing each effect separately (Gilmour et al., 2013). However, the coastal waters and coral reef system, in this case, do not exist in such isolated contexts; they share trajectories of change with land use change and related institutional effects. Therefore, responding to changes in marine systems, e.g., declines in water quality and coral reefs must integrate the impacts of anthropogenic stressors associated with land use change and institutional effects in the coastal fringe as well as that inland (Crabbe, 2012; Ramos-Scharrón et al., 2015; Hernández-Delgado, 2015; Butler et al. (2014).

Currently, managing impacts that affect coral reefs and water quality of bays due to land use practices in watersheds connect legislative or regulatory frameworks, policy, or issue diffuse strategic initiatives, through specific mandates such as forest conservation or sustainability. Butler et al. (2014) show how such connections are important in ICM, for responding to the impacts from multiple sources that can impact coastal water quality. For example, the policy

changes within the DNRE from forest management to more comprehensive watershed approaches, consider contiguous landscape ridge-to-reef anthropogenic effects. This approach serves as an important policy development that links terrestrial anthropogenic forces and their institutional dimensions as drivers of change, with impacts and effects on coastal water quality and coral reefs, within the marine area and coastal fringe.

The Buccoo Reef Protected Area as a marine protected area provides an opportunity for more coordinated management of water quality and reef effects, premised on indirect institutional linkages between the source and outcomes of anthropogenic impacts. However, the limited legislative authority of the subnational level has hampered the establishment and implementation of new regulations.<sup>11</sup> Despite the existence of such institutional weakness, responses to questions of coral recovery from the impacts of two bleaching events on the Buccoo Reef in 2005 and again in 2010 were favorable. This seems to suggest that anthropogenic stressors remain within reasonable impact thresholds. Therefore, the major challenge seems to be responding to the impacts of RSST and impacts that results in declines in coastal water quality that emanate from sources outside the protected area.

Rising Sea Surface Temperature, given its source, is beyond local or national jurisdictional responses. What can and has been managed are the additional impacts from within the nearshore, e.g., levels of substances from effluent discharge from coastal development and impacts from other contiguous terrestrial systems such as sedimentation from inland watersheds that have exacerbated the effects of RSST. Both Butler et al. (2014) and Wenger et al. (2015) show the limitations of protected area management related to water quality decline. They demonstrate how differences in institutional mandates hinder the coordination of water quality

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<sup>11</sup> The management jurisdiction of the subnational level is limited to 6 nautical miles.

management. For example, water quality management might exist within highly sector-based arrangements, where different rules exist between environmental protection agencies and between watershed management and protected area management.

In this case integrating coastal water quality management using protected area management is hampered by the limited legislative authority of the subnational level. Integrating coastal water quality management is also hampered by unofficial land tenures in areas contiguous to the BRPA (Walters, 2012). Such institutional failures show the challenges for practical compliance and enforcement and the barriers and opportunities for engaging with relevant government institutions to resolve water quality management issues (cf. Clarke & Jupiter, 2010). These scenarios also help to raise relevant questions regarding the role of protected area management in response to coastal water quality decline (Wenger et al., 2016). For example, how could unofficial land tenure be incorporated into existing legal and or regulatory arrangements and how would this help improve or hinder water quality management within marine protected areas?

Notwithstanding these challenges, coastal management must continue to focus on understanding and linking land use practices within the coastal fringe and in upland watersheds that share landscape connections with water quality and coral decline. Coastal management must also focus on the linkages and interactions between the three landscape scales identified above, to connect existing arrangements related to water quality management, within highly sector-based arrangements, where conflicting rules exist between agencies within responsibility for land use planning, environmental protection, watershed management and protected area management.

The need for immediate action to address these challenges, the institutional failures associated with responding to them and the time required to fix existing comprehensive management approaches present complex challenges for integrating coastal water quality management. The complexity presented by multiple trajectories of change suggests that responding to these changes should focus on ways of integrating coastal management across multiple sectors and coastal jurisdictions (Sorensen, 1997). However, unlike conventional approaches, e.g., protected area management, such frameworks ought not to focus merely on harmonization of management responses from the perspective of synergies within and between coastal sectors. Rather, they could be based on flexible and novel unconventional approaches that engage multiple coastal interests, within existing regulations, policies and strategies in key coastal management sectors.

#### **4.6 Conclusion**

Using the perspectives of multiple coastal interests, this paper has advanced an approach for understanding how different trajectories of change related to declines in coastal water quality affect a coastal area tourism system. This approach serves to reveal challenges and opportunities for responding to these trajectories, within existing coastal management arrangements. The approach used in this paper addresses a major concern in tourism research for aligning tourism-related activities more closely with the wider coastal system (Farrell & Twinning-Ward, 2004).

Applying the approach for mapping trajectories of change for impacts such as water quality decline between different components of the coastal area tourism system served as the basis for connecting considerations for integrating possible impacts on coastal tourism into the

wider context of coastal management. This case revealed three major challenges and opportunities for managing change in coastal area tourism systems:

Firstly, despite the obvious value of systems such as coral reefs to tourism, coastal tourism in Tobago is more connected to external push forces and transportation linkages that explain visitor flows from foreign markets. That this is the case is not entirely surprising, there is evidence in this case to suggest that while Tobago is marketed for its ecological assets many tourists visit the island based on passive associations with coastal systems. This in some ways seems to have created a sense of complacency among tourism interests, regarding the value of coastal ecological systems and the need for prudent management of such systems.

Secondly, there is an apparent dichotomy between the social-ecological impacts on coastal ecological systems and the effects on coastal tourism. For example, there is no evidence, in this case, to suggest the coral decline in the Buccoo Reef leads to corresponding declines in visitor traffic to the reef. While there has been a concern for the effects on other aquatic species and marine systems, the link between coral bleaching and declines in reef tourism is still unclear. This points to the significance of and need for linking coastal ecological systems as important causal pull factors of coastal tourism flows, and more comprehensive management arrangements.

Thirdly, there appears to exist a tacit acceptance on the part of tourism interests that the management of impacts on coastal ecological systems should remain within the purview of sectors related to environmental protection. This apparent apathy on the part of tourism stakeholders might mean that there is a need for institutional arrangements that link tourism more closely with the management of impacts on the coastal ecological systems. Current tourism research is already leaning in this direction (Weaver, 2011). However, there are still many gaps

that can be filled using social-ecological systems thinking as an analytical tool (Wu et al., 2016; Vugteveen et al., 2015; Pollnac et al., 2010).

Finally, this case has highlighted the complex challenges of managing multiple trajectories of change related to coastal water quality decline across multiple sectors, within coastal area tourism systems. However, it demonstrates a plausible approach to ICM that links coastal social and ecological systems and identifies and maps critical trajectories of change, within and between these systems, to management responses that match these trajectories. In this way, coastal management is able to consider collectively critical pathways and trajectories of change in coastal area tourism systems and the challenges and opportunities associated with their management.

The approach also serves as an important first step for establishing a SES framework for integrating coastal water quality management, based on matching current trajectories of change with existing coastal management approaches. This could serve as an entry point for examining coastal management arrangements and approaches that are more or less flexible and that yield positive or negative outcomes, particularly for sectors such as coastal tourism.

## **5.0 CHAPTER FIVE: Challenges and Opportunities for Integrating Coastal Water Quality Management**

### **5.1 Abstract**

Integrating coastal water quality management by harmonizing the goals and objectives of different coastal management arrangements has proven to be problematic because coastal water quality is affected by land use across different landscape scales, and management goals and objectives across several sectors and levels of coastal jurisdiction. However, even within such diverse coastal management settings, opportunities exist that may improve outcomes in coastal water quality. In this study, I use a typology of fragmentation to frame analyze how different types of conflicting, synergistic or cooperative linkages between the goals and objectives of coastal management arrangements, within and across sectors and coastal jurisdictions, enable or constrain water quality management. The study revealed five different types of conflicts in coastal water quality management, and show the difficulty with resolving some of these conflicts, within existing coastal management arrangements. However, the case also shows how within a dual-level coastal jurisdiction, mechanisms such as Memoranda of Understanding (MOUs) and Certificates of Environmental Clearance (CECs) serve to prevent water quality management conflicts between agencies within the same sector. Additionally, the study shows how loose connections between the goals and objectives of existing policies, e.g., policies for protected area management, serve to foster cooperation between agencies within the same sector or across sectors that can positively impact coastal water quality management. Such insights help to demonstrate practical approaches for integrating water quality management, even within a diverse and often fragmented coastal management setting.



**Keywords:** Coastal management, coastal water quality, fragmentation, conflicts, synergies, cooperative linkages.

## 5.2 Introduction

Different concerns have been raised in coastal management research regarding the instrumental value of harmonization as a governing principle for integrating coastal management (Cicin-Sain & Belfiorie, 2005). In the coastal management literature harmonization generally connotes governance arrangements and practices across sectors and coastal jurisdictions, where the goals and objectives and institutional mandates related to a common issue, e.g., protection of coastal water quality, are complementary, and where such agreement facilitates a more coherent decision-making processes (Christie, 2005; Olsen & Christie, 2000). However, as Cicin-Sain and Belfiorie (2005) note, that while harmonization is a noble ideal, harmonization is “easier said than done” (p. 847). Referring specifically to the role of Marine Protected Areas (MPAs) for integrating coastal management, Cicin-Sain and Belfiorie (2005) highlight the difficulty with harmonization, “since the actors involved in MPA networks and in integrated coastal management (ICM) programs are often different, reflecting different cultures, networks of relationships, ministries, and goals and motivations” (p. 847).

Further concerns regarding the difficulty with harmonization derive from the fact that coastal management is confronted with issues on both the marine and terrestrial side of the coast. On the marine side, these issues relate to natural biological processes that result in changes to coastal systems, e.g., coral reefs (Barbier, 2014). Additionally, ICM must consider how coral decline affect physical processes such as wave action and velocity and how these changes affect the profiles of shorelines (Linton et al., 2003; Huang et al., 2012; Sheppard et al., 2005). On the

landward side, coastal management must also consider social drivers and impacts that can exacerbate the effects of natural processes on the marine side (Mallela et al., 2010).

Impacts from the terrestrial side emanate from different spatial scales, from the coastal fringe to watersheds in the hinterland that may impact scales on the seaward side, e.g., marine protected areas. For example, in Tobago Lapointe et al. (2001) show how sewage from on land sources drives eutrophication of coastal waters within the Buccoo Reef Protected Area (BRPA). Within each scale, the authority for environmental management, e.g., biodiversity protection, preservation of water quality, prevention of coastal erosion, land use and wastewater regulation, reside within different sectors and coastal jurisdictions (Butler et al., 2013). Additionally, the responsibility for overlapping issue areas, for example land use regulation or water quality monitoring may be shared between different agencies, within the same sector or agencies across different sectors (Douvere, 2008).

Such sector-based and fragmented coastal management arrangements are antithetical to complementary coastal management given the constraints they place on decision-making for common issue areas among sectors, within and across coastal jurisdictions (Westmacott, 2001; Olsen, 2003). For example, Westmacott (2001), while formulating a decision support system for ICM shows how complex the decision-making process will be in managing multiple issue areas relating to multiple coastal sectors because the objectives for desirable management outcomes for each issue across sectors may differ. The difficulty in harmonization is also captured by GESAMP (1996), who note that:

Analysis of integration should take into account the interactions and interconnectedness among natural resources and different economic sectors. An ICM process must consider

all the relevant practices in a given locale-typically including fisheries, aquaculture, agriculture, forestry, manufacturing industry, waste disposal and tourism in the context of the needs and aspirations of the communities affected. It should distinguish between issues that are likely to be important over long time scales (e.g., climate change, population growth and the consumption habits of society) and more immediate concerns such as those associated with the governance process, conflicts among user groups and current social, economic and environmental conditions (p. 3-4).

Zelli (2011) characterizes such fragmented institutional settings as “policy domains marked by a patchwork of public and private institutions that differ in their character, constituencies, spatial scope, subject matter, and objectives” (p. 256). However, current governance scholarship points to opportunities for responding to common issue areas within fragmented sector-based and multilevel governance systems (Taljaard et al., 2012; Falaleeva et al., 2011; Bauer & Steurer, 2014). One approach for responding to change in such systems has been recently advanced by Biermann et al. (2009). They argue for the management of common problems related to global environmental change within a system of fragmented governance architectures. Biermann et al. (2010, p. 281) define governance architecture as “the overarching system of public and private institutions, principles, norms, regulations, decision-making procedures and organizations that are valid or active in a given issue area.” Unlike Zelli (2011), fragmentation for Biermann et al. (2009) connotes different types of linkages within governance architectures. Therefore, Biermann et al. (2009) take a rather nuanced approach and focus to the concept of fragmentation. They developed a typology of fragmentation, based on different types of linkages between the core mandates of governance arrangements that are synergistic or

cooperative or conflicting. While Biermann et al. (2009) address contextually challenges related to governing global environmental change, their characterization of fragmentation possesses great relevance for examining fragmented sector-based coastal water quality management between national and subnational coastal jurisdictions. Currently, the application of such an approach is not a common feature in ICM.

Using an instrumental case study, I modify the typology of fragmentation by Biermann et al. (2009) and use it to examine conflicting, synergistic and cooperative coastal management linkages related to coastal water quality management within a MPA. My main objective is to illustrate how conflicts between the goals and objectives of legislative and regulatory rules, policies and strategies and practice for different sectors related to coastal water quality management are resolved or could be resolved through synergistic and or cooperative linkages forged by existing coastal water quality management arrangements. Relatedly, I show how within these diverse management setting opportunities exist that promote more flexible coastal management responses that serve to speed up responses to coastal water quality decline (cf. Biermann et al., 2009; see also Taljaard et al., 2012).

### **5.3 Conceptual Background**

Integrated coastal management could be conceived as a principle-based approach to coastal governance (McKenna et al., 2008). Integrated coastal management assumes the existence of disconnections between the goals and objectives of coastal management arrangements and coastal management practice related to different sectors and across coastal jurisdictions. Further, ICM assumes the need for complementarity in management responses across jurisdictions, to resolve conflicts pertaining to common issue areas across landscape

scales, e.g., between inland watersheds and MPAs (Stepanova & Bruckmeier, 2013; McCreary et al., 2001; Hills et al., 2009; Doing, 1995). Where different sectors share responsibility for responding to common problems across such scales, e.g., declines in coastal water quality (Rodgers et al., 2012), ICM is premised on the notion that complementary regulatory and policy frameworks, in some way, lead to more favourable management outcomes (e.g., Ban et al., 2012; White et al., 2005; Fernandez et al., 2005). However, Olsen et al. (1997) note that “ICM does not replace traditional sector-by-sector management, but rather provides for an additional dimension to the governance process by examining and acting upon the interactions and interdependencies among human activities, and the ecosystem processes that link coastal lands with the coastal ocean” (p. 12).

Challenges with sector-based approaches in coastal management emerge from issues that are sometimes beyond existing governance frameworks, resulting from what Merrie et al. (2014) refer to as a governance vacuum. Other authors have associated sector-based coastal management with existing institutional arrangements that do not fit emerging problems or system changes, or conflicting political and sector mandates (Shipman & Stojanovic, 2007; Vatn & Vedeld, 2012; Clarke et al., 2013; Falaleeva et al., 2011; Nicholls, 1999). In response to these governance challenges there have been assertions within coastal management epistemic communities for new ways of thinking about ICM (e.g., Bremer & Glavovic, 2013; Ibrahim & Shaw, 2012; Shipman & Stojanovic, 2007; Clarke et al., 2013) that depart from mainstream ICM toward environmental governance scholarship that proposes a more flexible approach (see Mahon et al., 2009; Keohane & Victor, 2011). A core feature of this new thinking is its

acceptance of the inevitability of sector-based fragmented coastal management (Taljaard et al., 2012).

Recently, Biermann et al. (2009) have argued for the management of issue areas related to global environmental change by working within different types of linkages between governance arrangements. Here, I define governance arrangements as legislative or regulatory arrangements, policies or strategies that guide decision-making in any issue area (Lebel et al., 2006). Such decision-making processes may occur between agents, within the same sector or across sectors at the same or different levels of government. Biermann et al. (2009) characterize fragmentation based on linkages between the core mandates, goals or objectives of governance arrangements that are synergistic, that promote cooperation or that are conflicting. For Biermann et al. (2009), synergies represent linkages that support decision-making in an issue area among different agents, across different governance jurisdictions, based on mandates, goals and objectives that are closely connected. Linkages that promote cooperation mean that decision making is supported by connections between mandates or objectives that are more loosely related. For linkages that are conflicting, decision-making for an issue area occurs within mandates, goals or objectives that are largely unrelated.

In the context of coastal water quality management, the characterization of fragmentation by Biermann et al.'s. (2009) has instrumental value for finding solutions to conflicts by working within existing governance arrangements, either through synergistic linkages or more loosely connected linkages that foster cooperation. Table 5-1 is a modification of Biermann et al.'s. (2009) typology. Based on this typology, I define fragmentation as the extent to which linkages between the goals and objectives of coastal management arrangements for the management of

common issues are conflicting or synergistic, or the extent to which such linkages fosters cooperation among different coastal interests (cf, Biermann et al, 2009), across spatial scales, within or across different sectors or across different levels of coastal jurisdictions.

**Table 5-1. A typology of types of linkages between different governance arrangements**

Governance arrangements	Types of linkages between mandates, goals or objectives		
	Synergistic	Cooperative	Conflicting
Legislative/Regulatory linkages	Legislative/regulatory mandates for different sectors or agencies within sectors, closely related	Legislative/ regulatory mandates for different sectors or agencies within sectors, loosely related	Sector specific legislation and regulations largely unrelated Agency-specific regulations within a sector differ
Policy linkages	Sectors share the same policies or different policies with common mandates and objectives	Sector specific policies linked through common mandates, goals and objectives for the same issue areas	Sector specific policies are unrelated Policies in different sectors do not share mandates and objectives
Strategic linkages	Sectors share the same strategies or different strategies with common goals and objectives	Strategies address common issue areas across several sectors	Strategic goals and objectives unrelated

*Adapted from: Biermann et al. (2009)*

Analyzing different types of linkages provides an opportunity for untangling a patchwork of goals and objectives identified by Zelli (2011). This could be achieved, by using conflicts as an entry point for navigating negative influences and outcomes in environmental quality, across sectors and levels of coastal management and by identifying solutions to these conflicts within existing synergistic linkages or linkages that foster cooperation (Johnsen & Hersoug, 2014; Arbo & Thùy, 2016). Such an approach allows for “picking and choosing from an assortment of

governance approaches; and finding creative ways of handling complexity” (Berkes, 2012, p. 273).

Firstly, regarding coastal water quality management, conflicts may arise between different sectors because of divergent policy mandates. This might be the case where the value of coastal resources to wider public interests is given precedence over the effects of conflicting rules on environmental quality. For example, Van Leeuwen et al. (2014) show how, notwithstanding conflicts between existing fisheries and new oil and gas policies, short-term economic benefit from the oil and gas sector trumps likely ecological impacts of declining water quality on the fisheries sector. Analyzing such conflicts might be useful for determining how policy preferences create disconnections between the regulatory rules of different sectors and negative impacts and effects on environmental quality and on ecosystems that provide support for coastal sectors, e.g., tourism (Hovik & Stokke, 2007).

Secondly, conflicts could also be a useful entry point for examining how divergent mandates between the rules for land use management create impacts on coastal water quality. Using coastal water regulation in Australia and different land cover scenarios for agricultural land use, Butler et al. (2013) demonstrate how divergent mandates in rules that regulate land cover lead to the emission of substances such as nitrogen and phosphorous that negatively affect coastal water quality and the health of the Great Australian Barrier Reef (GBF).

Thirdly, analysis of fragmentation using conflicts as a starting point may also be useful to examine how conflicts arise between existing use policies and new policies established without due consideration for emerging environmental challenges from changing climatic conditions (Urwin, & Jordan, 2008). These types of conflicts may result in temporal mismatches between



rules that can degrade ecosystem quality (Crowder et al., 2006). Such conflicts are characterized by sudden changes that are too fast when compared to existing regulations or policy prescriptions. Fast moving changes may serve to exacerbate existing challenges in coastal water quality management because of multiple interactive and cumulative stressors (Crowder et al., 2006).

The inevitability of these multiple stressors creates conflicts in coastal water quality management even within coordinated and comprehensive governance frameworks such as MPAs. For example, Wenger et al. (2015) have identified management challenges in protected area management that point to multiple impacts that emanate from sources and management domains outside of the protected area. Managing these multiple sources of impacts demand an understanding of conflicting linkages and interactions between the rules, policies and strategies for different sectors that can affect water quality (Halpern et al., 2008).

Often, synergistic and cooperative linkages between the management arrangements of different sectors that can resolve water quality management conflicts exist within the same coastal management jurisdiction (Taljaard et al., 2012). In a marine management context, Arbo & Thùy (2016) refer to these as mixed constellations with multiple objectives, actors and management settings. Such mixed constellations might exist in coastal management, where some jurisdictions have passed legislation for ICM, while single-sector approaches to issue areas within the coast still exist (Müller, 2009). For example, Hassanali (2015) points to the coexistence of both synergistic and conflicting coastal management arrangements in Trinidad and Tobago and the opportunities such arrangements present for integrating coastal management with climate change adaptation across two levels and multiple sectors.

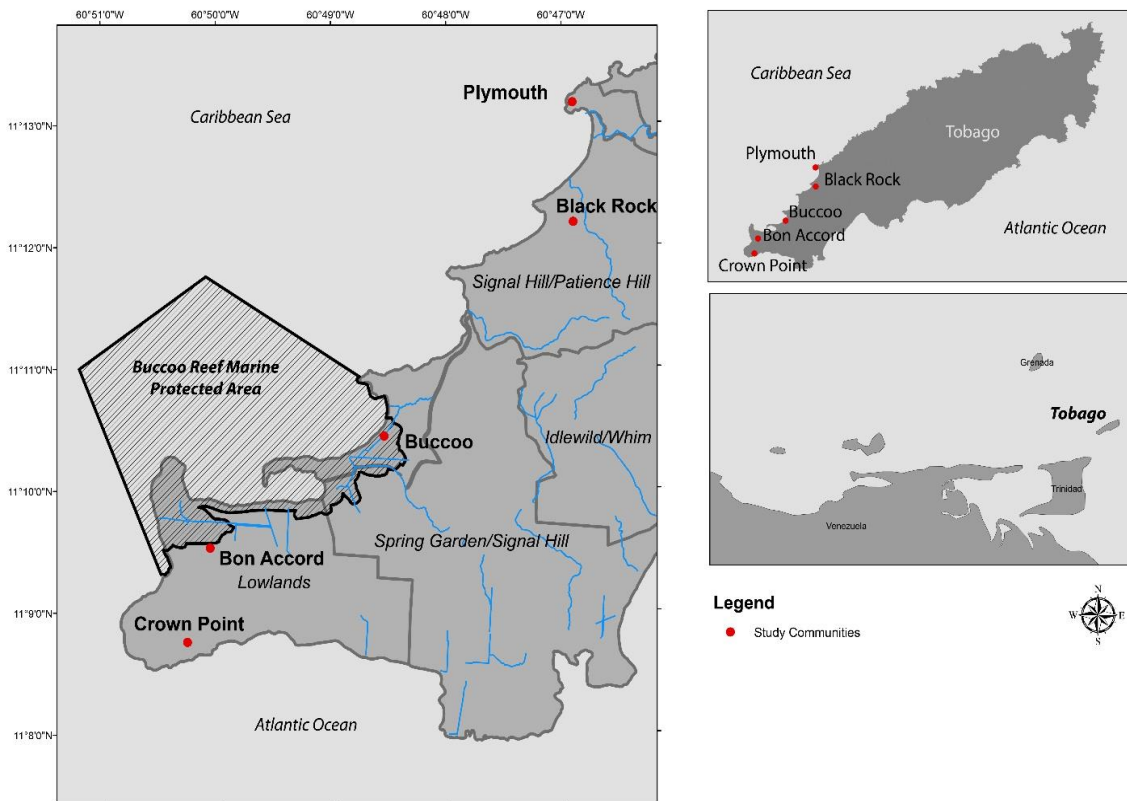
The mainstream thinking in past ICM scholarship is that multiple objective management settings could be resolved through institutional reform and new comprehensive or harmonized coastal management arrangements. However, authors such as Müller (2009) argue that coastal management responses to environmental change may require nimbler more flexible fragmented approaches that capitalize on existing synergistic or cooperative linkages between coastal management arrangements. For example, Read and West (2014) show how MOUs enable more flexible cooperative arrangements for effective protected area management. Such flexible approaches could offer simple practical solutions to complex problems (Berkes, 2012) that could serve to speed up responses to changes that affect coastal water quality, because they foster greater efficiency and participation across sectors and levels of government (Biermann et al, 2009).

#### **5.4 Research Methods**

Three sectors were considered for the inquiry in this case study; tourism, fisheries and environmental protection. The sectors were selected based on the way in which they are impacted by declines in coastal water quality or the way they impact coastal water quality management. The case study focused on the analysis of the types of conflicting, synergistic or cooperative linkages between regulations, policies and strategies related to coastal water quality management in southwest Tobago, within the Buccoo Reef Protected Area (BRPA) (see Figure 5-1).

### 5.4.1 Case study context

In 1973, in response to the changing coastal use in structure southwest Tobago and in an effort to integrate the management of activities related to both the tourism and fisheries sectors, the government of Trinidad and Tobago established the BRPA. The BRPA encompasses 7 km<sup>2</sup> of marine space, representing a large expanse of coral with ecological and economic significance to Tobago's tourism and fisheries sector (see Figure 5-1).



**Figure 5-1. Map of Buccoo Reef Marine Protected Area in southwest Tobago (left), Tobago (top right) and Trinidad and Tobago (bottom right). Source: ParCA project**

Within the last decade, changes in coastal water quality within the BRPA has attracted the attention of coastal management interests in southwest Tobago because of issues related to rising sea surface temperatures (RSST), land use change, (e.g., tourism development) and declines in coral reef health (Mallela et al., 2010; Alemu & Clement, 2014; Lapointe et al., 2001). However, more than four decades after the BRPA was established, coastal management in southwest Tobago still occurs without a comprehensive or overarching framework. In the absence of coherent ICM practice, responding to changes in coastal water quality and its impacts on coral reefs within the BRPA has meant navigating a dual-level sector-based structure of national and subnational coastal management.

Within this structure, legislation and regulations related to water quality management in Tobago (the subnational level) are formulated at the national level. Authority is then transferred from the national to the subnational level through MOUs (see Figure 5-2). Neither the fisheries nor tourism sector has responsibility for water quality management at the national level. This means that water quality at the subnational level is regulated largely by rules related to environmental protection at the national level. These rules focus primarily on gray and black water discharge from private dwellings, guest houses and hotels and other businesses. Environmental protection rules also focus on land use regulation.

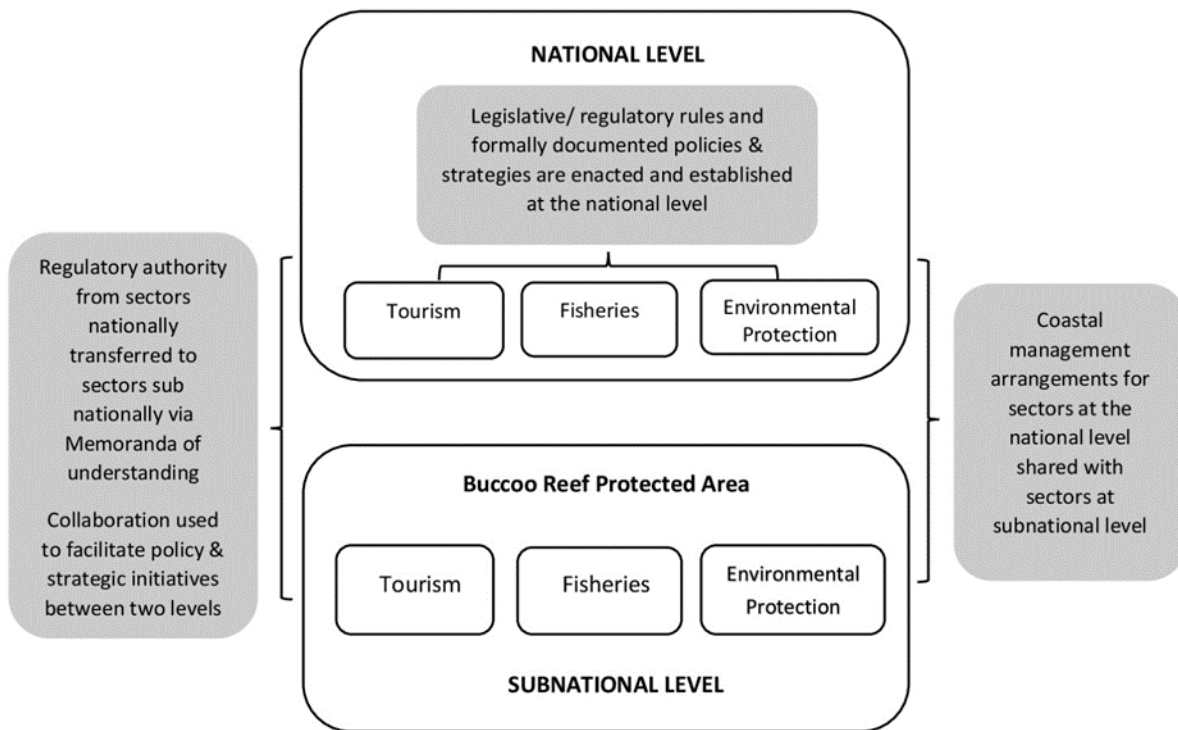
Within the immediate precincts of the BRPA, two sets of rules regulate gray and black water discharge, the Water Pollution Rules and the Pan American Health Organization (PAHO) standard for gray and black water discharge. Authority for water quality regulation under the Water Pollution Rules has been transferred from the Environmental Management Authority (EMA) at the national level to the Department of Natural Resources and the Environment

(DNRE) at the subnational level. The Water and Sewage Authority (WASA) regulates gray and black water discharge under the PAHO standard. This authority has not been transferred to any subnational agency: The WASA operates a sub-office at the subnational level.

Sediment or other runoff from land development in the nearshore that could affect water quality is regulated by the Town and Country Planning Division (TCPD). This authority has not been transferred to any subnational agency. The TCPD undertakes its land use regulation functions through a sub-office at the subnational level. Runoff from land development in the nearshore is also regulated by the DNRE under the Certificate of Environmental Clearance (CEC) Rules. Sediment runoff inland in watersheds contiguous to the BRPA also affects coastal water quality. Two national agencies are responsible for watershed management, the Division of Forestry and the WASA. The Division of Forestry regulates land use in the inland watershed using regulations under the Forestry Act chapter 66:01. This authority has been transferred to the Department of Forestry at the subnational level. The WASA manages watersheds using the Courland Waterworks Regulations. This authority has been retained by WASA at the subnational level.

Regarding policies and strategies, the subnational level has executive authority for coastal management, therefore there is no need to transfer responsibility for policies or strategies related to water quality management. However, there are no formally documented or clearly articulated policies or strategies for water quality management at the subnational level. Therefore, the subnational level utilizes policies and strategies developed by national-level state agencies (cf. McLeod & Airey's, 2007 for an assessment of dual level tourism policy in Tobago).

This dual level structure and the specific arrangements for management of the BRPA provide the context for analysis of conflicts in water quality management between tourism, fisheries and environmental protection sectors and the synergistic and cooperative water quality management linkages that can serve to influence coastal water quality management outcomes (see Figure 5-2).



**Figure 5-2. Dual-level coastal management structure related to three coastal sectors in Tobago**

#### **5.4.2 Data collection and analysis**

Thirty-four interviews were utilized in the data analysis for this research. Twenty-two semi-structured key informant interviews were selected from the dataset of 140 interviews from a Community-Based Vulnerability Assessment (CBVA) conducted in May and June 2012. Twelve key informant semi-structured interviews were selected from a dataset of 75 interviews conducted in June and July 2014 (see Namey et al., 2008) (see Appendix F). The sample for the CBVA was collected using saturation, while the 75 interviews were selected using purposive sampling (Patton, 2002; Morse et al., 2008). Data for this research was also collected using a stock taking desk survey of literature (Steurer et al., 2010) (see Appendix C).

The CBVA was conducted to collect data on social and ecological impacts on coastal systems and the attendant effects on the coastal community, and impacts and management responses from tourism, fisheries and environmental protection sectors and conservation groups. The twenty-two semi-structured key informant interviews served to identify sources of water quality impacts on coastal social and ecological systems and existing and possible management responses to these impacts. Data from the 22 CBVA interviews represent the information of 4 community leaders from local village councils. Village councils are community organizations that represent the local interest of the community. Three interviews were conducted with representatives from Environment Tobago (ET), an environmental protection advocacy NGO. One interview was conducted with a representative of the Buccoo Reef Trust (BRT), an NGO involved in coastal research.

Data from the 22 CBVA interviews also represent the views of leaders in government departments. Three interviews were conducted with personnel from the DNRE. Four interviews were conducted with personnel from the Department of Marine Affairs and Fisheries (DMAF).

Two interviews were conducted with the Tobago Emergency Management Agency (TEMA). Four interviews were conducted with personnel from the Department of Tourism and Transportation (DTT) and one interview with a representative from the WASA. The stock-taking desk survey (cf. Bauer et al., 2012) was conducted to identify governance arrangements related to coastal water quality management in Tobago. This survey focused on identifying regulatory rules, policies and strategies related to the three sectors identified above. This survey identified eight regulatory rules five policies and two strategies (see Appendix C).

The 12 key informant semi-structured interviews from the dataset of 75 interviews conducted in June and July 2014 represent the views of senior managers and mid-level supervisors from government departments related to tourism, fisheries and environmental protection. These interviews targeted the same respondents as the CBVA. However, interviews were conducted with personnel from two additional departments. The Department of Planning and the Division of Meteorological Services. The 12 key informant interviews were used to further identify and verify regulatory rules, policies and strategies utilized by their agency in the Tobago coastal management context.<sup>12</sup> Further, these interviews contributed to understanding the regulatory, policy and strategic linkages between agencies at the subnational level and between agencies at the subnational level and those at the national level. This process involving the verification of regulatory rules, policies and strategies by the 12 key informant interviewees was deemed necessary for two reasons. Firstly, this case study did not entail a comprehensive stocktaking of coastal management arrangements related to water quality management in

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<sup>12</sup> Because of the overlapping structure of governance between the national and subnational levels some legislative arrangements, policies and strategies may be limited to the national level. Additionally, there are old comprehensive policy framework that address sector specific issues, e. g., The Medium Term Policy framework of Tobago 1998 to 2000 that are not currently utilized in coastal management.



Trinidad and Tobago. Secondly, many governance arrangements related to environmental protection focus on common water quality issue areas. Consequently, only those arrangements identified as critical to water quality management within the case were selected.

Data were analyzed using directed content analysis (Krippendorff, 2012; Hsieh & Shannor, 2005) and constant comparison (Fram, 2013; Boeije, 2002). Directed content analysis involved using clearly identified categories to drive the data sorting and analysis process, based on the purpose and objective and conceptual framework of the case study (Krippendorff, 2012). Constant comparison refers to the process of adding subsequent data to the initial data analysis, by comparing the findings in the previous analysis to the new data that is added, to ensure that both sets of data are complementary. Fram (2013) has credited this approach as being important for maintaining the perspectives of the participants throughout the data analysis process. Constant comparison was also important for comparing interviews from different data sets (Boeije, 2002).

Firstly, data from the 22 interviews from the CBVA were sorted to identify the source and type of current or possible impacts on coastal water quality. This entailed carefully reading the first ten interviews to identify different types and source of impacts, then adding data from subsequent interviews to the previously sorted data. This sorting revealed categories for current impacts related to gray water discharge and sediment runoff; possible impacts were identified, based on new coastal activities such as oil and gas exploration. These impacts were categorized as emanating from either nearshore or from inland watersheds or in the case of probable impacts from oil and gas, seaward from areas outside the coastal jurisdiction.

Secondly, data from the stock taking desk survey were sorted using the typology in Table 5-1, to identify types of linkages between legislative and regulatory rules, policies and strategies related to water quality management, across three sectors, namely tourism, fisheries and environmental protection. Types of linkages between the governance arrangements within and across sectors were analyzed. This was done to determine how different conflicting objectives might constrain water quality management and how synergistic and cooperative linkages enable water quality management.

Thirdly, data from the 12 semi-structured interviews were sorted to identify different types of regulatory or policy conflicts in water quality management. This was done by systematically reading the entire interview transcripts. Policy conflicts were identified based on policy positions that were not necessarily documented. For example, within the study area, the nearshore coastal waters are used as both a sink for gray water discharge and source of recreation for tourism. The data from the semi-structured interviews were also sorted to identify solutions that were used to resolve regulatory and policy conflicts. This contrasts with the way the stocktaking data was used. The stock taking data served to demonstrate how interactions between types of coastal management regulations, policies or strategies could enable or impede water quality management. The data from the semi-structured interviews served to highlight actual examples of how regulatory and policy conflicts were resolved. Analysis of the different linkages also included identifying regulatory and policy linkages related to coastal water quality management that was not documented. Perspectives from respondents identified with the letter A represent data drawn from the CBVA interviews. Perspectives from respondents identified with the letter B represent data from the follow-up interviews.

## 5.5 Results and analysis

In this section, I outline five types of regulatory or policy conflicts in issue areas related to coastal water quality management. I then analyze and discuss how these conflicts are resolved or could be resolved, within synergistic and loosely related cooperative linkages in existing coastal management regulatory arrangements, policies and strategies in issue areas that can affect coastal water quality. Table 5-2 summarizes types and examples of water quality conflicts.

**Table 5-2. Summary of types and examples of coastal water quality conflicts**

Types of conflicts	Examples of conflicts
1) Inter-sector regulatory disconnections between watershed management and coastal area management	Watershed management rules focus on maintaining potable water quality, while protected area management rules focus on sustainable coastal marine uses.
2) Inter-sector policy conflicts related to the use of the coastal nearshore	The nearshore is used both as a sink for effluent discharge from hotels and a source for recreational bathing
3) Intra-sector regulatory conflicts related to different standards for emission of gray water into nearshore	Two sets of national level water pollution rules regulate water quality discharge. One set of rules allows cfu discharge of 400/100ml, while the other allows 100 cfu/100ml. Responsibility for enforcement of the latter rules has been transferred to a subnational agency. However, authority for the former has been retained at the subnational level by a national agency
4) Inter-sector policy conflicts arising from inadequate regulatory frameworks for emerging coastal uses offshore	New projects related to oil and gas exploration offshore conflict with existing fishing grounds of local fisherfolk
5) Intra-sector conflicts relating to the regulation of land use in the nearshore	Three agencies regulate land use activities in the nearshore, each one operating under its own rules

### 5.5.1 Types of coastal water quality management conflicts

#### 1) Inter-sector regulatory disconnections between watershed management and coastal area management and land use in the coastal fringe.

Inter-sector regulatory disconnections emerge due to differences in regulatory mandates for forest and watershed management inland and land use in the coastal fringe that can affect coastal water quality outcomes within the BRPA. Firstly, the DNRE has authority for the regulation of forest cover, based on the provisions of the forest act.

*“Tobago being a very hilly terrain, the department is also responsible for helping to keep at least roughly 50% or more vegetative covered area .... that would include private and state” (Respondent A 3).*

Secondly, the WASA, based on the provisions of the Prevention of Water Pollution (Courland Waterworks) bye-laws<sup>13</sup> has regulatory authority for the catchment and conservation and delivery of water from within the Courland watershed (*Respondent B 8*). The Courland watershed is Tobago’s largest watershed. Located 7 km inland of the study area, the Courland is connected to the BRPA via the Courland River. A watershed management strategy by the DNRE ensures that there is some management connection between inland watershed and the coastal marine area.

*“Initially our approach has been a watershed approach the department even though it has moved away from that approach from time to time, it has always come back to watershed management and hence the ridge to reef effect concept” (Respondent A 3).*

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<sup>13</sup> <http://faolex.fao.org/docs/pdf/tri2556.pdf>  
Water and Sewerage Act chapter 54:40, [http://www.wasa.gov.tt/Forms/Policies/Trinidad\\_and\\_Tobago-Water\\_and\\_Sewerage\\_Act\\_\(1980\).pdf](http://www.wasa.gov.tt/Forms/Policies/Trinidad_and_Tobago-Water_and_Sewerage_Act_(1980).pdf)

This strategic approach in effect links activities in Courland watershed to impacts in the coastal area.

Unlike watershed management, coastal management focuses on protected area management within the BRPA. The management of this area resides with the DMAF, rather than an environmental protection agency. The DMAF derives its authority from the Marine Areas (Preservation and Enhancement) Act 37:02 of 1970. Additionally, the department derives its authority from the Fisheries Act. Neither of these two pieces of legislation confers regulatory authority for issue areas related to water quality management on the fisheries department. Although the Marine Areas (Preservation and Enhancement) Regulations provide for the protection of the flora and fauna in restricted areas and the establishment of offenses in connection therewith, these and other guidelines within the regulation are quite vague, dealing for example with:

- (a) the care, control and management of the restricted area
- (b) the regulation of the use and enjoyment of such areas
- (c) the regulating of the use of parking and refreshment facilities
- (d) the licensing of boats and crafts employed in the transportation of visitors to restricted areas, and the licensing of any guides required by visitors
- (e) the ensuring of public rights of way over private property to allow access to restricted areas

Additionally, although the landward legal jurisdiction of the BRPA extends beyond the coastline boundary (see Figure 5-1), the control of land use within the coastal fringe resides with several environmental protection agencies.

## **2) Inter-sector policy conflicts related to the use of the coastal nearshore**

Inter-sector policy conflicts in issue areas that can affect water quality emanate largely from the use of the coastal waters of the nearshore as a source of recreation for various tourism related activities and as a sink for the discharge of greywater from hotels. It is the policy of environmental protection agencies such as the WASA, to allow hotels to install outfall lines for gray water emission in the nearshore. The authority sets the standards for effluent discharge, based on measures such as total oxygen demand, fecal counts, suspended sulfates and chlorine residue.

*“The basic factors that we would be looking for is Total Oxygen Demand (TOD), fecal count, suspended sulfate and what you would call chlorine residue” (Respondent A, 7).*

Ironically, it is activities within the tourism sector that have been implicated as a major contributor to declines in water quality and coral reef health. Some respondents believe that the release of gray water from hotels into the coastal waters of the nearshore has led to unfavorable levels.

*“The reef is losing its beauty, and a lot of this is caused by pollution, particularly sewage” (Respondent B 27).*

These concerns are supported by the fact that current water pollution rules for hotels allow high levels of fecal coliform count (400) and chlorine (2ppm) to be emitted into the

nearshore. The concerns also have merit since WASA's current rules do not monitor the discharge of phosphates and nitrates (Respondent A 7).

### **3) Intra-sector regulatory conflicts related to different standards for emission of gray water into nearshore**

Conflicting policy positions in the use of the nearshore have seemingly led to regulatory conflicts in different ways. For example, the policy positions that encourage the use of the waters of the nearshore as both a sink for gray water discharge and a source of recreation for tourism-related activities have led to water quality regulatory conflicts. These conflicts arise because the two agencies that regulate greywater discharge into coastal waters operate based on different standards. This is compounded by the fact that the water pollutions rules that was "... *established in 2001 is still going the route of voluntary compliance*" (Respondent B 11). The EMA regulates different categories of emissions into surface water courses using the Water Pollution Rules. The WASA regulates greywater discharge based on PAHO standards; the EMA operates under the Water Pollution Rules. In Tobago, the DNRE, through a MOU, undertakes the functions of the EMA.

Another layer of conflict arises because the water quality standards for the tourism sector are higher than those for effluent discharge set by WASA or DNRE. Tourism's requirement for higher standards for bathing water quality aligns with the blue flag designation, a European standard for water quality of bathing beaches. Blue flag is not a formal water quality standard in Tobago. However, the DNRE has undertaken a blue flag project to assess whether water quality in key beaches meets international standards.

*“Blue Flag is a significant voluntary program.... We are a tourist island and most of our tourist come from Europe. Those who reside in Europe know that when you see a blue flag, it means that the beach is safe for bathing” (Respondent B 14).*

Current water quality standards, e.g., for fecal coliform counts do not meet blue flag standards. WASA, has set a standard of 400 cfu<sup>14</sup> per 100ml for discharge from hotels into the nearshore. However, blue flag standards for the Caribbean only allow 100 cfu per 100ml for E. coli bacteria and 40 cfu per 100ml for streptococci<sup>15</sup>.

#### **4) Inter-sector policy conflicts arising from inadequate regulatory frameworks for emerging coastal interests offshore**

Recently, new policy conflicts have emerged based on oil and gas exploration outside of the jurisdiction of the BRPA. Oil and gas exploration is given priority over other sectors because of its economic importance when compared to other sectors, e.g., fisheries.

*“.... the state subsidizes the fishing industry because they recognize that fishermen don't make the kind of money. .... there are billions of dollars from the oil industry” (Respondent B 9).*

However, given the probable effects of pollutants from oil and gas on coastal water quality and other coastal systems, this new policy for oil and gas exploration conflicts with existing uses related to fisheries and existing traditional issues within the BRPA, e.g., reef watching.

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<sup>14</sup> cfu= colony forming units of bacteria

<sup>15</sup> <http://ec.europa.eu/ourcoast/download.cfm?fileID=1018>



## 5) Intra-Sector Conflicts Relating to the Regulation of Sedimentation from Runoff in the Nearshore

Issue areas related to run off into the coastal waters from land use in the nearshore engage rules across several environmental protection agencies. For example, land development is regulated by rules related to Town and Country Planning, based on the Town and Country Planning Act 29 of 1960<sup>16</sup> and the DNRE, based on the Environmental Management Act 2000.<sup>17</sup> This creates intra-sector conflicts between agencies with the responsibility for regulation of nearshore land use that can affect coastal water quality.

The conflicts highlighted above occur both at the same level of coastal management and across levels. Below, I show the current and probable response to these conflicts within existing synergistic and cooperative regulatory rules, policies and strategies for tourism, fisheries and environmental protection, across two levels of coastal management (see Figure 5-2). Table 5-3 presents a summary of avenues for resolving coastal water quality conflicts

**Table 5-3. Summary examples of avenues for resolving coastal water quality conflicts**

Types of conflicts	Diverse avenues for resolving different types of conflicts
1) Inter-sector regulatory disconnections between watershed management and coastal area management	<ul style="list-style-type: none"> <li>• Connecting loosely related common management goals and objectives, for issue areas related to water quality management across sectors and spatial scales, e.g., BRPA, to the coastal fringe and inland watersheds, e.g., the Courland Watershed.</li> <li>• Existing policies and strategy make connections between watershed management and protected area management e.g.,               <ul style="list-style-type: none"> <li>a. The National Tourism Policy (NTP) and the Integrated Water Resource Management, IWRM policy.</li> <li>b. The ridge to reef watershed management strategy of the forestry section, DNRE</li> </ul> </li> </ul>

<sup>16</sup> [http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs/35.01.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs/35.01.pdf)

<sup>17</sup> [http://www.oas.org/dsd/fida/laws/legislation/trinidad\\_&\\_tobago/trinidad\\_&\\_tobago\\_ema-2000.pdf](http://www.oas.org/dsd/fida/laws/legislation/trinidad_&_tobago/trinidad_&_tobago_ema-2000.pdf)

Types of conflicts	Diverse avenues for resolving different types of conflicts
2) Inter-sector policy conflicts related to the use of the coastal nearshore	<ul style="list-style-type: none"> <li>• Alignment of coastal uses with water quality standards for tourism.</li> <li>• However, the current tourism standards for coastal water quality is not part of the policy framework for water quality management.</li> </ul>
3) Intra-sector regulatory conflicts related to different standards for emission of gray water into nearshore	<ul style="list-style-type: none"> <li>• Intra-sector regulatory conflicts are resolved using current mechanism for transferring authority, i.e., MOU</li> <li>• MOUs serve to transfer authority for water quality monitoring from environmental protection agencies nationally to those sub-nationally.</li> <li>• MOUs empowers subnational agencies to manage water quality issues, e.g., gray water discharge.</li> </ul>
4) Inter-sector policy conflicts arising from inadequate regulatory frameworks for emerging coastal uses offshore	<ul style="list-style-type: none"> <li>• CECs enable multiple national and subnational agencies responsible for issue areas related to water quality management, to work together across loosely connected or conflicting regulatory and policy mandates</li> <li>• CECs serve to regulate new coastal uses because impacts from oil and gas exploration affect coastal water quality within the management jurisdiction of Tobago. Therefore, exploration is subject to CEC regulations</li> </ul>
5) Intra-sector conflicts relating to the regulation of land use in the nearshore	<ul style="list-style-type: none"> <li>• CECs allow for the forging of cooperative linkages between different agencies with responsibility for land use regulation in the nearshore. This is achieved because CECs serve as the final level of regulation of land use.</li> </ul>

### 5.5.2 Resolving multiple regulatory conflicts by connecting watershed management with protected area management

The approach recommended here takes into consideration intra-sector regulatory conflicts created by disconnections between watershed management, land use in the coastal fringe and protected area management in the coastal area that entails The need to respond to such disconnections it captured by the following comment:

*“ .....managing a space with many users. ....is very complex because there are a lot of different agencies involved” (Respondent B 26).*

Disconnections between watershed management and protected area management leads to intra-sector conflicts relating to the regulation of land use inland and the coastal fringe and water quality standards in the nearshore. Responding to these linkages should take into consideration how impacts from multiple sources shape water quality management responses and create effects in coastal water quality (Butler et al., 2014). This would mean connecting three sets of rules: Rules that control pollutants emanating from areas contiguous to the nearshore, e.g., the Water Pollution Rules of 2001,<sup>18</sup> with those that regulate the activities related to sediment runoff from degraded watersheds further inland, e.g., The Prevention of Water Pollution (Courland Waterworks) By-laws,<sup>19</sup> together with rules that regulate land use activities in the terrestrial nearshore, e.g., Town and Country Planning Act, 35: 01.<sup>20</sup> The Prevention of Water Pollution (Courland Waterworks) by-laws provide protection against “mining, quarrying or any other works which may result in earth, sand, debris or any other waste material entering the Courland River” (pg. 107). The Courland River connects the Courland watershed with the BRPA. Additionally, the Town and Country Planning Act provides for control of the development of land in the coastal fringe, under part II. Further the Water Pollution Rules address specific areas related to permissible levels of emission of twenty-nine categories of pollutants into surface water courses (pg. 874).<sup>21</sup>

Regarding policy prescriptions, the Buccoo Reef Management Plan (BRMP), provides another avenue for connecting water quality management in coastal areas with water quality management in watersheds. However, the plan has never been fully operationalized.

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<sup>18</sup> [http://www.ema.co.tt/new/images/pdf/water\\_pollution\\_rules2001.pdf](http://www.ema.co.tt/new/images/pdf/water_pollution_rules2001.pdf)

<sup>19</sup> [http://www.oas.org/en/sedi/dsd/ELPG/DataBase/Docs/Trinidad\\_and\\_Tobago-Water\\_and\\_Sewerage\\_Act\\_\(1980\).pdf](http://www.oas.org/en/sedi/dsd/ELPG/DataBase/Docs/Trinidad_and_Tobago-Water_and_Sewerage_Act_(1980).pdf)

<sup>20</sup> [http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs/35.01.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs/35.01.pdf)

<sup>21</sup> [http://www.ema.co.tt/new/images/pdf/water\\_pollution\\_rules2001.pdf](http://www.ema.co.tt/new/images/pdf/water_pollution_rules2001.pdf)

*“To date we have only implemented a few things on the management plan” (Respondent B 26).*

Given the current lack of implementation of the BRMP, existing policy synergies that incorporate water quality mandates can serve to fill this gap. For example, the National Tourism Policy (NTP) addresses, quite explicitly, issues related to coastal management (Ministry of Tourism, 2010). The NTP contains elements related to the capacity of tourism to deal with likely impacts of climate change, particularly, those that affect climate-sensitive resources, e.g., water quality, beaches and coral reefs (Ministry of Tourism, 2010, p. 4 & 24). Likewise, the National Water Resource Policy (NWRP) deals with issues related to the impacts of degraded watersheds on coastal areas and common objectives related to the protection of coastal systems.

*“... Within the policy it states that there has to be an integrated coastal zone management policy” (Respondent B 22).*

Thus, the NTP and the NWRP serve as an avenue for connecting impacts on coastal water quality nearshore and those further inland. However, currently, the committee responsible for implementing the NWRP is an ad hoc committee that does not include active participation from the subnational level.

*“They (the subnational level) are a part but it’s difficult considering that the Meetings are held in Trinidad, the national level” (Respondent B 22).*

Consequently, watershed management is guided mostly by the legislative arrangements for forest management that are not directly linked to water quality impacts on coastal areas, e.g., the Forestry Act 42 of 1915.<sup>22</sup>

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<sup>22</sup> [http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs/66.01.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs/66.01.pdf)

Existing strategic overlaps also provide opportunities for resolving water quality regulatory conflicts. For example, efforts to integrate coastal area management and climate change adaptation in southwest Tobago<sup>23</sup> create a significant overlap with the ridge to reef strategy of the Forestry Unit with the DNRE that connects “... *the upper watershed and the main ridge forest reserve with the lower watershed and the reef...*” (Respondent A 6).

Additionally, efforts by the EMA, to expand the boundaries of the BRPA inland to include coastal villages could lead to more stringent regulation of water quality discharge from both hotels, residential dwellings and guesthouses that currently fall outside the limits of the BRPA.

The EMA has tried “*to designate the Buccoo Reef marine area as an Environmentally Sensitive Area an ESA under the ESA rules, under the (Environmental Management (EM Act)*” (Respondent B 46).

This has not proven to be an easy task, however, as other challenges have arisen related to the extent of the landward boundaries. After approval was granted by the cabinet at the national level in Trinidad

*“We did a survey of the marine area and it was decided based on sources of land-based pollution that the boundaries would not be a marine park only, it would be a marine as well as a land-based park. ....the Tobago House of Assembly (THA) rescinded their correspondence approving us to move forward”* (Respondent B 46).

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<sup>23</sup> Through the project “Piloting the Integration of Coastal Zone Management and Climate Change Adaptation in Tobago, “The institute of Marine Affairs is seeking mainstream climate change adaptation

### 5.5.3 Resolving regulatory conflicts through MOUs

These prescriptions pertain primarily to intra-sector regulatory conflicts related to different standards for emission of gray water into the nearshore. These regulatory conflicts derive largely from Intra-sector policy conflicts related to the use of the coastal nearshore. For example, in this case, MOUs allow environmental protection agencies to transfer authority between national and subnational coastal jurisdictions (see Figure 7).

*“.... in the context of Tobago, as far as the environmental management act is concerned, the DNRE acts for and on behalf of the EMA” (Respondent A 18).*

This transfer facilitates bidirectional authority flows between environmental protection agencies for the two levels of coastal management. For example, in Tobago,

*“The Environmental Management Unit in the has a significant regulatory function for gray water discharge as it relates to the EM Act of 2000<sup>24</sup> the Certificate of Environmental Clearance Rules and the Water Pollution Rules” (Respondent A 18).*

Additionally, through a MOU with the DNRE, the EMA has transferred the responsibility for water quality management from Trinidad to the DNRE in Tobago. Therefore, the DNRE undertakes the function of regulating water quality at the subnational level, using the same Water Pollution Rules. Other instances, in this case, demonstrate that where authority transfers have not occurred between the two levels, regulatory conflicts emerge. For example, unlike the EMA the WASA, a national agency, has retained responsibility for regulating gray water discharge at the subnational level under its own regulation.

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<sup>24</sup> [http://www.ema.co.tt/docs/legal/cur/Act\\_3\\_of\\_2000.pdf](http://www.ema.co.tt/docs/legal/cur/Act_3_of_2000.pdf)

*“Under the Tobago House of Assembly ACT 40 of 1996, the WASA was supposed to be under the purview of the THA but we have been left under the Central Water Authority and whoever is in charge of WASA” (Respondent B 8).*

This arrangement undermines the regulatory authority of the DNRE at the subnational level. These intra-sector conflicts between environmental protection agencies could be avoided if the responsibility for gray water discharge was reposed under one subnational agency, using one set of rules. Given the coordinating regulatory function of the EMA nationally, it would seem plausible that the EMA should retain this overarching regulatory function under its own rules. Since the EMA has transferred the authority for water quality monitoring to the subnational level through the DNRE, the DNRE would be the only regulator of water quality in Tobago.

#### **5.5.4 Resolving conflicts through regulatory overlaps CECs**

Here, I demonstrate how CECs create regulatory overlaps between the national and subnational levels of coastal management and between environmental protection agencies with responsibility for issue areas related to water quality management. Certificates of Environmental Clearance derive their regulatory scope from the Environmental Management Act 2000.<sup>25</sup> Certificates of Environmental Clearance are particularly useful for regulating possible sources of sedimentation from runoff in the nearshore.

Earlier, I highlighted the role of MOUs in transferring authority for water quality monitoring from the national to the subnational level. Similarly, CECs have served to transfer the authority for land use regulation. CECs gives the authority to ensure that:

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<sup>25</sup> <http://faolex.fao.org/docs/pdf/tri36383.pdf>

*“whatever the EMA does in Trinidad, we (DNRE mirror their activities. The only thing is we don't have signatory power. The final signature must come from the Chairman of the Board or his delegate ... the Corporate Secretary or the CEO of the EMA ” (Respondent B 14).*

This type of arrangement allows for the fast-tracking of approvals of applications for coastal development.

The views expressed by respondents across environmental protection agencies show how CECs might help to regulate land use activities that might contribute to possible sediment runoff and other pollutants from large projects.

Firstly, CECs are required *“if you wish to conduct any development activity in a coastal area .... you are required to apply for and receive a CEC before you conduct that development activity (Respondent A 18).*

The sentiments expressed by (Respondent B 50,) show how CECs create further regulatory overlap that can impact water quality outcomes. If an application of use of land is complex,

*“There are other technical applications, for instance if the application is an area that is fronted by a sensitive area, lagoon, mangrove all those areas, where there are of trade-offs environmental impacts those would be considered as complex applications, that require a wider participation from (Water and Sewage Authority and Fire Services Department) ” (Respondent B 50).*



*“CEC applications are structured in such a way so as to give the TCPD the opportunity to participate in the process .... By law all of the applications that are land based, ... be submitted to the TCPD” (Respondent B 46).*

Based on the provisions of the CEC (Designated Activities) Order 2001, CEC’s are also required for 44 designated activities. In this way, CECs can play a major role in regulating other point sources that can impact coastal water quality, especially, point sources from smaller projects (Environmental Management Authority, 2016). Given the lack of a policy dealing with water quality issues at the subnational level, water quality management in these projects could also be integrated using policy linkages. These linkages exist in diffuse national policies that may directly or indirectly focus on areas such as coral reef health or policies that address more broadly diffuse areas such as conservation or climate change.

The National Environmental Policy (NEP), for example, has as one of its coastal area focus a core objective that emphasizes water quality testing, ecosystem diversity and functionality (NEP, p. 17).<sup>26</sup> This is linked to the management and protection of watersheds and the conservation of wetlands, particularly the role that wetlands play as sediment traps (NEP, p. 19). Additionally, the National Protected Area (NPA) policy identifies the BRPA as a general area of interest (GOTT, 2011b, p.6). This means that policy prescriptions for protected area management nationally already align with water quality management sub-nationally. Such prescriptions can be useful for informing responses to impacts on coastal water quality, within the BRPA that emerge from conflicts between watershed management and protected area and coastal management.

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<sup>26</sup> [http://www.ema.co.tt/docs/legal/pol/NEP\\_19SEP05.pdf](http://www.ema.co.tt/docs/legal/pol/NEP_19SEP05.pdf)

#### **5.5.4 Responses to conflicts arising from inadequate regulatory frameworks for emerging coastal uses offshore**

Emerging uses have created some disquiet, particularly among fisheries stakeholders. As (Respondent B 9) indicated;

*“the dangers of the oil and natural gas search around Tobago and the exploitation of it is the age-old fear of spill, oil spill. This country as was demonstrated months ago is ill-prepared in dealing with an oil spill.”*

Over the last five years, oil and gas have emerged as an economically important sector within the study area resulting in policy conflicts and regulatory vacuums for the control of pollutants that might affect coastal water quality (*Respondent B 9*).

The general sentiment expressed by respondents suggest that these types of conflicts create challenges that are difficult to resolve; largely because they emanate from areas outside the jurisdiction of the EM Act 2000 that allow the DNRE to regulate land-based development.

*“Tobago’s waters are defined ...within 6 nautical miles of the coast but many of the offshore projects here, oil and gas and so on those projects are way outside of that boundary but notwithstanding that the DNRE retain processing responsibility for those projects, probably by virtue of their proximity to Tobago”* (*Respondent A 18*).

In this way, notwithstanding the limitations of the EM Act 2000, CECs serve to fill a regulatory gap in water quality management created by emerging sectors such as oil and gas.

The type of temporal mismatches created by the oil and gas sector could also be resolved through overlapping inter-sector strategic linkages. Such strategic linkages have been established at the subnational level, between environmental protection agencies, e.g., DNRE, and the TEMA and across levels between these agencies and the meteorological office. The following comment by

(Respondent B 32) shows how these overlapping relationships could work to mitigate the impacts of a disaster event and the effects on oil and gas infrastructure offshore.

*“... we are one of the redundancies ... since we work so closely with the TEMA ....”*

*(Respondent B 32).*

The comments by (Respondent A 1) also show how overlapping and redundant relationships might work to avert the impacts of a disaster event.

*“We work with the Pacific Early Warning Center which is situated in Puerto Rico. So let's suppose that event is a one that is what we call a tele event. A tele event is described as a hazard which was triggered in the distance something that you didn't feel, that you didn't see .... we will be alerted by ... the Pacific Warning Centre. That information comes through the meteorological service ... The meteorological service in the country will then notify the disaster office ... and then we notify the population” (Respondent A 1).*

These linkages allow for strategic responses to possible oil spills in times of disasters.

These linkages have created spin-offs, e.g., the oil spill contingency plan to deal specifically with the risks posed to sectors such as tourism and fisheries by possible climatic impacts on the oil and gas sector.

## **5.6 Discussion**

Different types of regulatory and policy conflicts serve as starting points for identifying and analyzing regulatory and policy synergies or more loosely connected cooperative linkages for water quality management, within and between different sectors and coastal management jurisdictions. When analyzed from the perspective of fragmentation, synergies and loosely connected objectives highlight opportunities for managing water quality conflicts. This approach

to integrating water quality management addresses some of the serious concerns raised by authors such as Westmacott (2001) who suggests that the decision-making environment for ICM might be too complex to navigate and resolve. The approach taken in this paper is also relevant for dealing with some of the concerns raised by Portman et al. (2015), e.g., whether ICM had outlived its usefulness.

Firstly, analyzing different types of linkages between the objectives of coastal management arrangements must take into consideration connections between common issue areas, across spatial management scales, as confining management responses to one scale could exclude impacts from other scales. For example, Bulter et al. (2014) show how management responses for water quality management within marine protected areas often neglect the impacts of drivers of change from contiguous scales such as watersheds. This suggests that regulations for protected areas should integrate nearshore and inland effects on water quality into a wider framework of management responses for coastal water quality management (Beliaeff & Pelletier, 2011).

In such settings, integration might take the form of connecting different approaches that focus on issue areas related to coastal water quality management. For example, horizontal integration would focus on linking existing water quality management arrangements for activities nearshore with those inland, across sectors. In southwest Tobago, at the subnational level of water quality management, this would mean connecting the regulatory provisions of the Water Pollution Rules that control emissions emanating from areas contiguous to the nearshore, with those that regulate the activities related to sediment runoff from degraded watersheds further inland, e.g., Courland Waterworks Regulations. However, in practice, this could be a

difficult proposition, especially where there are diverse intra-sector interests with overlapping responsibility for issue areas related to water quality management.

This case demonstrates how, in this environment, MOUs promote regulatory synergies that allow for the transfer of authority for water quality management from the national to the subnational level and how through this authority transfer, decisions are made at the subnational level, where water quality effects are felt. MOUs have been used to integrate regulatory mandates across policy domains (see Imperial, 2005). MOUs work because they allow different sectors and levels of coastal management to set aside regulatory differences to transfer authority (Shamsul-Huda, 2004). Whereas such governance arrangements have been implicated for promoting negative authority migration (see Betsill, 2007), this case shows that mechanisms such as MOUs can serve generally to circumvent the possible regulatory water quality management conflicts between the national and subnational level. Authority migration also ensures that decisions are made at the level where the problems exist. Conversely, where these arrangements do not exist, conflicts arise. For example, the conflicts between the Water Pollution Rules of the WASA and those of the EMA arise largely because WASA has not transferred its authority for water quality monitoring to a subnational agency. If such a transfer was made, then water quality at the subnational level could be governed by one set of superior rules.

The case also shows how CECs, like MOUs, exploit existing overlapping management authority between multiple agencies that possess responsibility for different issue areas, e.g., development control of land in coastal areas, assessment of environmental impact of land development, and the regulation of effluent discharge from proposed or existing properties. CECs serve an overarching regulatory function in that all other land-related activities and

possible impacts from those activities on coastal water quality must satisfy the regulatory requirements of a CEC. In this regard, CECs do not require synergies between the goals and objectives of different agencies with some responsibility for the regulation of issue areas that can impact coastal water quality. CECs serve a coordinating role across several sectors that regulate land use activities that can have negative impacts on coastal water quality.

This research also demonstrates how diffuse policy areas related to climate change adaptation and protected area management encompass policy mandates connected to water quality related issues and how these overlapping mandates can fill regulatory gaps. In this case, for example, both the National Environmental Policy and National Protected Area Policy advance policy mandates related to coral reef health, water quality management, and the management of sedimentation from surface runoff. The National Water Resource Management Policy also addresses these specific areas. The water quality focus of these national policies can inform the water quality policy mandates for different sectors at the subnational level. Hence, horizontal loosely integrated linkages can be created between coastal management sectors, even when sector specific policies do not focus on water quality management.

The emergence of new interests such as oil and gas within the study area has resulted in conflicts with traditional sectors such as tourism and fisheries. The priorities placed on such new interests, the possible fallouts from related activities on coastal water quality and the current institutional deficits for managing these fallouts present complex coastal management challenges. For example, current oil and gas exploration in southwest Tobago takes place outside the coastal management jurisdiction of Tobago. Responding to these challenges may require more loosely integrated type arrangements that respond to the effects of an activity that may

degrade water quality, not the activity itself. These opportunities exist within existing overlapping and redundant management arrangements for coastal disaster response that connect sectors with mandates for weather forecasting nationally, with disaster response agencies sub-nationally and arrangements that connect both agencies with regional and international forecasting of disaster events.

## **5.7 Conclusion**

This paper presented a typology of fragmentation for framing and analyzing how different types of coastal management linkages limit the harmonization of goals and objectives for integrating coastal water quality management. In this paper, I define fragmentation as the extent to which linkages between the goals and objectives of coastal management arrangements for the management of common issues, across spatial scales, within or across different sectors and across levels of coastal jurisdictions, are conflicting or synergistic, or the extent to which such linkages foster cooperation among different coastal interests. I showed how diverse conflicting linkages between the goals and objectives of different coastal management arrangements for the management of coastal water quality, presents challenges for harmonization. However, I also showed how opportunities exist for integration through other linkages.

The major contribution of this paper is its framing of fragmentation in coastal management arrangements and the application of the typology to identify, analyze and discuss the integration of coastal water quality management. The conception of fragmentation was not original to this paper. This paper was framed based on a typology of fragmentation by Biermann et al. (2009). However, fundamentally, the framing of fragmentation in this paper differs from

that of Biermann et al. (2009) in its identification and analysis of different types of linkages between the goals and objectives of coastal management arrangements across sectors. This did not form any significant element of Biermann et al. (2009) conceptualization. They focused on larger global scales and multinational regulations, e.g., Kyoto Protocol. The application of the typology of fragmentation within a national and subnational context of coastal water quality management served to capture some insight of its value as a conceptual and analytical approach for water quality management praxis. Three significant insights have been identified from the analysis of the results:

1. Dual-level coastal management that shares similar regulatory arrangements can create synergies in water quality management, where mechanisms, e.g., MOUs that link both levels allow for authority migration and decision-making at the lower level. These linkages serve to resolve conflicts across the subnational and national levels of coastal management. This insight may also be useful in multilevel coastal management arrangements.
2. Regulatory mechanisms, e.g., CECs that foster coordination among sectors with responsibility for issue areas related to water quality through regulations that are more loosely connected can serve to circumvent conflicts between regulatory rules for water quality management.
3. Broad policies such as those pertaining to climate change adaptation and protected area management can forge cooperative linkages for water quality management, where sector-specific policies do not target such issue areas.

Social and ecological drivers of change and their impacts and effects on coastal systems will continue to pose challenges for managing coastal water quality. Managing the impacts of



these changes using conventional approaches to coastal management may prove difficult, given the different types of conflicts involved and the effects of these conflicts across sectors and levels of coastal jurisdiction (Westmacott, 2001).

A common solution to fragmentation advanced in coastal management literature is the harmonization of regulatory rules and policies across sectors for the same issue area (e.g., Christie, 2005). However, in line with the findings in this case, the thesis of Biermann et al. (2009) and the complex decision environment identified by Westmacott (2001), harmonization for integrating coastal management is a complex and difficult endeavor. Often, approaches to harmonization require new legislative arrangements that serve, to slow down the process of integrating coastal management (Taljaard et al., 2012).

Analysis of fragmentation in coastal water quality management shows how conflicts could be resolved more quickly, by taking advantage of existing synergistic management linkages or by working within cooperative regulatory and policy linkages (cf. Biermann, 2009). Such a flexible approach could serve to promote greater efficiency and participation in decision-making processes across sectors and coastal management jurisdictions. In this way, functional fragmentation is avoided (Tobey & Volke, 2002) leading possibly to more favorable outcomes in coastal water quality management.

## **6.0 CHAPTER SIX: Understanding Responses to Declines in Coastal Water Quality: An Integrated Collaborative Coastal Management Approach**

### **6.1 Abstract**

Coastal water quality decline has become a major governance issue for different sectors. Like other coastal problems, responding to declines in coastal water quality requires involvement of several sectors to navigate of arenas of collaboration that: 1) enables disparate coastal interests to make decisions within autonomous and interdependent management arrangements; 2) helps these interests to negotiate power, leadership and accountability within collaborative processes; and 3) enables disparate interests to negotiate trade-offs between resource uses. This research used a case study approach, to examine three collaborative coastal management projects. Each project was managed by a collaborative committee, involving state and non-state agents. Several key findings were identified. Primarily, the results show how existing managerial and research capacity in state and non-state agents enable collaborative committees, to mediate power and leadership across several sectors operating within autonomous and interdependent governance arrangements, in a dual-level coastal jurisdiction. For example, the results show how existing interdependent governance arrangements related to water quality management could enable transitions from sector-specific approaches to more collaborative responses to water quality management. Conversely, the results show how autonomous governance arrangements impede collaborative water quality management. Given that this case study included wide engagement of public and private and national and subnational coastal interests, the findings could have significance for shaping collaboration as a strategic approach for responding to coastal water quality decline in other jurisdictions.

**Keywords:** collaborative coastal management, coastal water quality, autonomous, interdependent, collaborative institutions

## **6.2 Introduction**

Collaboration is often promoted as a governance strategy to integrate coastal management (cf, Imperial, 2005). One of the major arguments is that collaborative processes could serve to negotiate conflicts between coastal interests that share responsibility or that need to share coastal management responsibility for common issue areas (Kearney et al., 2007; Berkes et al., 2007; Shamsul Huda, 2004). However, the contexts of shared responsibility could be quite diverse and fragmented requiring new collaborative institutional arrangements (see Lubell et al., 2010). In such circumstances, collaborative institutional arrangements help to clearly integrate antecedent legislative and policy prescriptions, between sectors and levels of coastal management (Stojanovic & Ballinger, 2009; Pomeroy & Carlos, 1997; Chua, 2013), with coastal management problems that serve as motivation for collaboration. Collaborative responses and outcomes could be understood more clearly by connecting and analyzing the functional linkages between these contexts (Gray, 1985).

Recently, public administration scholars have examined the collective value of antecedents and collaborative institutional arrangements and the collaborative process as decision arenas, to understand outcomes from the perspective of responding to climate change as well as navigating general public collective problems (Emerson et al., 2012; Emerson & Murchie, 2010; Gray, 1989; Bryson et al., 2006; Saint-Onge and Armstrong, 2004). Given the lack of such an approach in the coastal management literature, I used the arenas above as the basis to define and develop a framework to understand integrated collaborative coastal

management. I define integrated collaborative coastal management as a strategy that functionally links problems in ecosystem conditions that serve as motivation for collaboration with coastal management arrangements across sectors and levels of government within new collaborative institutional arrangements to foster cooperation and participation in response to common issue areas (Lubell et al., 2010; Imperial, 2005).

Using an instrumental case study approach, I apply the framework to analyze and understand collaborative responses and outcomes within the context of three coastal management projects in a protected area in southwest Tobago. My aim is to present a more integrated perspective of collaboration, by demonstrating how issue areas linked to declines in coastal water quality and related governance arrangements shape collaborative processes and collaborative institutional arrangements and how these linkages influence collaborative responses and outcomes. Often, in the literature on collaboration, antecedents are treated merely as contextual conditions, meaning that they provide important background information for understanding collaboration without necessarily affecting the outcomes of collaborative processes. In this paper, I examine antecedents and other conditions, e.g., existing governance arrangements as directly influencing collaborative outcomes.

### **6.3 Conceptual Background**

Definitions of collaboration fit generally with that of Carlson (2007), i.e., “a variety of processes in which all sectors; public, private and civic are convened, to work together, to achieve solutions to public problems that go beyond what any sector could achieve on its own” (Carlson, 2007, cited in Emerson & Murchie, 2010, p. 142). In this paper, my use of collaboration aligns with the characterization of Emerson and Murchie (2010) who argue that “collaborative

governance integrates structures for decision making, deliberative processes, leadership and information, to resolve and manage difficult public policy problems” (p. 2). Gray (1989) characterizes the collective of these structures as a domain. In the context of collaborative institutions, Saint-Onge and Armstrong (2004) define the linkages within this domain as cross-functional elements that serve to enable joint action.

The different characterizations of collaboration above capture many of the dimensions evident in several decades of research on collaboration in environmental management and public administration (Wood & Gray, 1991). This general body of literature acknowledges that collaboration is an essential endeavor that is driven largely by interest in common problems, involving multiple actors (Gray, 1989; Margerum, 2008). Research on collaboration also places emphasis on the processes that guide the actions of collaborators, within established procedures and institutional settings (e.g., Carlsson & Berkes, 2005). Additionally, collaborative management research emphasizes the fact that notwithstanding the desire to work together collaborators often bring to the process different institutional mandates, different interests in collaborative problems and different degrees of power and influence (Bryson et al., 2006).

The emphasis in the literature on collaboration above highlights three important aspects of collaboration: common interests in antecedent circumstances that serve as motivation for collaboration, collaborative institutional arrangements and collaborative practice, within a collaborative domain. Here, I define a domain as “a set of actors (individual, groups and or organizations) and governance arrangements that become linked to common problems or interests” (Gray, 1985, p. 912). For example, a collaborative domain may exist where different coastal sectors have an interest in coastal erosion or coastal water quality decline. In integrated

coastal management (ICM), as is the case in other forms of environmental governance, it is mostly the navigation of these common interests within autonomous or interdependent institutional mandates and the negotiation of these problems within a collaborative process that shape collaborative outcomes (Christie et al., 2005). According to Gray (1985, p. 912), “a domain level focus is essential for understanding and solving collaborative problems.” The following review seeks to connect key elements within a collaborative domain drawing on literature related to collaboration in environmental management but mostly that related to public administration.

**Table 6-1. Functional linkages and key variables within a collaborative domain**

<b>Arenas of collaboration</b>	<b>Functional linkages</b>	<b>Key variables for integrated collaborative focus</b>
Collaborative antecedents	Connecting shared interests in common coastal problems with autonomous and interdependent organizational arrangements.	Common problems, diverse coastal interests, autonomous or interdependent management authority
Collaborative institutional arrangements	Linking collaborative institutional arrangements with disparate institutional mandates, goals and objectives across different sectors	Shared responsibilities, shared goals and objectives, shared institutional mandates.
Collaborative processes	Negotiating and canvassing widespread support among diverse interests and authorities related to common issue areas	Power, leadership and accountability

### **6.3.1 Collaborative antecedents**

Here, I define antecedents as existing problems that impact ecosystems and existing governance arrangements that enable or constrain collaboration. Antecedents establish contextual conditions for collaboration (Imperial, 2005; Selin & Chevez, 1995) and could determine the

success or failure of collaborative outcomes (Marroni & Asmus, 2013). Antecedents determine the design of collaborative institutional arrangements and shape the dynamic process of working together (Wood & Gray, 1991; Emerson et al., 2012; Bryson et al., 2006). Here, the distinction is made between antecedent interests in the condition of ecosystems that serve as underlying motivation for collaboration, antecedent interests that serve as proximate drivers to collaboration and existing governance arrangements that serve to enable or constrain collaboration. The three categories identified above are particularly relevant for collaboration in coastal area management or what is referred to at times in this paper as collaborative coastal management (Lawless, 2015; Verheij et al., 2004).

Underlying interests in coastal systems and common ecosystem problems eventually terminate as connections between sectors and their institutional mandates (Imperial, 1999). For example, impacts on coral reefs emanating from sedimentation forge connections between inland watersheds and coastal areas but also between the institutional mandates of the sectors affected by these impacts (Alemu & Clement, 2014; Mallela et al., 2010). Systems-based approaches to resource management are usually premised on these connections, sometimes to assess the impacts of ecosystem changes on human welfare or to negotiate alternatives between economically important interests, to prevent negative resource outcomes (Pritchard et al., 2000; Clarke et al., 2013; Sandersen & Koester, 2000; Johnsen & Hersoug, 2014) or to accommodate overlapping management responsibilities (Plummer et al., 2006).

Often, even where there is consensus on the need to resolve common problems, collaborative arrangements and outcomes are stymied based on disagreements between disparate proximal interests. For example, Johnsen & Hersoug (2014) illustrate how wider public

economic interest in oil and gas resources in Norway takes precedence over the likely impacts of oil spills on coastal tourism. Such trade-offs create tensions between the interests of either sector. The negotiation of these interests within collaborative initiatives also entails consideration for existing organizational dynamics and structure.

Organizational autonomy could lead to conflicts or failures in collaboration (Storbjörk, & Hedrén, 2011; Imperial, 1999). Autonomy is used here to mean that an agency has legislative sanction to act on an issue, within a management jurisdiction, independent of other sectors (see Hassanali, 2015). However, this agency may not have sole responsibility for the management of a resource system within that jurisdiction. For example, two agencies operating with different institutional mandates may have responsibility for rules governing water pollution within a coastal jurisdiction. In Tobago, the discharge of gray water into the waters of the coastal nearshore is regulated by the Water Pollution Rules of the Environmental Management Authority (EMA) and the Water Pollution Regulations of the Water and Sewage Authority (WASA) (*Personal communication. Key Informant, Water and Sewage Authority, June 13, 2014*). Such autonomous institutional mandates have challenged existing coastal management arrangements, forcing existing coastal management interests to work together (Johnsen & Hersoug, 2014).

Relatedly, existing interdependent governance arrangements or agreements or relationships can serve to foster reciprocal relations between organizations and thereby bolster collaboration (Goble et al., 2014). For example, where responsibility for the management of coastal areas is shared between different agencies, overlapping institutional mandates for different levels of coastal management have served to forge closer linkages between different coastal management sectors (Hassanali, 2015). This might mean collaboration that acknowledges



the sharing of rights between state and non-state interests (Armitage et al., 2011; Berkes, 2002; Plummer et al., 2006). State interests may also need to work together where legislation provides for the sharing of management responsibility between state agents (Fisheries & Oceans Canada, 2002). In Tobago, for example, existing arrangements for the sharing of responsibility for resource management between the national and subnational levels help to make working across coastal management boundaries much easier. Experience with working across such jurisdictions serves to make convening collaborative institutional arrangements more seamless (Hassanali, 2015).

### **6.3.2 Collaborative institutional arrangements**

Many types of collaboration are driven primarily by institutional choice, which has the effect of circumventing and reconfiguring existing autonomous governance arrangements (Lawrence et al., 2002) to enable the collaborative process. Crawford and Ostrom (1995) define collaborative institutions as “enduring regularities of human action in situations structured by rules, norms, and shared strategies, as well as by the physical world” (p. 582). According to Saint-Onge and Armstrong (2004) collaborative institutional arrangements foster cooperation in multi-sector problem domains that can be viewed as a “collection of cross-functional elements that converge to establish the potential for effective action” (p. 17). Emerson et al. (2012) represent joint action based on elements such as procedural and institutional arrangements, leadership and resources that reinforce one another. As such, they posit that cross functional linkages between elements may serve as an inducement for joint action. For example, collaborative institutional arrangements may be established to enhance capacity, based on shared institutional mandates or autonomous institutional environments, within connected or fragmented

management jurisdictions. Such arrangements can serve to respond to change and to promote coordination and cohesion among sectors and levels of government, through shared objectives and shared decision-making (Heikkila & Gerlak, 2005). For example, Ananda and Proctor (2013) show, how watershed advisory committees serve as collaborative institutional arrangements for river catchment management at the regional level in Australia, where different levels of water management exist within a nested hierarchy. Here, water advisory committees involving multiple stakeholders are established statutorily, by a minister responsible for water management, using terms of reference. However, Ananda & Proctor (2013) argue that the advisory nature of these committees limits the intent of collaborative action, given that the minister retains ultimate decision-making authority.

In the case of coastal area management, collaborative institutional arrangements could be designed to respond to multidimensional management contexts in the form of a specific project (e.g., Pomeroy & Carlos, 1997), where the project serves to identify and outline strategies and parameters for collaborative action, within specific shared goals and objectives (Wood & Gray, 1991). Based on these common objectives, projects serve to clearly identify institutional conflicts or synergies arising from sector-based institutional mandates. Collaborative outcomes in the context of projects can be used for long-term strategic intervention, where similar variables and contextual conditions might exist (Olsen, 2003).

### **6.3.3 Collaborative process**

The process of collaboration must necessarily consider how shared interests link multiple sectors and stakeholders together within autonomous or interdependent governance arrangements (e.g., Heikkila & Gerlak, 2005, Ansell & Gash, 2008; Leach, 2006; Carr et al., 1998).

Collaboration also needs to address organizational dynamics (Huxham et al., 2000) that emerge as a result of interaction between organizations within these realms (e.g., Emerson et al., 2012). Thompson et al. (2009) identified several important dimensions of this dynamic including, organization autonomy, mutuality and reciprocity and trust. Leadership, power and accountability are also important elements of organizational dynamics (Smith, 2015; Lockwood et al., 2009; Huxham & Vangen, 2000).

Collaboration frequently begins with important considerations of who should participate and the amount of power that should be accorded to participants (Smith, 2015; Arnstein, 1969). Power is used here in the broad context of authority derived from institutional arrangements and how this authority can influence deliberative processes (Jentoft, 2007). These varying degrees of power have implications for decision-making as stakeholders with more power tend to manipulate the process (Ansell & Gash, 2008).

Collaborative processes can also determine whether participants have a direct influence on collaborative outcomes, based on the legitimacy of collaborative decision-making (Fung, 2006). In many instances, where state and non-state agents collaborate, state agents may have greater access to coercive and resource power given the structures within which they operate and the financial and technical resources available to them to manage important state resources (Purdy, 2012). Non-state groups usually depend on more persuasive or discursive forms of power, to lobby the state into action. Such forms of power may be more effective when they represent wider societal ideals, e.g., ecological conservation and originate from sources with wide public support or appeal (Purdy, 2012).

Coercive state power has several important elements including but not limited to convening the process of collaboration, fostering and safeguarding ongoing interactions and influencing decisions that are credible and acceptable (Ryan, 2001; Arnstein, 1969). Often, collaboration across different levels of government is empowered by superior sanctioning rules. Therefore, some agents come to the table with greater authority than those at lower levels. Coastal management negotiation and decision-making in such environments might involve negotiating different forms of power, e.g., the power found in leadership (Jentoft, 2007).

The important aspects of leadership emphasized here relate to how it influences collaboration. Leadership is used here in reference to “making things happen” (Huxham & Vangen, 2000). Leaders have the power to convene the process of collaborative action as well as establishing goals that initiate and sustain joint action (Ansell & Gash, 2008). Leadership can serve as a catalytic force for canvassing widespread support and for seamless integration of technical, managerial and organizational spheres (Ivanova, 2010). Given its dynamic and multidimensional nature, leadership is often most effective when consideration is given to leadership roles within the collaborative process, where decision-making is based on antecedent conditions (Sutton & Rudd, 2014). For example, managing complex changes in ecosystem conditions may require greater leadership input from technical experts, while not neglecting the role of community leaders (Margerum & Whitall, 2004). In other instances, well-organized non-state agencies may be able to circumvent bureaucracies and lead collaborative initiatives based on competence and past experience (Huxham & Vangen, 2000). Yet again, depending on jurisdictional interaction and shared management responsibility, co-leadership arrangements may be most relevant for effective decision making (Pearce et al., 2014). Where collective action is

dependent on significant financial input, leadership could determine the resource capacity available to collaborators for achieving stated goals and objectives (Lockwood et al., 2012).

Accountability is another important dimension of leadership. “Leaders are accountable to a number of different forums and there are different ways of categorizing who is accountable to whom” (Christensen & Lægreid, 2015, p. 209). For example, accountability could be viewed based on hierarchical relations as upward or downward accountability (Christensen & Lægreid, 2015). Accountability serves to strengthen and legitimize the process of collaboration.

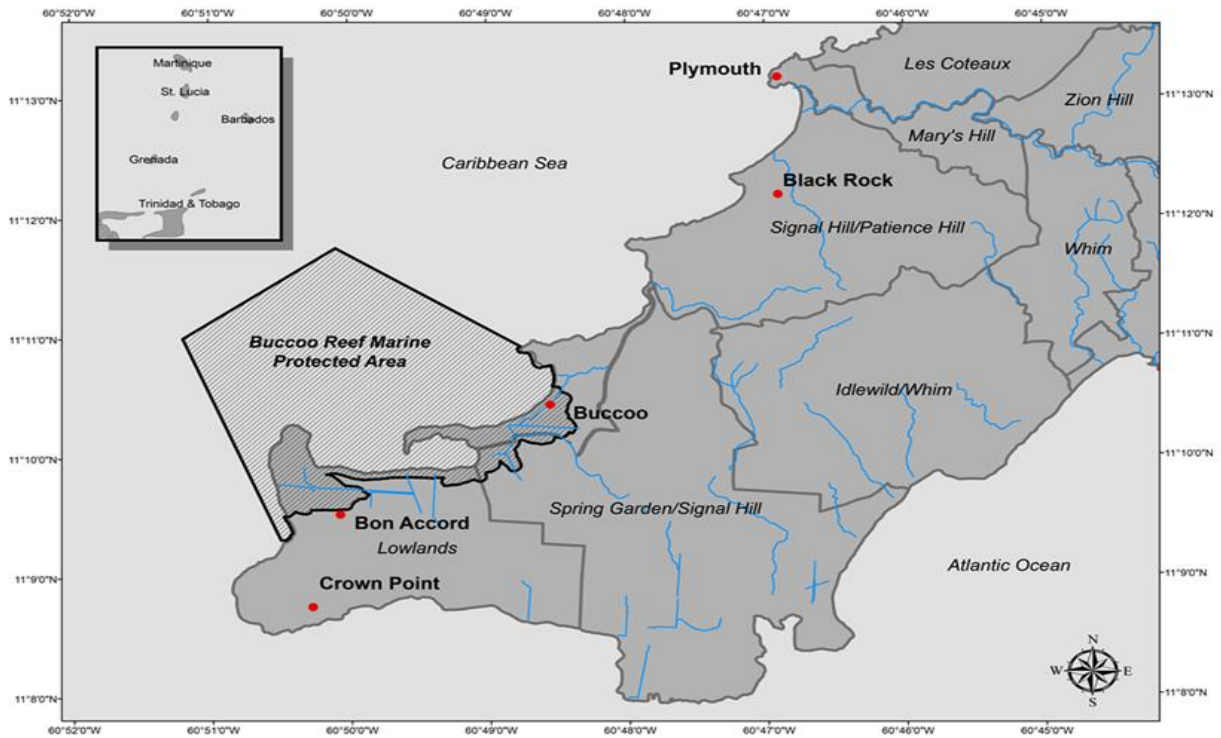
Accountability suggests that there is a mutual and reciprocal obligation among collaborators to account, through established standards or regulations (Koliba et al., 2011). Accountability has been credited with fostering interdependence, through the feedback it engenders, within collaborative processes. However, ensuring accountability could prove difficult, especially in multi-level arrangements with autonomous decision-making centers (Koliba et al., 2011). Other important aspects of accountability include public reporting and engagement (Cameron, 2004). Such reporting provides a means through which stakeholders know that goals and objectives are being met (Cameron, 2004). In the case of community groups that may not be directly involved in decision-making processes downward accountability has been seen as important (Lane et al., 2004), especially where lack of accountability could lead to strained relations with important community partners (Lockwood et al., 2009). From the perspective of state agents and other authoritative bodies, upward accountability, although burdensome, has led to greater efficiency in collaborative decision making (Lockwood et al., 2009).

## **6.4 Research Methods**

This research utilized three coastal management projects and an instrumental case study method, to examine how issues related to water quality decline shapes collaboration between diverse coastal interests. Instrumental case studies serve to provide insight into a specific issue or issues, to redraw generalizations or build theory (Stake, 1994). According to Stake (1994), the details of the case play a supporting role, to facilitate the understanding of something else. For example, in this case, each project is used to provide insight into how declines in coastal water quality link different coastal interests in these problems with autonomous and interdependent coastal management arrangements, and how these decision arenas shape collaborative processes and collaborative institutional arrangements.

### **6.4.1 Case study contexts**

The case study was conducted within a protected area on the southwestern end of the island of Tobago. Tobago is the smaller of the two islands in the twin island republic of Trinidad and Tobago and represents the subnational level of coastal management. Tobago has a land mass of 300 km<sup>2</sup> and a population of approximately 60,000 persons; 56% residing in the southwestern region of the island (GROTT, 2011a). Located in southwest Tobago is a coastal enclave of highly sensitive ecosystems, e.g., lagoons, mangroves and beaches, within an area designated as the Buccoo Reef Protected Area /Bon Accord Lagoon Complex (BRPA/BLC). The Buccoo Reef Protected Area (BRPA) encompasses an area of approximately 7 km<sup>2</sup> (Potts et al., 2004). The BRPA/BLC encompass approximately 12.5 km<sup>2</sup>. The entire area is surrounded by several coastal villages (see Figure 6-1).



**Figure 6-1. Map of Buccoo Reef Marine Protected Area in southwestern Tobago, with Trinidad and Tobago inset. Source: ParCA project**

In 2005 and again in 2010 the Buccoo Reef experienced two major bleaching events (Alemu & Clement, 2016). Empirical evidence connects these two events to rising sea surface temperatures (RSST) and approximately 25% decline coral cover in the Buccoo Reef (Alemu & Clement, 2014). Additional studies within the BRPA have linked coral decline to high sediment loads during periods of heavy rainfall and enrichment of the waters in the nearshore. These impacts have been attributed to changing land use practices in watersheds inland, e.g., the Courland watershed and sewage discharge from hotels within the coastal fringe (Mallela et al., 2010; Lapointe et al., 2001).

The BRPA has its own legislative arrangements and regulatory rules.<sup>27</sup> Additionally, management of impacts on coastal systems within the BRPA occurs within legislative and policy arrangements from the national level. For example, at the subnational level, the regulation of gray water discharge from hotels into coastal waters is regulated by a national agency, the WASA. Gray water discharge from other properties, e.g., guesthouses and private dwellings is regulated by WASA and the Department of Natural Resources and the Environment (DNRE). In most instances, management responsibility has been transferred via a Memorandum of Understanding (MOU) from the national to the subnational level. For example, the Environmental Management Agency (EMA), at the national level has transferred responsibility for the monitoring of water quality discharge in the coastal nearshore, to a subnational agency, the DNRE. However, the WASA retains responsibility for water quality monitoring at the subnational level.

In response to the management conflicts within this environment, national and subnational state and non-state agencies respond to the changes in coral reefs and water quality alluded to above utilizing collaborative coastal management projects. Three of these projects serve as the context for this case study. A brief overview of each project is provided below:

### **Integrated Watershed and Coastal Area Management (IWCAM): Land-Use Planning and Watershed Restoration in the Courland Watershed and Buccoo Reef Area**

Integrated Watershed and Coastal Area Management (IWCAM) was a national demonstration project for Trinidad and Tobago funded by the Global Environmental Facility (GEF) and designed to reduce the impact of land degradation in the Courland watershed and

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<sup>27</sup> Marine Areas (Preservation and Enhancement act chapter 32:07)  
[http://rgd.legalaffairs.gov.tt/laws2/alphabetical\\_list/lawspdfs/37.02.pdf](http://rgd.legalaffairs.gov.tt/laws2/alphabetical_list/lawspdfs/37.02.pdf)



other smaller watersheds on coastal areas and the Buccoo Reef. The Courland is the largest watershed in Tobago. A project management unit managed IWCAM with oversight from a statutory committee. The statutory committee included agencies with responsibility for issue areas related to or affected by coastal management, e.g., tourism environmental protection and watershed management, e.g., the WASA. Other interests represented on the committee included Environment Tobago (ET) and the Buccoo Reef Trust (BRT). Environment Tobago is a Non-Government Organization that promotes public advocacy and leadership in issues affecting the environment. The BRT is a non-profit trust lead by a board of directors. The Trust was established to address in part the specific needs of the marine environment in Tobago through research in tropical reef ecosystems. Based on the work of the BRT in coastal research and its linkages with private sector agencies and academia, it was made the lead of the project. The management of the project by the BRT was facilitated via a MOU with the Tobago House of Assembly (THA) (Buccoo Reef Trust, 2005).

### **Piloting the Integration of Coastal Zone Management and Climate Change Adaptation Tobago**

The project Piloting the Integration of Coastal Zone Management and Climate Change Adaptation (ICZM/CCA) in southwest Tobago is a technical cooperation project, funded by the Inter-American Development Bank (IADB). The pilot project forms part of a larger initiative geared towards supporting the government of Trinidad and Tobago in strengthening and modernizing its regulatory, institutional and policy frameworks to integrate climate change and its impacts on national economic development. The Tobago pilot is geared toward the

development of an integrated coastal zone management (ICZM) plan for Tobago, addressing the vulnerabilities of the coastal zone of Tobago, to the impacts of climate change (McCue, 2014).

The ICZM/CCA project was managed by a cabinet appointed National ICZM Steering Committee with representation from both state and non-state sectors, at the national and subnational levels. Most of these agencies possess some measure of legislative and executive responsibility for issue areas related to coastal management and climate change adaptation. One NGO was represented on the committee. The pilot project in southwest Tobago was managed by a project coordinator, within the office of the Institute of Marine Affairs (IMA), a national state agency.

### **The National Sea Turtle Tagging and Monitoring program**

The National Sea Turtle Tagging and Monitoring Program (NSTTMP) is a three-year research project geared towards promoting proactive management and decision-making regarding the protection of sea turtles in Trinidad and Tobago to prevent extinction. The project has as one of its main objectives gathering information about the resident population of hawksbill and green turtles that forage on the reefs and sea grass beds around Tobago (Bachan, 2009). An important aspect of data collection in this project is the extent to which declines in such coastal systems affect turtle populations.

A consortium of NGOs managed the NSTTMP comprising representatives from the national and subnational levels, within the Turtle Village Trust (TVT). The trust is managed by a board of directors and receives funding for its work from private corporate entities such as BHP Billiton and Atlantic LNG and the state. BHP Billiton and Atlantic LNG are private companies involved in oil and gas exploration and drilling in Trinidad and Tobago. The program in Tobago

is coordinated through a sub-office of the Turtle Village Trust, which provides administrative oversight and support to facilitate training in data collection. The trust also coordinates the work of other community groups involved in the program.

#### **6.4.2 Data Collection**

The data for this research were drawn from a dataset of 75 interviews conducted in June and July 2014 with tourism, fisheries and environmental protection stakeholders (see Appendix F). Interviewees were selected based on previous contact from an earlier data collection exercise in 2012.<sup>28</sup> Thirty-seven interviews from this dataset were utilized in this research (see Namey et al., 2008). Firstly, 17 interviews were selected from key informants from different collaborative initiatives between sectors in Tobago representing tourism, fisheries and environmental protection, e.g., the Oil Spill Contingency Committee, Tobago Hotel and Tourism Association, the Tobago Bed and Breakfast Association, South West Tobago Fishermen Association and the defunct Buccoo Reef Management Committee. These 17 interviews served to provide data on social ecological changes and governance issues that help to determine collaboration among organizations in Tobago. Analysis of the data from these 17 interviews was used together with insights from established literature to frame the conceptual approach to the research. For example, insights from the 17 interviews and the literature were used to determine the focus areas in the literature review. Some insights from these interviews were also included in the results and analysis and discussion.

Secondly, twenty 20 interviews were selected from the total dataset of 75, based on purposive sampling using one main inclusion criterion (Patton, 2002), i.e., representation on the

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<sup>28</sup> In June of 2012, a community based vulnerability assessment (CBVA) was conducted in the study area which included interviews with key stakeholders from state and non-state interests from sectors such as fisheries, tourism and environmental protection.

committees that managed each of the three projects used in this case study. The sample from the IWCAM project comprised five respondents who served on the management committee. Additionally, five persons who were not directly involved in the committees were interviewed. These persons were added to the sample, based on suggestions from respondents who served on the committee for the IWCAM project. Three of these persons served in a technical capacity at the Buccoo Reef Thrust and were intimately involved in the project implementation and evaluation. Two persons were interviewed from a community group-- Ansformage Ecological Community Organization (AFECO)--who were engaged in watershed management within the Courland watershed. These selections were made based on their involvement with IWCAM and recommendation from the project manager.

The sample from the pilot project ICZM/CCA included four persons who served on the National ICZM Steering Committee; the committee that managed the project. Additionally, two persons were interviewed from the coastal vulnerability sub-committee.<sup>29</sup> The sample from the NSTTMP comprised persons; the national and subnational coordinators of the program and two persons directly involved in the implementation of the NSTTMP in Tobago; one from Save Our Sea Turtles (SOS) Tobago, an NGO and the other from a community group involved in the collection of data for the national monitoring program.

In keeping with the three arenas of collaboration under investigation the 20 interviews had three main foci. Firstly, in an effort to capture the coastal management context, the interviews focused on the work of each agency, the institutional environment within which the agency operated, and where necessary, the links between agencies at the subnational level and

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<sup>29</sup> This project also included a number of sub-committees with mandates to present reports on different thematic areas, e.g., coastal vulnerability

those at the national level. Secondly, the interviews sought to identify and understand the environmental context of each project. Both the institutional environment and environmental context helped to identify the issues related to declines in coastal water quality that served as the underlying motivation of collaboration related to the project. Thirdly, the interviews sought to capture data on the internal dynamics of the collaborative process itself, i.e., the influence of leadership, power and accountability on collaborative outcomes. These related to how power was mediated with different collaborative institutional arrangements and how leadership serves to convene and sustain the collaborative process.

Here, a collaborative outcome is defined by relations within the collaborative process in terms of how it enables effective cooperation and participation as opposed to other tangible project outcomes. This is an important distinction as project outcomes might be dependent on a host of other variables or factors unrelated to the collaborative process. Additionally, project outcomes may be influenced by activities pre or post project implementation and completion.

### **6.4.3 Data analysis**

Data was analyzed using directed content analysis and constant comparison (Hsieh & Shannon, 2005; Fram, 2013). The data analysis focused on the linkages between the three arenas of collaboration identified in Table 6-1. Directed content analysis involved using clearly identified categories during the data sorting and analysis process, based on the purpose and objective and analytical framework of the case study (Krippendorff, 2012). Constant comparison refers to the process of adding new data to the initial data analysis while ensuring that both sets of data are complementary. Fram (2013) suggests that this approach is important for maintaining the perspectives of the participants throughout the data analysis process.

Data was transcribed and coded manually into three broad categories based on antecedents, process and collaborative institutional arrangements (see Table 6-1). Based on the literature review, data relating to the antecedents was further divided into three subcategories, namely: shared interests in common problems, organization autonomy and organizational interdependence. Within the collaborative process, three broad categories (power, leadership and accountability) were chosen deductively based on the literature review on collaboration. Subcategories were also identified from the literature review. Identification and framing of the data according to categories and analysis of subcategories, within each category served to identify the linkages between categories and subcategories that foster or impede collaboration.

The direct quotes from respondents are labeled A for the project Integrating coastal management with climate change adaptation, B for the IWCAM project, and C for the NSTTMP.

## **6.5 Results and Analysis**

The results are reported to highlight how important functional linkages between different variables or elements within the three arenas of collaboration--antecedents, collaborative processes and collaborative institutions--enable collaboration for issue areas related to coastal water quality. This is in line with what was referred to in the background of this chapter as a domain level analysis of collaboration (Gray, 1985). Table 6-2 below provides a summary of the findings.

**Table 6-2. Summary of important linkages for collaborative coastal water quality management**

<b>Type of functional linkages</b>	<b>Relevance of linkages for collaborative coastal management</b>
<b>Declines in Water Quality and Coastal Interests</b>	<p>This link shows how direct and indirect interests influence the constitution of collaborative committees. Both direct and indirect interests are represented based on the way they influence or are influenced by declines in coastal water quality. Although collaborative committees limit the involvement of indirect interests, these interests are engaged in responses to water quality declines in two ways; directly on committees through NGO representation or engagement with community groups. This type of engagement allows for advocacy on important water quality issues at the levels of collaborative committees but also accountability to the coastal community and wider public interests that are not directly involved. Engagement of too many interests in collaborative committees has been shown to slow down and frustrate the process of collaboration.</p>
<b>Autonomous and interdependent water quality mandates</b>	<p>Autonomous and divergent institutional mandates for the regulation of issue areas related to coastal water quality management highlight integrated management conflicts. Conversely existing interdependent arrangements for water quality management create overlaps across sectors and levels of coastal jurisdictions that foster efficient collaborative outcomes.</p>
<b>Institutional Arrangements, Leadership, Power and Accountability</b>	<p>New institutional collaborative arrangements serve to circumvent existing sector mandates so that agencies can negotiate leadership roles and authority conflicts, created by either autonomous or interdependent institutional arrangements for issue areas that impact coastal water quality. Where no authority exists for the participation of non-state agents, mechanisms such as MOUs serve to transfer power. MOUs also provides legitimacy to non-state agents in state sanctioned programs. Regarding accountability, advocacy of water quality issues that are important to different publics is ensured through the participation of NGOs on collaborative committees and involvement of community groups in awareness and education programs in issue areas related to water quality declines. This type of engagement seems to be important for public buy-in to collaborative projects and programs.</p>

### **6.5.1 Linking declines in water quality and coastal interests**

Here, the focus is on how ecosystem conditions that serve as motivation for collaboration connect sectors having common but diverse interests in coastal water quality decline. Declines in coastal water quality serve to connect important coastal sectors and their coastal management mandates in issue areas related to water quality management, either indirectly or directly. For example, turtle conservation stakeholders in the TVT, involved with the STTMP are indirectly concerned with how declines in water quality affect different species of sea turtles, e.g., hawksbills.

*Turtles want, safe clean beaches and near shore waters so they are really an ideal kind of mascot. Hawksbills are actually listed as an indicator species of climate change (Respondent C 14).*

Respondents from the ICZM Steering Committee and the IWCAM project focus more directly on the impact of water quality decline on coral reefs as a major focal point. Additionally, all three collaborative initiatives connect coastal water quality with wider public interests. For example, in the IWCAM project, public interest in coastal water quality was incorporated into statutory committees by including representation from NGOs, in this case ET, while the interests of the research community were represented by the BRT based on their work in coastal research. The involvement of the BRT represents close linkages between research in coral decline and the collaborative process.

*“Buccoo Reef Trust at the time being very vibrant in terms of following up with these types of projects ...got the endorsement of the THA to pursue the project” (Respondent B 25).*



*“...we had the resources, the capability and the management expertise on board .... and when other agencies were evaluated to do similar projects they did not have the kind of expertise and track record as BRT” (Respondent B 22).*

Based on the responses across different committees, it is obvious that collaborative committees limit the involvement of many stakeholders that are either directly affected by coastal water quality decline or that may contribute to it. Some respondents shared sentiments that support this exclusion. For example, past experience with the defunct Buccoo Reef Management Committee show how large collaborative committees degenerate into *“talk shops”* when they engage too many stakeholders (Respondent A 7).

*“With too many stakeholders there is diffusion, so there is no need for you to perform and when you have thirteen pallbearers one or two don't want to lift it” (Respondent A 7).*

*“...If you put too many people on one committee it might be too overloaded and the committee might not function” (Respondent B 19).*

### **6.5.2 Autonomous and interdependent water quality mandates**

Institutional autonomy can affect water quality management because such autonomy results in disconnections between agencies with responsibility for issue areas that impact coastal water quality. For example, in the IWCAM project the DNRE and the WASA operate within autonomous rules for the emission of gray and black water from private business and hotels.

*“The WASA collects, treats and distributes wastewater... (Respondent B 8).*

*WASA regulates gray water discharge using PAHO standards” (Respondent A 7)*

However, unlike the DNRE WASA does not monitor phosphorous and nitrogen.

*“The basic factors that we would be looking for is Total Oxygen Demand TOD, fecal count, suspended sulfate and chlorine residue ...” (Respondent B 7).*

The DNRE monitors private business based on the water pollution rules that regulate pollutant levels in greywater emissions that affect coastal areas.

*“The water pollution rules.determines how a person, an applicant ,can pollute. There are parameters set and there are limits to these parameters. These limits are dependent on the location, whether it is near shore or environmentally sensitive areas...). (Respondent B 12).*

On the other hand, collaboration between agencies from the national and subnational levels benefits from overlapping and interdependent institutional arrangements. For example, MOUs already existed between the EMA (a national agency) and the DNRE (a subnational agency). Both agencies are represented on the ICZM Steering Committee. MOUs also exist between the IMA at the national level and the THA<sup>30</sup> for collaboration on coastal research. Through these agreements, the IMA was able to establish systems for water quality monitoring within the BRPA as part of the pilot project ICZM/CCA.

*“Two coral reef early warning systems were placed in the Buccoo Reef to capture scientific and meteorological data, e.g., water temperature, salinity and turbidity..... The IMA would do some preliminary analysis of the data and ... the National Oceanographic*

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<sup>30</sup> The Tobago House of Assembly is a constitutionally established body that has executive authority for coastal management at the subnational level.

*and Atmospheric and Administration (NOAA) would also receive the data real time and they would do monthly or weekly reports” (Respondent 26).*

Such organizational interdependence demonstrates how existing management structures enable collaboration between the national and subnational agencies within the ICZM Steering Committee and how such structures contribute to shaping water quality management outcomes.

### **6.5.3 Collaborative institutional arrangements, leadership, power and accountability**

Statutory committees represent new ways of engaging multiple coastal management interests with significant implications for shaping leadership power and accountability, within collaborative processes, related to coastal water quality management. Through new institutional arrangements such as statutory committees, different interests are able to negotiate issues related to leadership, power and accountability, within autonomous and interdependent institutional mandates. For example, the BRT, within which IWCAM management committee was able to serve as the lead on the IWCAM project despite the difficulties with NGOS implementing and managing national projects funded by international agencies, such as the GEF.

*“...this was not just a Tobago project it was actually a national project a Trinidad and Tobago Project one being done and led by an organization in Tobago and more so not by the state but more so by a NGO I guess that provided part of the major challenge because projects of these nature are usually spearheaded by the state” (Respondent B 17).*

*GEF doesn't operate with NGOs but with government agencies (Respondent B 12).*

In this case, however, the leadership for the project was transferred from the nation to subnational level through a MOU,<sup>31</sup> NGO leadership was engaged via another MOU that transferred authority to the BRT (Respondent B 12).

*“The THA benefited from the lack of bureaucracy and the capacity that NGO leadership brought to the project” (Respondent B 25).*

Statutory committees also allow NGOs to play a leading role in convening the process of collaboration among multiple stakeholder interests, nationally and sub-nationally. For example, based on its previous work in coral reef research, the BRT was able to convene and lead the IWCAM project.

*“Buccoo Reef Trust at the time being very vibrant in terms of following up with these types of projects and writing of proposals, liaising with the stakeholders got the endorsement of the THA to pursue the project” (Respondent B 25).*

However, notwithstanding the capacity to convene and manage projects, NGO leadership has its challenges. One such challenge was referred to by (Respondent B 11) as “NGO/government kinds of resistance” or national/subnational coastal management resistance. These types of resistance refer specifically to challenges faced by an NGO to manage a state project at the subnational level. These tensions are created between national and subnational levels. However, they can be circumvented based on co-leadership arrangements.

Responses from members of the National ICZM Steering Committee for the ICZM/CCA pilot project highlight the important role of co-leadership in collaborative coastal management, particularly, for working across two levels of coastal management.

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<sup>31</sup> The Tobago House of Assembly is a semi-autonomous government body, responsible for the executive management of the island of Tobago. The assembly has limited legislative responsibility for matters in Tobago, <http://www.tha.gov.tt/about-the-assembly/>

*“It's the THA that has the mandate over the six nautical miles and whatsoever happens within that, to the shoreline or to the coastal belt” (Respondent A 19).*

An important aspect of co-leadership in this project is the “*ex officio*” leadership role accorded to the subnational level. For example, while the project is managed by a National ICZM Steering Committee, it is co-led by the Chief Administrator; the most senior public servant of the THA, at the subnational level.

*“With respect to that arrangement it is better for the project as a whole, to ensure that the THA is in agreement with what the national policy and procedures are and they can work together to implement these policies and procedure” (Respondent A 19).*

The Chief Administrator also serves as the Tobago representative on the National Steering Committee. Given that the Chief Administrator is the administrative head of the THA, collaboration between the national and subnational levels is made less conflicting.

Regarding the mediation of power, the manifestation within any given committee and the way it is exercised and mediated depends on the source, i.e., whether statutory or non-statutory. Generally, within the different collaborative committees, in this case, power was mediated without conflict and concerns about power were latent as stakeholder interests were represented by senior management.

*Researcher: “Would you say that your input as General Manager within the committee would have perhaps been more effective than say if a lesser officer had been a part of the committee?”*

*“Somebody at my level, when you speak you more or less speak with some level of authority and get commitments to implement things as the case may be. A lower level*

*person may not be able to really represent the organization in the way in which I could”*  
(Respondent B 8).

The IWCAM case also demonstrates that in some instances, especially where state and non-state interests collaborate within non-statutory committees, additional mechanisms are required to mediate power. For example, the role given to BRT would be highly improbable without a MOU transferring authority for the leadership and management from the subnational authority for issue areas related to coastal area management, the THA, to the trust. The important point here is that although NGOs usually work within persuasive forms of power (see Purdy, 2012) to promote the public interests, some types of public engagement require the coercive power of the state (Ryan, 2001; Arnstein, 1969).

*“Especially where legislative mandates are fuzzy and where sometimes public could mean that it is everybody’s property but in terms of collaboration it could mean that is it nobody’s responsibility”* (Respondent C 14).

This shows that where state agents may not be directly involved in a collaborative arrangement, state sanction might still be required where formal authority is needed for project implementation within jurisdictions that fall under the authority of the state (Gray, 1985). For example, one respondent involved in NSTTMP in Tobago indicated that prior to the NSTTMP, NGOs in Tobago were able to work across organizations with similar interests in turtle conservation, without the involvement of the state (Respondent C 19).

However, when the NSTTMP was established, NGO engagement required formal arrangements such as MOUs, to clearly identify roles and responsibilities between different NGO’s and to receive sanction from the relevant state agency.

*“The opportunity to sign a MOU allowed different turtle conservation groups to carry out our activities now on behalf of Turtle Village Trust, which is the main monitoring body” (Respondent C 17).*

MOUs were also signed between TVT and the DNRE. In the latter case, the MOUs served as mechanisms to transfer responsibility between state and non-state agencies and in the former instance the MOU served as the avenue for sharing responsibility between non-state agents.

Although limiting the number of stakeholders that can be indirectly involved in the collaborative process, collaborative institutional arrangements engage wider public interests indirectly through the public advocacy of NGOs and directly through engagement with different publics. This process of downward accountability is particularly important for stakeholders with secondary interests but no direct responsibility for coastal area management. These stakeholders must buy into the collaborative process but are not directly involved in decision making. For example, IWCAM engaged with coastal communities to glean perspectives both pre and post project implementation. IWCAM also worked closely with community groups, e.g., Ansformage Ecological Community Organization (AFECO) for both the transfer of technical training and collection of base data. AFECO is a community group involved in reforestation in the Courland watershed (*Respondent B 38*).

*“They were already into a lot of reforestation activities and they required financial support. So they were one of the partners at a certain level that we did some of the reforestation project with” (Respondent B 12).*

*“I was definitely the person who was on the workshops and the conferences. So whatever I learnt I brought it and imparted it to the group and others outside the group”*

*(Respondent B 38).*

Such sentiments demonstrate how wider public interests can be engaged through downward accountability measures, e.g., public reporting or other forms of direct public involvement (Cameron, 2004).

## **6.6 Discussion**

Collaboration as a strategy for ICM must consider collectively how the linkages between variables across different collaborative arenas and within a collaborative domain influence collaborative outcomes (Gray, 1985; Gray, 1989; Saint-Onge & Armstrong, 2004; Emerson et al., 2012; see also Tobey & Volk, 2002). These linkages represent decision-making across sectors and levels of government, a major focus of ICM (Sorensen, 1997). Unlike some approaches to collaboration that treat some aspects of this domain as contextual conditions whose impacts are more distal to the shaping of collaborative outcomes, in this discussion I treat them as integral and proximal to collaboration and to the outcomes of the collaborative process (Sutton & Rudd, 2014). Here, I discuss four types of linkages.

### **6.6.1 Water quality challenges and collaborative leadership**

This case highlights two instances where antecedent circumstances shape leadership. Firstly, the leadership arrangements for the statutory committee that managed the IWCAM project was evidently influenced by the work of the BRT on the impacts of declines in coastal water quality on coral reefs. The trust was chosen to lead the project as an NGO, even if it had no responsibility for coastal management. Although government agencies with direct responsibility



and authority for issue areas related to water quality management were involved in the project, the case evidence suggests that the leadership role was given to the BRT based on the nature of the changes affecting the Buccoo Reef and the recognition that the trust had the capacity to lead the project based on its previous work in coastal water quality research. This suggests that where collaboration is related to complex issue areas such as coastal water quality decline, collaborative outcomes might be more favorable where leadership has demonstrated an understanding of and response to complex water quality issues, e.g., coral bleaching.

Secondly, this case demonstrates that collaborative leadership between sectors influenced by issues related to coastal water quality decline is shaped by autonomous or interdependent governance arrangements. For example, in the pilot project for integrating coastal management with climate change adaptation, co-leadership within the ICZM Steering Committee benefited from existing arrangements for coastal research between the IMA at the national level and the DNRE at the subnational level. Such interdependent institutional arrangements have served to forge cross-sector linkages between the subnational and national levels, thereby preventing leadership conflicts. The leadership arrangement for the ICZM Steering Committee also supports the point made earlier about leadership being entrusted to agencies with an understanding of the nature of the problem to be managed. In this case the, IMA is a national agency however, its core mandate is coastal research.

### **6.6.2 Leadership, power and collaborative water quality institutional arrangements**

A major determinant of collaborative outcomes, in this case, is the source from which authority derives and how this authority empowers the collaborative process within new collaborative institutions such as statutory committees. I use power here in the context of how

power enables leadership to make things happen (Huxham & Vangen, 2000). The evidence in this cases suggests that state-led and dominated collaborative committees have many advantages but also many constraints. State statutory committees are usually supported by state sanction and the power and resources that accompany such sanction (Purdy, 2012). However, although the authority vested in committees, such as the ICZM Steering Committee ensures that decisions are taken with a measure of certainty, they tend to be top heavy and bureaucratic, sometimes including stakeholders not linked to important antecedent circumstances. Arnstein's (1969) "ladder of participation" shows how such arrangements only serve to placate different interests without necessarily providing an opportunity to influence collaborative outcomes.

Conversely, NGO-led collaborative committees, once given the requisite institutional support, provide opportunities to integrate a wider array of coastal water quality interests, without much of the bureaucratic red tape in state lead collaborative committees. The more salient point here is that for NGO-led collaborative committees, working across subnational and national levels of coastal management jurisdictions requires institutional arrangements that link both levels for the transfer or sharing of authority (Hassanali, 2005). One of the most significant takeaway points from the IWCAM project, for example, is that given the necessary institutional support, NGO leadership is also possible in projects involving agreements between international funding agencies and national governments. Although such projects require direct government involvement given the nature of funding arrangements, this case shows that NGOs can lead state sanctioned committees, through negotiation and power sharing, even where management committees comprise both state and non-state sectors.

### **6.6.3 Authority conflicts in water quality management: collaborative institutional arrangements and agency overlap**

Collaborative institutional arrangements work largely because different interests agree to set aside narrow institutional mandates to achieve wider goals and objectives related to some management target or common issue area (see Shamsul-Huda, 2004). In this case, for example, water quality management served as the objective target of collaboration in all three projects. New institutional arrangements, for example, the statutory committees for IWCAM and the ICZM Steering Committee, provide the basis on which existing institutional mandates can be partly set aside in order to facilitate collaboration across sectors and levels of coastal management to resolve water quality management issues. Ananda and Proctor (2013) show, how such arrangements enable collaborative committees to work, even in diverse and complex institutional settings. I use the word partly because each agency still retains its authority under its own institutional mandate. Statutory institutional arrangements like the ICZM Steering Committee served to link both the subnational and national levels of management across six different sectors representing tourism, fisheries, forestry, public works and infrastructure and planning and development, marine research and environmental management. Working within such a diverse mix of interests would be near impossible without a single regulatory instrument which serves to circumvent the sector mandate of each interest.

In this case, possible authority conflicts were avoided and collaboration across levels of coastal management or important sectors was also facilitated through agency overlap. I have already explained above how co-leadership between the national and subnational level of coastal management was facilitated through an existing MOU between the IMA and DNRE. Similarly, agency overlap occurs within committees, where the same agents represent a department,

division or ministry on two or more committees. For example, in the ICZM/CA pilot project, members of the ICZM Steering Committee also serve on the consultative committee. Therefore, challenges related to coastal areas were discussed and rationalized quickly. In this way, agency overlap serves to circumvent possible policy and institutional conflicts and foster coastal area management between sectors nationally and sub-nationally.

#### **6.6.4 Collaborative committees and accountable water quality management**

Collaborative decision making serves to integrate non-state perspectives into executive decision-making related to coastal water quality management (Arnstein, 1969). Where agents emanate from non-state interests, collaborative committees offer a level of representation in executive decision-making. State-sanctioned collaborative committees have the capacity to include non-state agents, where ordinarily such agents would be excluded from the process of executive decision-making. The inclusion of non-state agents in executive decision making ensures close contact with community perspectives in important coastal management decisions, as NGOs often serve as advocates on environmental issues with wide public appeal (see Purdy, 2012). For example, apart from its leadership role, the BRT has played a significant role as a public advocate in matters related to coral decline within the BRPA. Environmental Tobago is another NGO that has also advocated for coastal conservation and preservation to protect the Buccoo Reef. Ordinarily, in the process of coastal management NGO input may be limited to consultative arrangements that are top down in their orientation. Such approaches have been criticized for excluding the direct involvement of important interests in executive decision-making processes and for focussing generally on placating the interests of some stakeholders (Arnstein, 1969).

## 6.7 Conclusion

In this paper, I presented an integrated collaborative coastal management approach for understanding how the functional linkages within and between three decision arenas-antecedents, collaborative processes and collaborative institutional arrangements serve to shape collaborative outcomes. This framework was used to critically analyze collaboration in three coastal projects in response to declines in water quality, or in issue areas related to water quality decline, within a protected marine area in southwest Tobago.

I drew significantly on the literature on collaboration in public administration. Using the three arenas identified above, I illustrate how, in addition to shared responsibility, responses and outcomes in integrated collaborative coastal management depend on a number of functional linkages within and between antecedents, collaborative processes and collaborative institutional arrangements.

This approach led to the identification of the following four insights as important features of collaboration in terms of how it shapes ICM related to declines in coastal water quality:

- 1) Coastal problems such as water quality decline, in addition to serving as important contexts for integrated collaborative coastal management, can also serve to determine leadership roles and outcomes. This was perhaps demonstrated most effectively within the IWCAM project where an NGO, the BRT served as leader. It is also evident in the ICZM/CA pilot project, where a state agency having responsibility for coastal research was chosen to lead the project instead of one having direct responsibility for coastal management.
- 2) Non-state agencies can successfully lead a state project where statutory committees serve as the collaborative committees, where mechanisms to transfer power from state to non-state interests exists. A project like IWCAM Tobago, particularly its leadership, management

structure and modes of power sharing, i.e., mechanisms used to transfer authority from the state to an NGO the BRT provides interesting insights for collaborative leadership in ICM. In terms of the ICZM Steering Committee, sharing leadership between Tobago (the subnational level) and Trinidad (the national level) shows how co-leadership serves to circumvent possible tensions between the two levels.

- 3) Within collaborative institutional arrangements, collaborative processes related to responses to declines in coastal water quality could help to foster more meaningful decision making among multiple coastal management interests, where collaborative institutions and processes engage more directly state and non-state coastal water quality management interests.
- 4) Mechanisms for downward accountability are important because they serve as pathways for connecting the coastal water quality concerns of wider public interests more directly with immediate coastal interests, within statutory committees, through the public advocacy roles of NGOs, e.g., ET.

Some of the findings in this paper help to raise many important questions that can serve to guide future collaborative coastal management projects or to frame future research in integrated collaborative coastal management. For example, should collaborative leadership focus primarily on interests with coastal management responsibility, or should leadership in collaborative coastal management engage interests that reflect an intimate understanding of common ecosystem problems and their impacts on coastal systems? What role should NGOs who have demonstrated leadership capacity in coastal research play in collaborative coastal management? If NGO leadership is a plausible approach to collaborative coastal management, what conditions need to exist for such leadership to be effective? Some of these questions have

been answered in this case albeit in the context of collaborative coastal management in southwest Tobago. Certainly, these questions can be generalized to investigate integrated collaborative coastal management in other contexts.

## **7.0 CHAPTER SEVEN: Conclusions**

In this chapter, I revisit the conceptualization of the research, trace the research logic and link these to the findings and contributions of the research. The chapter is divided into three main sections. In (*Section 7.1*), I revisit the thesis of the research and restate the research aim. Secondly, I identify the objective for each of chapters four, five and six. I then link each objective to the surrogate principles of integration used to frame and examine the problem context for each chapter and identify and discuss the key findings and insights. In (*Section 7.2*) I discuss the theoretical and practical contributions, based on the three conceptual frames in chapter four, five and six. Finally, in (*Section 7.3*), I discuss the implications of the findings and insights for future coastal management research.

### **7.1 Research Goal, Objectives, Key Findings and Insights**

My aim in this research was to illustrate how trajectories of change related to water quality decline affect coastal systems and coastal tourism and how such trajectories highlight challenges and opportunities for integrated coastal management (ICM). Relatedly, I aimed to understand how trajectories of change shape multiple-sector responses to declines in coastal water quality, within a national and subnational coastal management jurisdiction. I identified four objectives in this research:

#### **7.1.1 Objective one**

Examine how different conceptions of the underlying principles of integration serve to inform and advance thinking and improve coastal management practice in an era where coastal systems and sectors are severely impacted by multiple climate and non-climate drivers of change



This objective served as the basis to frame the conceptual background of the entire research and the different conceptual and analytical frameworks in chapters four, five and six.

### **7.1.2 Objective two**

Identify critical pathways and trajectories of change in coastal systems related to coastal water quality to determine how these pathways and trajectories have shaped coastal management responses across multiple sectors and coastal jurisdictions.

For this objective, I used the principle of comprehensiveness to frame and understand critical causal pathways and trajectories of change between coastal marine and terrestrial systems and coastal tourism. I framed these connections from the perspective of a Coastal Area Tourism System (CATS), using a social-ecological system (SES) lens. This facilitated the mapping of trajectories of change in CATS from initial drivers, e.g., rising sea surface temperature (RSST), land use change and institutional failures associated with those changes, to effects and feedbacks on coastal water quality decline (cf. Fazey et al, 2011). More importantly, a SES lens facilitated connecting these trajectories of change to existing governance responses. This served to paint a picture of the current challenges and opportunities for managing those changes.

#### **7.1.2.1 Key findings**

1. Water quality decline within the Buccoo Reef Protected Area is significantly affected by land use change and activity contiguous to the coastal nearshore and further inland. However, disconnections and mismatches exist between environmental management, watershed management and protected area management and water quality standards for tourism. These disconnections have hampered responses to water quality decline.

2. Knowledge gaps exist regarding connections between declines in coastal water quality, coral decline, increase in wave velocity and storm surges and coastal erosion. These gaps have led to mismatches between management responses to coral decline.
3. Maladaptive response trajectories exist because institutional failures related to land use change in terrestrial areas close to the high water mark have led to the need for coastal armoring. However, coastal armoring has exacerbated the effects of storm surges leading to rapid erosion and changes in beach profiles.

Below I highlight some of the important implications for coastal tourism and wider tourism sector:

1. Despite the obvious value of coastal systems such as coral reefs to tourism, coastal tourism in Tobago is more connected to external push forces and transportation linkages that explain visitor flows from foreign markets
2. There is an apparent dichotomy between the social-ecological impacts on coastal ecological systems and the effects on coastal tourism.
3. There appears to exist a tacit acceptance on the part of tourism interests that the management of impacts on coastal ecological systems should remain within the purview of sectors related to environmental protection.

Anecdotal and empirical evidence in this research clearly links degradation in coastal marine and terrestrial systems to climate drivers such as RSST and non-climate drivers such as sedimentation and their impacts and effects on coastal water quality decline. However, notwithstanding the climate and non-climate related impacts on coastal systems, the links

between water quality decline, degradation in coastal marine and terrestrial systems and declines in tourism-related activities have not been clearly established empirically. There is empirical and anecdotal evidence that suggest that coastal tourism has suffered as a result of degraded coastal systems (Beharry-Borg & Scarpa, 2010; Mallela et al., 2010; Mallela et al., 2016). However, the negative effects of these impacts have been limited to small tourism niches such as diving.

The most recent empirical evidence suggests that the economic value of tourism in southwest Tobago derives largely from the value of coral reef systems. Although no recent studies have been conducted, the study by Burke et al. (2008) empirically demonstrate the economic contribution of coral reefs to coastal tourism in Tobago. However, this current research found that tourism stakeholders seem to be more connected to economic push factors and transportation linkages that affect visitor flows from foreign markets. The supply of tourists to the Tobago market derives mainly from Europe and North America during peak periods from November to April. Any external event that disrupts these flows impact significantly on the arrivals of tourists to Tobago. The downturn in the world economy in 2005 to 2008 and the connections to declines in visitor arrivals to Tobago in the corresponding period demonstrates the effect of these impacts. Therefore, more attention is placed on tourism push factors relating to demand in supply markets.

The management of the impacts of trajectories of change are largely sector-based, interspersed by loose cooperative arrangements between different coastal management sectors. Tourism has no direct involvement in coastal area management. Tourism's involvement is limited to sporadic collaborative arrangements. This suggests that tourism needs to be more

closely integrated with the management of social and climate-related impacts on coastal marine and terrestrial systems.

### **7.1.3 Objective three**

Empirically examine linkages between the regulatory rules, policies and strategies related to coastal water quality management and the tourism, fisheries and environmental protection sectors, to demonstrate how integrated coastal water quality management may be enabled or constrained by different types of conflicting, synergistic or cooperative governance linkages

For this objective, I used the harmonization principle and the concept of fragmentation in governance, to frame and analyze linkages between different regulatory rules, policies and strategies related to coastal water quality management. This conception led to the identification and analysis of different regulatory, policy and strategic linkages between the coastal management arrangement for tourism, fisheries and environmental protection sectors that I characterized as conflicting, synergistic or cooperative. A fragmented governance lens served as the basis for examining how sector-based coastal management may be more or less efficient in terms of promoting greater efficiency, cooperation and participation in water quality management (cf. Biermann et al., 2009).

#### ***7.1.3.1 Key findings***

1. Dual-level coastal management that shares similar regulatory arrangements can create synergies in water quality management, where mechanisms that link both levels allow for authority migration and decision-making at the lower level. This insight may also be useful in multilevel coastal management arrangements.

2. Regulatory mechanisms, e.g., CECs that are more loosely connected and that foster cooperation among sectors with responsibility for issue areas related to water quality management can serve to circumvent conflicts between regulatory rules in issue areas related water quality management.
3. Broad policies such as those pertaining to climate change adaptation can serve as cooperative linkages for issue areas related to water quality management, where sector-specific policies do not target such issue areas.

Coastal water quality management in Tobago exists within a dual-level overlapping governance structure that includes the national and subnational levels of coastal jurisdiction. Within this structure, water quality management is governed by statutorily mandated regulatory linkages, in the form of MOUs. Here, coastal management is sector-based and legislative authority derives solely from the national level. Some sector mandates are synergistic, meaning that they share almost similar goals and objectives. Other mandates are more loosely connected, while others are conflicting. Where mandates are loosely connected or conflicting, mechanisms such as CECs serve as coordinating governance arrangements between sectors with responsibility for issue areas related to environmental protection, e.g., land use planning and water pollution regulation. Some policy mandates, e.g., those related to tourism, are highly sector specific, sometimes having no relation to water quality issues. Such policy mandates conflict with the policy mandates of other sectors, e.g., environmental protection.

The results in chapter five help to demonstrate that even if coastal management occurs within a fragmented sector-based and dual-level structure, opportunities still exist for resolving water quality management conflicts, within regulatory, policy or strategic arrangements. For

example, the results in chapter five show how mechanisms such as CECs serve to coordinate responses between sectors with responsibility for issue areas such as land use regulation and water pollution regulation, that can affect water quality decline, without conflict. In this way, CECs provide the institutional basis for cooperation in issue areas related to water quality management. The role of CECs in this case demonstrates that sector-based coastal management with the requisite institutional support mechanisms can lead to processes and outcomes that promote efficiency in responses to coastal water quality decline.

#### **7.1.4 Objective four**

Critically examine collaborative coastal management related to social and ecological impacts on coastal water quality decline, to determine how such impacts on coastal systems shape collaboration within existing governance arrangements, collaborative processes, new collaborative institutional arrangements and collaborative outcomes

For this objective, I use cooperation and participation as a fundamental premise in ICM and the concept of collaboration, to frame and examine how collaboration integrates different coastal management arenas, e.g., problems that serve as motivation for collaboration, e.g., water quality decline, existing governance arrangements in issue areas that can affect coastal water quality decline, collaborative coastal management processes and collaborative institutional arrangements (cf. Emerson et al., 2012; Emerson & Murchie 2010; Gray, 1989; Bryson et al., 2006). I refer to each of the elements above as a collaborative arenas and the aggregate of all the elements as a collaborative domain (Gray, 1985). Relatedly, I show how functional linkages across arenas shape collaborative outcomes in issue areas related to water quality decline.

This approach draws on current thinking on collaboration in public administration literature that frames collaboration from a more integrated management perspective (e.g., Emerson et al., 2012; Emerson & Murchie, 2010). While this is in line with existing literature in coastal management that advances collaboration as a strategy to integrate coastal management (Imperial, 2005), the public administration literature deals more explicitly and analytically with antecedents and collaborative institutional arrangements. Three projects served as the basis of inquiry.

#### ***7.1.4.1 Key findings***

- 1) Coastal problems such as water quality decline, in addition to serving as important contexts for integrated collaborative coastal management can also serve to influence leadership roles and outcomes. This was perhaps demonstrated most effectively within the IWCAM project where an NGO, the Buccoo Reef Trust served as leader. It is also evident in the ICZM/CCA pilot project where a state agency having responsibility for coastal research was chosen to lead the project instead of one having direct responsibility for coastal management.
- 2) Non-state agencies can successfully lead state projects where statutory committees serve as the collaborative committees, where mechanisms to transfer power from state to non-state interests exists. A project like IWCAM Tobago, particularly its leadership, management structure and modes of power sharing, i.e., mechanisms used to transfer authority from the state to an NGO--the Buccoo Reef Trust--provides interesting insights for collaborative leadership in ICM. In terms of the ICZM Steering Committee sharing

leadership between Tobago (the subnational level and Trinidad (the national level) shows how co-leadership serves to circumvent possible tensions between the two levels.

- 3) Within collaborative institutional arrangements, collaborative processes related to responses to declines in coastal water quality could help to foster more meaningful decision-making among multiple coastal management interests, where collaborative institutions and processes engage more directly state and non-state coastal water quality management interests.
- 4) Mechanisms for downward accountability are important because they serve as pathways for connecting the coastal water quality concerns of wider public interests more directly with immediate coastal interests within statutory committees, through the public advocacy roles of NGOs, e.g., Environmental Tobago.

These results help to demonstrate that whereas collaboration in coastal management has a dedicated focus on the processes within which power, leadership and accountability are mediated, collaborative coastal management that has an integrative intent needs also to focus explicitly on how collaboration is shaped by linkages between antecedents coastal problems that serve as motivation for collaboration, existing governance arrangements, new collaborative institutional arrangements and collaborative processes.

In this case, antecedents to collaboration, particularly those related to existing autonomous and interdependent coastal management arrangements, play important roles in shaping collaborative arrangements and outcomes. For example, in this case, MOUs for sharing regulatory authority exist between the national and subnational levels of coastal jurisdiction. Such MOUs allow for the establishment of statutory collaborative committees between the two



levels without conflict. Existing MOUs also allow for co-leadership between the national and subnational levels. In this regard, MOUs serve as important linking mechanisms in collaborative coastal management that connect significant coastal interest related to coastal water quality management to existing governance arrangements. Leadership arrangements that respond to these linkages seem to lead to more efficient collaborative processes and outcomes.

## **7.2 Theoretical and Practical Contributions**

This research contributes to rethinking the principle of integration in coastal management and related surrogate principles. I used the principle of integration to connect three related bodies of scholarship; SES, fragmentation in governance arrangements, and collaboration, to show how different conceptions of integration provide insight to inform coastal management practice.

Here, theoretical contributions relate to the extent that the conceptual and analytical frames related to each objective can be applied to different coastal management contexts. I revisit the surrogate principles for ICM (Stojanovic et al., 2004; Cicin-Sain & Belfiorie, 2005) namely; comprehensiveness, harmonization and cooperation and participation, by locating them within the three conceptual lenses in each of chapters four, five and six.

### **7.2.1 Social-ecological systems**

The *comprehensiveness principle* for ICM suggests that management responses must be premised on the connections and interactions between different components of a coastal system (Sorensen, 1997). This is also a fundamental feature of SES scholarship. Anderies et al. (2004) define SES based on the linkages and interactions between different components. Based on these connections and interactions, SES thinking is used to demonstrate how impacts affecting coastal systems follow critical pathways and trajectories of change (see Fazey et al., 2011).

Experience in coastal management shows how finding management solutions within such contexts is problematic (Chuenpagdee & Jentoft, 2009). Identifying management solutions demand mapping causal pathways and trajectories of change along these pathways and connecting these to management responses. Fazey et al. (2011) have taken this approach for mapping and responding to maladaptive trajectories in coupled human and natural systems (CHANS). However, the approach by Fazey et al. (2011) has not been widely used for responding to change in coastal tourism systems. Several tourism researchers have applied systems approaches; however, their research is still in its early stages (e.g., Espine & Becken, 2013; Becken, 2013).

This thesis built on perspectives that seek novel ways to respond to changes in SES or CHANS. I treat tourism as part of the wider coastal system, by mapping the drivers and trajectories of change that link tourism with marine and terrestrial systems. Following authors such as Strickland-Munro (2010) and using a SES lens, I treat the coastal area as a CATS. This background was important for representing tourism as part of the wider coastal management context but also for linking tourism to trajectories of change that impacts coastal water quality.

Some tourism scholars have argued that in order to respond to the impacts of changing social and ecological conditions on tourism there needs to be a reconceptualization of tourism from a more systems-oriented perspective (e.g., Farrell & Twinning-Ward, 2004). In this regard, the concept of a CATS, in addition to broadening the scope for thinking about coastal marine SES (Charles, 2012), aligns social and biophysical impacts on coastal tourism and their trajectories of change more closely with coastal management goals and outcomes.

Examining trajectories of change in CATS has very practical implications for coastal water quality management, especially, where coastal tourism has been linked to the value of coastal systems such as coral reefs (e.g., Burke et al., 2008) and where coral reefs have been degraded because of coastal water quality decline (Mallela et al., 2010). For example, the empirical evidence in this case shows that impacts that affect CATS emanate from different drivers. Understanding and managing these different drivers and their trajectories should be integrated into coastal management responses that consider connections between climate and non-climate impacts, nearshore and inland impacts, as well as impacts from institutional sources, on coastal water quality (Butler et al., 2014; Wenger et al., 2015).

This case demonstrates how poor sewer treatment related to coastal tourism development creates challenges for coastal water quality management. The case also highlights the institutional dimensions of anthropogenic land-based drivers of change and the impacts of these dimensions on coastal water quality and coral decline (Mallela et al., 2010; Alemu & Clement, 2014; Mallela et al., 2016; Lapointe et al., 2010). These concerns are not germane to coastal tourism in southwest Tobago. Throughout the Caribbean, coastal water quality and the health of coral reefs are seen as extremely important issues for sustainable coastal tourism (Burke et al., 2008; Hall, 2001; Gayle & Goodrich, 2014; Parker, 1999). However, integrated management of multiple drivers and trajectories of change that affect coastal systems has proven to be challenging (see Halpen et al., 2008). Some challenges derive from indifference or lack of appreciation for the current and probable effects of climate and non-climate drivers of change on coastal tourism activities. For example, the Tobago case demonstrates how ambivalence for the connections between water quality decline and direct impacts on activities such as reef tours

leads to apathy among tourism stakeholders (Trawöger, 2014). Beyond tourism stakeholders, the case also demonstrates how the decisions of policy makers in response to coral decline in the absence of knowledge systems that involves and understanding of water quality management could lead to maladaptive responses. Such maladaptive responses have occurred in current efforts to restore the Buccoo Reef (see Williams, 2016).

Another finding of this case is the apathy of those who are most likely to be affected by declines in coastal water quality and coral reefs. This apathy derives from the fact that although coral reefs have been negatively affected by multiple drivers of change, these changes have not had a significant impact on tangible and estimable aspects of tourism, e.g., tourist arrivals. Arrivals have been mostly affected by global socio-economic drivers of change (Acevedo Mejia et al., 2016).

Graham et al. (2014) show how degraded coral reef systems may still remain sustainable and provide services that support littoral coastal communities and sectors when such systems are enhanced by artificial means. Ferrario et al. (2014) show how restoring degraded reefs with artificial breakwater structures create similar effects on wave attenuation and coastal erosion. However, Graham et al. (2014) warn of the dangers of the value of novel coral reef system as such systems can create a sense of complacency that can illicit management responses that trap those who depend on coastal resources into maladaptive trajectories of change (see Williams, 2016, Minshall makes mass in the Buccoo Reef), especially when practices persist that can contribute to the continuation of coral degradation (Westmacott 2000). Additionally, there are limits to novel approaches to restoring degraded coral systems for erosion abatement. For example, in a meta-analysis of coral reef degradation and restoration, Ferrario et al. (2014) show

the exorbitant cost of building artificial underwater structures to control wave action and onshore erosion. Making connections between the impacts and effects of change and management responses are important for effectively integrating coastal management (McFadden, 2010). SES scholarship as a lens seems to provide great latitude for examining these climate and non-climate related changes and for identifying the opportunities and challenges associated with their management.

### **7.2.2 Fragmented governance**

This contribution is based on the *harmonization principle* in ICM. Integrated coastal management scholars argue that coastal management arrangements for any issue area, e.g., water quality, ought to be harmonized across sectors and levels of government. In this body of scholarship, harmonization is generally interpreted to mean coastal management arrangements in which the institutional mandates and objectives are synergistic, i.e., institutional mandates and objectives that are closely connected and that pursue the same management outcomes (see Wever et al., 2012). However, in this research, I demonstrate how challenging harmonization could be, within a sector-based and dual-level coastal management jurisdiction.

Concerns related to sector-based management have been at the forefront of ICM scholarship for quite some time (Olsen et al., 1997; Duda & El-Ashry, 2000; Taljaard et al., 2012). These concerns have been generally framed within the coastal management literature as constraining integration (e.g., Goble et al., 2014; Kim et al., 2015). The typology of fragmented governance architectures by Biermann et al. (2009) serves as a useful tool to conceptually frame and analyze how different types of linkages between the goals and objectives of coastal

management arrangements within and across multiple sectors constrain or enable decision-making. This represents a significant departure from current coastal management scholarship.

The examination of integrated water quality management from the perspective of differing types of synergistic, cooperative or conflicting linkages has implications for the practice of ICM. For example, integrated coastal water quality management could be practiced within existing sector-based management arrangements, where consideration is given not to ensuring that all governance arrangements are harmonized but to the identification of linkages that promote efficiency and participation, within existing coastal management frameworks. This could serve to speed up initiatives to integrate issue areas related to water quality management, within diverse institutional mandates.

In this case study, there are simple practical solutions to integrating water quality management, particularly within the same sector. For example, this case shows that it is quite practical to regulate water pollution using one set of rules. The main requirement will be to repose water pollution management under the authority of the Department of Natural Resources and the Environment (DNRE) in Tobago, while removing the responsibility from the Water and Sewage Authority (WASA). The removal of the authority from WASA could be effected using a MOU. This is already the standard practice in Tobago, where the responsibility for the water pollution rules was transferred from the Environmental Management Authority (EMA) a national agency to the DNRE a subnational agency. Integrating water pollution rules across sectors might be more difficult. For example, aligning the water pollution rules for fecal coliform counts (200 cfu per 100ml) with Blue Flag (100 cfu per 100ml) has far reaching implication for the tourism sector. This will force hotels and guesthouse to significantly upgrade sewer treatment facilities.

This could drive the cost of operating a hotel or guesthouse higher rendering the local tourism sector uncompetitive (Parker, 1999). This raises concerns regarding the issue of practical compliance to integration (Clarke & Jupiter, 2010).

A similar impediment to compliance will exist if land use planning within the coastal fringe were to be incorporated into protected area management. Tobago, as is the case in the eastern Caribbean has a high incidence of unofficial land tenure (Zips, 1998). Therefore, controlling land use in the coastal fringe would require the regulation of untitled land parcels, a process that could be extremely time-consuming (Taljaard et al., 2012). Additionally, sustaining the quality of coral reefs for tourism will require significant trade-offs between the cost of treating effluence from land-based sewers and the use value of coral reefs to the tourism sector (Parker, 1999). Although there is support for the long-term economic and social benefits of such trade-offs for both tourism and the wider population, the initial capital outlay for treating effluence might be a major impediment to small developing tourism economies (Cesar et al., 2003).

### **7.2.3 Collaborative coastal management**

Regarding collaboration, the core principle for ICM is that given the propensity for conflicts between the management arrangements for different coastal sectors and across jurisdictions in any issue area, ICM must foster *cooperation and participation* (Sorensen, 1997). In advancing this principle, current ICM scholarship focuses primarily on cooperation and participation from the perspective of shared rights and responsibility for different issue areas related to coastal management. This research departed from this primary focus, by emphasizing collaboration more explicitly from the perspective of three collaborative decision arenas;

- a) Antecedent coastal problems that serve as motivation for collaboration, e.g., coastal water quality decline and antecedent coastal management arrangements that foster or impede responses to antecedent coastal problems,
- b) The collaborative process in terms of how it shapes responses to common problems across sectors and levels of coastal management and
- c) New collaborative institutional arrangements in terms of their cross-functional role in circumventing existing institutional mandates to foster cooperation and participation in response to common coastal management challenges, e.g., responding to coral decline.

To advance these perspectives, I drew significantly from the collaborative governance literature in public administration, to situate ICM within this body of scholarship. This allowed for the inclusion of a more extensive body of scholarship to be used for investigating collaborative coastal management. This approach also served to build on the theoretical foundations of existing work, for example, the integrated collaborative governance framework advanced by (Emerson et al., 2012).

Applying a collaborative management framework that integrates three decision arenas into one collaborative domain provides another approach for thinking about ICM. Here, I consider collectively and more comprehensively a set of variables and contextual conditions that link coastal management interests and that influence ICM outcomes (see Sutton & Rudd, 2014). This has implications for ICM practice. Whereas it is generally accepted that rights and the power that accompany those rights are an underlying proximal variable in shaping outcomes in collaborative processes, in some instances other distal and confounding variables need to be given close consideration. For example, this case demonstrates how antecedent autonomous



institutional arrangements between sectors and levels of government influence both collaborative engagement, leadership and collaborative outcomes for coastal water quality management. Using this knowledge, collaborative institutional arrangements, in addition to responding to the need for sharing authority, could be framed to address the different linkages and interactions between decision arenas. For example, in a case study in Bonaire, Parker (1999) used the concept of a collaborative problem domain (Wood and Gray, 1991) and the perspectives of stakeholders with an interest in tourism environmental protection, to examine the trade-offs between increasing the hotel room stock, increased airlift and the cost of water quality abatement. Consideration of these contexts collectively serve to incorporate social, economic and ecological concerns into wider public policy and decision-making related to environmental protection. Collaborative processes that engage and integrate knowledge of biophysical, social and institutional impacts with the perspectives of persons within littoral communities, environmental change advocates and policy makers have been seen as leading to more favorable responses to climate change (André et al., 2012; Bell & Bramwell, 2005). More importantly, collaborative processes that engage empirical and experiential knowledge may contribute to greater efficiency in convening and sustaining collaborative processes (Sutton & Rudd, 2014).

### **7.3 Discussion**

Much of the research related to coastal management is in many regards disaggregated. For example, marine science scholars study biophysical interactions between marine coastal systems, with almost no connection to terrestrial systems. Even in instances where linkages between both the land and sea interface are studied, the social connections and the human element may be deemphasized (see Linton & Warner, 2003). Integrated coastal management

scholars merge all these elements together in an effort to understand how linkages and interactions within marine or terrestrial system and between marine and terrestrial systems influence coastal problems and shape coastal management responses to those problems (Olsen et al., 1997).

This integration of different elements of the coast remains the core focus of coastal management scholarship and practice (Cicin-Sain & Belfiorie, 2005). However, more than five decades of research of practice ICM scholars (e.g., Portman et al., 2015) continue to question the instrumental value of integration as a core tenet of coastal management. This research in many regards embodies the concerns of ICM scholars such as Portman et al. (2015), particularly within the context of the value ICM as a plausible response to multiple drivers and trajectories of change that impact coastal SES. However, the findings of this research demonstrate the value of using new and unconventional approaches for thinking about ICM. The key point here is that ICM requires a basket of approaches not just one approach. Some approaches may be quite simple, while others may require significant effort based on the complexity of coastal problems, the multiple actors affected by these problems and the multiple sectors and institutional arrangements that attend to them. As I reflect on some insights from the findings in this research, I address generally their broader implications from the perspective of current modes of ICM policy and practice that can be informed by the thinking advanced in this dissertation. I address three broad areas.

### **7.3.1 Social-ecological systems thinking: A current and emerging paradigm in ICM**

The use of SES in many regards overlaps with an ecosystem-based approach. For example, Berkes (2012) argues that in order to bring about a revolution in ecosystem-based

management marine fisheries should be conceived as SES. Social-ecological systems thinking can serve more broadly to advance coastal management research, especially, where the focus is on responding to change. I make this claim based on the ancestry of both bodies of scholarship regarding coastal management practice. Clearly, ecosystem-based perspectives regarding ICM are grounded in the protection of biological diversity and sustainability of coastal marine systems (Haines-Young & Potschin, 2011; Forst, 2009). However, predicting the impacts of change on coastal systems and managing coastal systems for sustainability might be difficult in the advent of rapid and unpredictable impacts of climate and non-climate drivers of change, especially, where those impacts derive from multiple sources (see Ostrom, 2007) and where their management demands the engagement of many sectors and more than one level of government.

Current research in coastal management already shows how drivers such as RSST result in rapid changes in coral reefs that breach traditional sustainability thresholds. For example, Graham et al. (2014) show how the rapid change that occurs in such system demand a shift in the thinking about their viability. They argue that coral reef systems affected by RSST may decline to the extent that their ecological structure may change. However, they demonstrate that such systems may still be able to support the livelihoods of current littoral populations. Social-ecological systems scholarship provides the avenue to point future coastal management research towards managing impacts that can be highly unpredictable.

Social-ecological systems thinking serves as an important first step for identifying other types of coastal management opportunities for responding to drivers and trajectories of change from the perspective of the connections between people and their environments (Berkes, 2012). For example, matching current trajectories of change with existing coastal management

approaches could serve as an entry point for examining coastal management arrangements and approaches that are more or less resilient and that yield positive or negative outcomes (see Hopkins and Bailly, 2012). This could lead to several important questions for future research. For example, how do natural linkages between social and ecological components of CATS contribute to resilience?

This research has highlighted the fact that much work still needs to be done to incorporate economic sectors such as tourism into the mainstream of coastal management. Such advances would lead to greater uptake of coastal management concerns by the tourism sector and greater insight into current and future socio-ecological challenges for tourism. Additionally, where challenges are identified, questions could be posed and responses framed related to how governance intervention contribute to the resilience of CATS?

The important point here is that a SES approach can be used as the basis for analyzing and integrating issue areas such as coastal water quality management across scales and sectors, following the logic of integration from comprehensiveness principle to the principle of cooperation and participation. At the very least this approach could serve as a useful tool for assessment of different issues from an integrated perspective. Much of the current ICM literature is more spatially oriented. An issue-based approach cuts across spatial scale, e.g., protected area management and watershed management (see Clarke, 1992). An issue-based approach also cuts across sector-specific mandates. Consequently, an issue-based approach can serve as a useful tool for integrating coastal management particularly, regarding complex problems related to social and ecological change, e.g., coastal water quality decline.

### **7.3.2 Limits to harmonization for integrating responses to coastal water quality management**

Based on the existing ICM literature, it is obvious that harmonization is advanced as one of the central goals of ICM (see Tobey & Volk, 2002; Sorensen, 1997). However, both the existing literature and this case demonstrates how difficult an endeavor harmonization is or could be (Cincin-Sain & Belfiore, 2005). For example, using a comprehensive management framework with 46 variables for assessment of the benefits of integrating MPA into the management structure of fisheries agencies Read and West (2014) found that despite the benefits of such approaches many management conflicts still exist. Westmacott (2001), using a decision support system model demonstrate how difficult it would be to harmonize the goals and objectives of multiple sectors across multiple issue areas.

The current literature also tends to focus on harmonization within a comprehensive coherent management framework (see. Chuenpagdee et al., 2013). The challenge with this thinking in the advent of change is that the nature and source of changes that affect coastal systems could be so complex and the sectors affected by those changes so diverse and their institutional mandates so different, responding to those changes within a comprehensive framework might be highly improbable (Imperial, 1999).

Rather than thinking about harmonization within the limits of a comprehensive synergistic governance framework, e.g., MPAs, ICM could also proceed from the perspective of matching and resolving conflicts within existing coastal management arrangements, across sectors and jurisdictions. This approach to ICM is more practical. It is more practical to the extent that often establishing and implementing comprehensive coastal management frameworks could be time-consuming. For example, such arrangements may require the enactment of new

legislation that can slow down the process of responding to pressing and immediate coastal management challenges (Müller, 2009), e.g., responding to issue areas that impact coastal water quality.

Biermann et al. (2009) show, albeit at a global and regional scale how within the same governance jurisdiction or across jurisdictions conflicts may be resolved within existing governance arrangement that may share similar objectives or through objectives that are loosely connected. Even where comprehensive management frameworks exist, the evidence in this case shows that integrating water quality management could be problematic because of divergent institutional mandates that are difficult to resolve. For example, in the Tobago case, water quality management is hampered by issues such as unofficial land tenure for which no regulatory framework exists. Such antecedents are antithetical to conventional approaches to harmonization. As I indicated earlier, often, new institutional arrangements are required to respond to challenges related to environmental change but the enactment of new legislation may be time-consuming. This may arise due to differences in political mandates regarding the importance of coastal resources for wider community interests (van Leeuwen et al., 2014) or governance challenges that emerge as a result of rapid and unpredictable change (Crowder et al., 2006). ICM that utilizes existing institutional arrangements might be a more efficient and practical option.

### **7.3.3 From environmental governance to public administration**

Ecosystem conditions create networks between coastal management arrangements (Imperial, 1999). Often, understanding the linkages can serve to shape collaborative processes and collaborative institutions and determine collaborative outcomes. Interactions between these three arenas (ecosystems conditions, collaborative processes and collaborative institutions) form

important elements of understanding and responding to changes that affect coastal systems, through ICM approaches (Emerson et al., 2012). Therefore, analysis of the cross-functional linkages between arenas could show how collaboration is enabled or constrained across sectors or coastal jurisdictions (Saint-Onge & Armstrong, 2004). Such approaches to understanding collaboration do not focus so much only how on shared authority influences decision-making. Rather, the focus is on issues such as how the nature of change affecting coastal systems helps to shape collaborative leadership and how this might lead to more favorable collaborative outcomes. For example, when change is complex should collaborative leadership derive from within epistemic communities as opposed to those who share authority for the management of coastal resources?

Certainly, in the contexts of this research NGOs have played an important role as advocates for public policy. The findings of this case also show that NGOs can play a significant leading role in responding to change through integrated collaborative processes. What these findings point to is the importance of wider public input in collaborative coastal management (Ehler, 2003; Koontz & Thomas, 2006).

The current coastal management literature tends to frame and analyze approaches to coastal management as an environmental governance challenge. However, coastal management is also a major challenge for public policy and public administration, given the impacts on economically significant sectors such tourism. In many jurisdictions concerns for issue areas such as coastal water quality decline may only receive due attention when it is seen as a major public policy issue and not merely an environmental governance concern. For example, the impacts an oil spill is likely to have on coastal tourism in Tobago is not only an environmental

governance challenge but also a major economic concern for public policy. Such concerns, if incorporated into mainstream public administration, might receive greater attention.

An important shift seems to be taking place in the public administration related collaboration literature towards climate change and environmental governance (see Emerson et al., 2012 framework for integrated collaborative governance; Emerson and Murchie, 2010 definition of collaboration and Imperial's, 2005 treatment of watershed management from a public administration perspective). This development is likely to bring climate change into the mainstream of public administration. Already, some countries, e.g., the United Kingdom are integrating climate change in wide public policy to “ensure that adaptation to climate change is integrated into the wider policy-making process” both domestically and in the European Union (EU) (DEFRA, 2005, p. 5, cited in Urwin & Jordan, 2008).

Finally, although I have not dealt with the concepts of fit and interplay and mainstreaming explicitly in this research, I note here that there seems to significant overlap between these and the concept of fragmentation and integration. Bridging these concepts could contribute significantly to advancing interdisciplinary approaches to ICM, while preventing tensions in conceptual thinking between ICM and other approaches, e.g., ecosystem-based approaches and governance architecture. Such tensions have been at the center of much debate about the value of ICM as a governance response in an era of rapid social-ecological changes that affect coastal systems (see Portman et al., 2015). As Berkes (2012) notes, “some recent works on fisheries have started to emphasize moving from management to the broader frame of governance, embracing multiple disciplines and multiple objectives and broader interdisciplinary



approaches, to deal with marine ecosystems as integrated systems of people and environment, SES, rather than merely as ecosystems” (p. 466).

#### **7.4 Research Note:**

Another important insight has developed since the original field work for this research that demonstrated how drivers of change that impact CATS could be rapid and unpredictable and how such changes can result in cross-scale effects on tourism arrivals. When the fieldwork for this thesis was conducted in 2012, respondents had indicated observing significant shifts in weather patterns in the dry season, from a dry-dry season to a wet-dry season. In 2016 a news report referencing tourism stakeholders indicated that the dry season is again dry but now this dry weather extends into the rain season (Baboolal, 2016). This has resulted in water shortages that impact the supply of potable water to hotels and guesthouses. Some hoteliers have indicated that they have had to cancel bookings as a result of the decline in the water supply. These new developments in some ways help to validate one of the challenges I highlighted in chapter five. In chapter five, I emphasized the apathy of some tourism stakeholders towards the prospects of climate-related impacts on the wider tourism sector and the need for aligning the impacts of change on CATS more closely with institutional arrangements that respond to those changes. This change in weather patterns also highlight the relatively short time horizons within which seasonal changes can occur and even shorter timeframe within which these shifts can have significant impacts on the potable water supply for the tourism sector. This quote from a newspaper article sums up the predicament, “there has been no water in the Crown Point and Bon Accord areas in Tobago, where most of the hotels are located, for some days now and hoteliers have entered into panic mode” (Baboolal, 2016, p. A7). These new developments also

have implications for public policy regarding shifts in weather pattern and the availability of a potable water supply for all residents in Tobago.

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## APPENDICES

### Appendix A: CBVA Field Guide

#### Field Guide

#### For Community-based Assessment of Vulnerabilities and Adaptive Capacities related to the effects of climate change on the tourism and fishery industries in Tobago

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**Rationale:** To assess the ways in which people are vulnerable to climate change within the context of the tourism and fisheries sectors in Tobago, especially in the context of exploring ways of dealing with the issues in the future.

**Context:** The vulnerability assessment (vulnerabilities of societies to changing conditions) requires information from a variety of sources, including census, previous studies, historical documents, instrumental records, other secondary information sources, key informants, team colleagues, and people (stakeholders) associated with the society/community of interest. This document summarizes elements of the information collection that is collected directly from stakeholders, i.e. the community-based vulnerability assessment.

#### 1. Process

Like all community-based field work, it is necessary for the researchers to spend some time familiarizing themselves with the study site to become familiar with various groups, the accepted conventions and processes for research in the area, selection of key institutions, and similar issues. In this case, it may be advantageous for the researcher(s) to be introduced to the community by a person who is both known and respected in the location. In addition, the familiarization time will allow the community to become accustomed to the researchers. It is recognized that some of this work will continue throughout the exercise, as much information may only become available as a rapport is built with the community.

Sample selection will aim to include all social and economic groupings in the community (as identified during the familiarization period), and will also capture interests beyond the settlement itself (e.g. temporary employment, seasonal workers currently absent, regional decision-makers and managers, including businesses/industries [tourism, fisheries, etc. – organizations and institutions]). The researchers will identify the community profile and select a cross-section appropriately.

The strategy for interviewing will involve letters of introduction and consent (as per local protocol), and interviews (and focus groups or similar methods, as most appropriate in the case of the community of concern) will attempt to be scheduled at times most appropriate for respondents (for instance in the early morning for fisherpeople).

The research process will be guided by community-based methods and techniques used in ethnography, participatory appraisal and rapid rural appraisal. The nature of the research requires adaptability and judgment on the part of field researchers, though they will update the larger research team at periodic intervals to review data collected, preliminary interpretation, and the need to revise the checklist (Appendix 1).

## **2. Information Collected**

The types of information collected during the community-based vulnerability assessment portion of the research are considered analogous to “questions” for interviews, but researchers will use semi-structured interviewing (SSI) methodology which relies on structuring the interview as a conversation which is carefully guided to address particular topics related to the above research objectives.

There is no prescribed set of questions beyond a checklist of topics to be covered (see Appendix 1). The specific communication tools will be selected to suit the community and the particular group or individual being interviewed (or focus group). This can include use of maps, diagrams or photos as a means of engaging respondents and acquiring accurate information.

This document illustrates some of the likely questions researchers will ask for the vulnerability assessment portion of the research as well as a suggested flow of the conversations (subject to revision as more insight is gained into the community). Thus, the questions should be viewed as illustrative rather than definitive. In most cases, the natural flow of the interview, as per SSI technique, will deviate significantly from the list, and interviewers will use this as a “checklist” rather than a questionnaire. At the end of the interview or focus group, the researcher will summarize the main insights gained to allow the interviewees or participants to confirm or clarify the findings/data (often called a reflective interview process).

Furthermore, many relevant questions may only become obvious as the interviewing process continues (and follow-up interviews may be conducted as necessary). Although researchers will have as complete a picture of the history, institutions, conflicts and similar as possible (using all appropriate sources, including colleagues from biophysical disciplines, historical records, current publications, etc.), it is inevitable that new issues which had not been considered at the outset will be entered into the research checklist. The guiding principle of the research will be the rationale as stated above.

## **3. Interviewing Plan for Community Members: General Guide**

**Purpose: For interviews with residents (not key informants), in order to characterize the vulnerabilities of individuals/households.**

[As noted earlier, vulnerability assessment involves the synthesis of all possible sources of information to characterize exposure sensitivities and adaptive capacities for a particular

community. Thus, vulnerability assessment includes the collection of information from secondary sources, interviews with experts/key informants, and interviews with community members. This guide addresses the latter category of interviews.]

This document outlines a very general approach for interviewing individual community members, and attached are checklist/question examples for specific contexts. The information below outlines the approach, and is not an exhaustive list of particular questions. Many questions become important to ask but cannot be anticipated – they follow from earlier responses. One of the strengths of this approach is that it allows for the identification and investigation of aspects of vulnerability that were not known or hypothesized at the outset. Thus, work using this approach requires a high degree of interviewer judgment and focus. A checklist as well as fall-back questions (in the teeth-pulling style interviews) are useful tools.

### ***Part 1: General Information Questions / Setting the Stage***

This part of the interview serves two purposes: it situates the person being interviewed in the larger picture with personal details (family history, occupation/main source of livelihood, and community involvement) which will allow for more appropriate questions later, and it aims to create a rapport to allow the respondent to become comfortable.

For example:

1. *How long have you and your family lived in this community? What brought you here? Who lives in your household today? (partner, children, other dependents, and their ages) Do you have other relatives in the community? Have members of your immediate family left the community? Where have they gone? What led them to leave? (age ranges can be estimated from the answers to these questions or the respondents can be asked if they would place themselves within a prescribed range, or provide their precise ages).*
2. *What do you do for a living? (employment, including permanent/temporary/seasonal) Other sources of income? (other family members earning money for household? Details?)*
3. *Are you involved in any local organizations? Which ones? In what capacity?*
4. *How do you use/experience the marine/coastal environment? Does it add value to your life outside of your livelihood?*
5. *What specific activities are you involved in that are directly related to the marine/coastal environment? What is the value of this activity to you daily life?*

### ***Part 2: Open-Ended Interviewing on Exposure-Sensitivities, Adaptive Strategies***



The purpose of this part of the interview is to document, from the respondent's point of view, those conditions (i.e. **exposure sensitivities**) that are important to people, and why, and how those are dealt with (why, why not, how effective) (i.e. **adaptive strategies**). This gives a basis for describing the vulnerabilities specifically considered relevant by these individuals, without bias or suggestion or prompting from the researcher. This is necessary in order to put the tourism and fisheries industries in the context of other forces and influences. The operative word for Part 2 is probing, not prompting.

The aim here is to identify the conditions, stresses, changes or forces that are important to the respondent and his or her livelihood; in particular, we seek to note conditions that relate to our concepts of exposure sensitivity and adaptive capacity. Based on insights from general questions about the respondent's life in the community (Part 1), he/she is asked (open-ended) about what factors/conditions/changes affect his/her life and what stresses affect his/her livelihood. While these are general questions, the interviewer strives to turn this into a conversation while following up new topics as they arise. How, why, when etc. are key questions here – ideally, the respondent brings up new topics on his/her own, but this is not always the case. The interviewer is exploring, not giving possible answers. For example:

*What affects your livelihood/life? [refer to Part 1 to make relevant for particular context] Your occupation? Your community? Are you facing any problems? What have you had to deal with over the years? What are they? Why are they a problem, when, in what way? What causes them? What have you had to deal with? [these sorts of questions address exposure sensitivity] How do you/have you manage(d) them? How did that work? Why did you choose that way? Why not other ways? How effective has the way you manage been? Why? Do you have help? Have things changed over time? What happened, why, how was it handled? What else had an effect? [addressing adaptive strategies and capacity]*

To illustrate the very general question, in the case of a fisherperson, the interviewer might ask:

- a) *What are the challenges/opportunities for your fishing operation? (and then explore what comes up in detail) – how, when, why...*
- b) *What affects the decisions you make on the fish? How? Why?*
- c) *Is fishing providing a secure income? Has this changed over the past few years? What happened? Why? What influenced this? How? How did you deal with it? Why? How effective was this? Would you do it again? Why/why not?*
- d) *Are you able to adequately support your family from fishing only?*

To illustrate the very general question, in the case of someone in the tourism industry, the interview might ask:

- a) *What are the challenges/opportunities for your handicraft/food/tour operation/guest house/hotel operation? (and then explore what comes up in detail) – how, when, why...*
- b) *What affects the decisions you make for your livelihood? How? Why?*

- c) *Is creating or selling handicrafts/food/running or working for your tour operation business/running or working at a guest house/hotel providing a secure income? Has this changed over the past few years? What happened? Why? What influenced this? How? How did you deal with it? Why? How effective was this? Would you do it again? Why/why not?*

If climate change comes up as an issue in the open-ended portion, explore it – but do not prompt specific forces or adaptive strategies. In Part 2 we need to get the story in the respondents’ own words, but not prompt.

For example, if the respondent says, “climate change is a problem”, follow up with –

**Fisheries-related:**

*How is climate change a problem? Why is that? What has changed? What influences the effects of this problem? What does this mean for the way you fish? Which fish? Which equipment? What effect does this have on your livelihood from fish overall? How do you deal with this? Why this way? Is this effective?*

**Tourism-related:**

*How is climate change a problem? Why is that? What has changed? What influences the effects of this problem? What does this mean for the way you operate your tourism-related business/ make decisions/practice your tourism-related job? What changes are you making? What effect does this have on your livelihood from tourism overall? How do you deal with this? Why this way? Is this effective?*

If poverty or inequality comes up as an issue in the open-ended portion, explore it – but do not prompt specific forces or adaptive strategies.

For example, if the respondent says, “poverty/inequality is a problem” follow up with –

*How is poverty/inequality a problem? Why is that? What has changed? What influences the effects of the problem? What does this mean for the way you undertake your livelihood? What changes are you making? What effect does this have on your livelihood overall? How do you deal with this? Why this way? Is it effective? How do you think this should be resolved?*

In the above example, the interviewer asked, “how do you deal with this?” – it may be that the person is thinking of pursuing some sort of action, but if he/she does not bring it up, do not prompt with an example of a strategy they might be using, because at this point he/she might say “thinking about it” by default. We need to ensure that we understand why a challenge is a challenge, how it evolved, how it plays out, and what they do/want to do about it.

**To address the future:**

*What main challenges do you anticipate for your livelihood in the future? Why these? How would these affect you? What might be done about them?*

*If you look ahead five or ten years, how do you see your operation changing? Why? How? Living conditions, livelihoods? How would these affect you? Why?*

### ***Part 3: Guided Interviewing***

This portion of the interview provides a systematic basis for assessing exposure-sensitivity and adaptive capacity to ensure that all potential factors are covered in a rigorous and comparable manner. In the process, we necessarily prompt for expected conditions relevant to weather, climate, and institutions. The list of specific topics needs to be established by researchers to be as comprehensive as possible through careful pilot testing, and adjusted as necessary.

In this section, we follow the open-ended responses (Part 2) up with specific questions where we ask about each of the factors identified/hypothesized by the researcher (ie. address all of the bullets in the checklist). The interview is still a conversation, but we have a checklist of topics to cover (see Part 3 in the Appendix), and this may be amended based on what comes up in the open-ended section.

For example, in the open-ended portion, the fisherperson indicates that “lots of things changed with the fish”, and when probed noted nothing specific or only fish prices, and when asked how he/she managed changes the only adaptive response he/she listed was replacing the main catch with another (e.g. shellfish?). Now, follow up with a question to ensure that changes [from the checklist] in water/precipitation, temperature, biophysical, economic and social environment are addressed, and that potential adaptive responses (water and financial management, institutions, social responses) are discussed. We already know the exposure sensitivities and adaptive strategies the fisher considers particularly relevant from the open-ended portion of the interview, now ask these in light of labour, prices, environmental sustainability (and other potentially relevant factors that we established when we built the comprehensive checklist) that were not addressed without prompting. Make sure we understand the role of institutions in addressing any changes.

For example, if climate change has not come up yet on its own, since it is on the checklist, introduce it:

*How are you affected by changes in weather patterns/climate? [ensure that both household and fishing-related effects are identified; get the respondent to explain where they are impacted, where they are impacted, when they are impacted, etc]. Are you currently being affected by changing climate? Have noticeable changes occurred that affect you? (if yes: what sort of changes? How are they occurring? Why are they occurring?) [get detailed explanation of changes, with suitable follow-up].*

For example, if “changing fish migration patterns” emerges as an exposure-sensitivity for a particular fisherperson, we might follow up in greater detail with:

*What are you doing to adjust to changing fish population patterns? Are their programs you can use? Changes in the fishing strategy? Timing of fishing or alternative fish varieties? Use of other sources of income? [be observant – are there peak catch times? If not mentioned in a general discussion, ask about them].*

Similarly, we need to prompt for other items on the checklist. If one of these emerges as an issue, probe and prompt until we understand why and how it is an issue, how it is managed, using what strategies (and check these – are there financial implications, social considerations, institutions that are relevant here...)

It is important that all of the categories of items included in the checklist are systematically covered – but we must also probe for temperature, biophysical (flooding, mudslides) hazards, and economic and social stresses, and explore these fully in light of potential adaptive strategies. Like water, institutions are of particular interest in this project, and examples are provided below.

Institutions represent an item on the checklist. If they haven't come up on their own, ask specific questions to place the respondent's understanding of institutional roles/opportunities in managing current and future exposure sensitivities:

*What role do community organizations play in managing your operation? (have list of relevant ones you know – some may have come up already in Part 2) What regional/national organizations have an impact? How? In what ways is it effective? In what ways does it not work well?*

At this point, it is important to address the respondents' ideas or recommendations for addressing specific problems. Using the vulnerabilities that have already been noted, probe further:

*You told me about problems related to .... What could be done to address these problems? What can you do? Your community? Various organizations? Your government? What else would need to be done? Why is it not done?*

Since the Partnership for Canada-Caribbean Community Climate Change Adaptation (ParCA) Project is also concerned with institutions, researchers need to compile a list of all potentially relevant institutions (to be included on the checklist in Part 3 of the Appendix) and ensure that their roles and relevance are checked with respondents. After the general questions on organizations, we ask about specific institutions (the order is important – institutions that are mentioned by the respondent first are generally considered more relevant to the problem).

For example:

*What role does the X committee or the X Authority play? Has it helped you in overcoming [specific problem]? How? What was the nature of support you received? Did it help with the*

*solution? Why/why not? In what way was it effective? Ineffective? Why? [repeat for other relevant institutions]*

### **Future Exposure-Sensitivities/Adaptive Strategies**

ParCA is focused on climate change, tourism, fisheries, communities and institutions. Consequently, we focus on the interrelationship among these issues in our consideration of future exposure sensitivities and adaptive capacities. As above, we prompt for specific/anticipated changes that may not have come up in the open-ended questions, including repeating partial answers to follow up.

#### ***Institutions***

We already know which institutions are currently relevant to respondents. However, we still need to explore potential future institutional dynamics. First, we give respondents a chance to anticipate:

*Are there institutions/programs that you think may be able to help in the future? How? Why? Do the risk management programs and strategies you currently use need to change if climate and water dynamics change? How? Are there institutions or programs that currently don't exist here that would help?*

Similarly, we can employ a scenario-driven approach if we have discovered potential institutional alternatives to the status quo (through key informant interviews, added to the checklist).

#### **Conclusion**

We conclude the interview by giving respondents a chance to provide us with feedback and add anything else that they may feel is relevant

*Thank you for your help. As you can see, I'm particularly interested in fisheries/tourism, institutions, and climate. Is there anything else on this topic – or your livelihood in general – that I didn't ask you about that you would like me to know?*

*Thank you for helping me to understand how you work and live. Who in the community is in a similar situation to you? There are many different ways of living, what people/groups do you expect to have very different experiences? Can you suggest some people to talk to who would give me a good idea of the range of experiences?*

### **4. Reporting Back**

We plan to be in the community for a follow-up workshop in the coming year – conclude the interview with a mention of this, and that it will include a public presentation of our findings. Invite the interviewee to give you their contact information so we can follow up.

## **Appendix 1: Checklist for Community Member Interviews**

Checklists need to be developed carefully for each particular context – specific bullets will depend on occupation of respondent and the community within which he/she lives. The categories here are to be seen as “top level”, with site-specific sub-bullets. The example here is for people involved in the tourism and fishery industries, and the list will be adjusted for other occupations.

### **Part 1 (Situational/Setting the Stage)**

- Name, age, occupation, sources of income, where he/she lives
- Family – who he/she lives with, ages, employment
- Occupation/Livelihood (e.g. for fisherpeople: where they fish; how they fish/what practices are used; equipment used, equipment owned, rented; type of fish they catch; how many fish they typically catch; how long fishing, etc.) (e.g. for the people engaging in the tourism industry: where do you sell handicrafts/operate tours/operate taxi services/locate guest houses; what practices do you use to make handicrafts/what practices do you use to attract business from tourists, etc.)
- Role in the community
- Membership and role in organizations/institutions

### **Part 2 (Open-ended, probing)**

No specific list – there are broad questions (see interview plan) and the interviewer’s job is to probe exhaustively without suggesting specific directions to answers. Avoid questions that can be answered with a simple (dead-end) yes or no.

### **Part 3 (Systematic, prompting)**

The researcher develops a list of potentially relevant exposure-sensitivities and adaptive strategies in this region, and ensures that all topics on the list are addressed in a systematic manner (much may have been addressed earlier, but ensure that explored fully). For each point in the checklist, questions of why, how, in what way, when, was this effective... need to be explored fully.

#### ***Exposure-Sensitivities***

- Water: level, salinity, quality (incl. potable water)/contamination
- Biophysical environment: beach erosion, hazards related to flooding, mudslides, coral bleaching, inundation, storm surges...
- Economic environment: markets, unemployment
- Social: loss of kinship networks, psychological stress, health status...

#### ***Adaptive Strategies***

- Water management: pollution control (e.g. of oil from boats), spacing of nets to allow greater flow
- Management of other conditions:
  - For fisheries: altering catch levels, type of catch, or timing of catch

- For tourism: altering the type of tour operations, altering the type of tourists being attracted
- Financial management: insurance, draw on reserves, secondary non-fishing/non-tourism-related income (e.g. remittances?)
- Institutions: role of specific institutions (local and subnational, national, regional) in managing exposures
- Social: kinship networks and local organizations

***Consideration of Future Exposure-Sensitivities and Adaptive Strategies***

It is important to refer to additional information here: external climate data (ie. what may happen in this region) and recommendations being considered by policy-makers. The researcher thus needs to refer to key informant interview results here to generate specific checklists of potential climate scenarios for study communities.

*Checklist for Future Exposure-Sensitivities (to be developed by researchers)*

1. Climate: to be developed for each study site in collaboration with climate scientists.
2. Tourism/Fisheries: to be developed for each study site in collaboration with relevant scientific experts and industry representatives.
3. Institutions: to be developed for each study site in collaboration with local experts and other project members with expertise in this area.
4. Poverty/Inequality/'Development': to be developed for each study site in collaboration with local experts and other project members with expertise in this area.

**Appendix B: Interview guide semi-structured/key informant interviews**

Thematic areas	General questions
Stakeholder profiles	What is the role of your division/organization? How does your division/organization fit within the structure of the Tobago House of Assembly? Stakeholders as the national level will indicate how their organization relates to the Tobago House of Assembly. What are the responsibilities of your department/agency in relation to coastal management? How is your agency empowered to fulfil this role? Through what legislative arrangements, policies, strategies?
Stakeholder collaboration & capacity for collective action	What work-related activities, programs or projects have you been involved in related to the coastal area?

	<p>What is/was the focus of the activities, program or project and in what capacity have you been involved? How are other stakeholders involved in these activities, programs or projects?</p> <p>How did you become involved in the project (through what process were you engaged)?</p> <p>What has your role been (what is the nature of your contribution)? How are coastal management programs or projects convened, (which agency initiates the program or project)? What are the drivers for engagement (organizational mandate, statutory requirement)? At what level is the engagement initiated (national or quasi-national, sectoral)?</p> <p>Which agency serves as lead in the project or program?</p> <p>What is the nature of the collaboration (e.g., statutory or committee, inter-sectoral arrangement)? What is the nature of your contribution to the program or project? What is the process of decision making (procedural/institutional arrangement)? Who makes the final decision (are the final decisions vested within or outside the group)? Do you feel confident that the deliberations would lead to positive outcomes?</p>
	<p>Could you identify examples of successful outcomes from the collaborative process? To what do you attribute these outcomes? Would these outcomes be possible without collaboration?</p>



<p>Knowledge of change and perception of risks in coastal system</p>	<p>What changes have you observed in the coastal area? How have these changes affected different elements of the coastal system, e.g., beach erosion, water quality, coastal flooding, reef decline? To what do you attribute these changes? How long have these changes started to occur? How have your department responded to these changes?</p> <p>What is your source of information on coastal systems (local knowledge, technical expertise, primary in-house data, published reports or journals)? How does this information inform your work within the coastal area? What arrangements exist for information sharing between your organization and other organizations (through what processes and mechanisms)?</p> <p>What are the current and future challenges faced by your organization regarding coastal management? How is your organization prepared to respond to these challenges? How do these changes affect other sectors? How do you work with these sectors to respond to these changes?</p>
<p>Institutional environment and governance arrangements</p>	<p>Could you outline the current legislative and policy environment for the operationalization of the mandate of your division/agency? Which institutions exist at the national level and the quasi-national level? What governance arrangements exist for working across coastal management jurisdictions? Are these arrangements formal or informal? How is your work informed by coastal management legislation, programs or projects? What challenges exist for working across different jurisdiction (Tobago/Trinidad)? What challenges exist for working across sectors/agencies associated with coastal</p>

	<p>management in Tobago? How have you dealt with these challenges? What challenges or opportunities do the current coastal management arrangements (legislation, designation of protected areas (BRMP/BRESA) for effective coastal management?</p>
<p>Interactions between coastal systems and tourism</p>	<p>What is the nature of coastal tourism in Tobago? Who are the major players in the sector? What is the role of these different players? Could you identify changes that have affected tourism? Could you identify source/reason for these changes? Were these changes the result of natural forces or man-made forces? What impact do you think these changes have had on the tourism industry? How have your agency/division responded to these changes (individually or collectively)? What has been the impact of these responses on the tourism sector? Are there alternatives to coastal tourism? How have these alternatives benefitted the tourism sector? How do you see the role of different actors within the coastal area in helping the tourism sector to deal with current or future challenges? Could these challenges be dealt with without the contribution of sectors? What other sectors. What role do would they play? What incentives currently exist for tourism operators? Who provide these incentives? How have these incentives benefitted the tourism sectors?</p>

## Appendix C: Example of output of stocktaking survey of coastal management arrangements for three sectors

Sectors	Legislation	Regulation	Policy	Strategy
<b>Tourism</b>	Tourism Development Act Chapter 87:22	Tourism Development (Prescribed Forms) Regulations (LN 258/2000) <sup>32</sup>	Nation Tourism Policy of Trinidad and Tobago <sup>33</sup> Comprehensive Economic Development Plan, Tobago, National Climate Change Policy	Not considered in data set
<b>Fisheries</b>	Fisheries Act Chapter 67:51	The fisheries act contains seven subsidiary regulations. However, linkages were considered under the Marine Areas Preservation and Enhancement Regulations	Not considered in data set	Not considered in data set
	The Marine Areas Preservation and Enhancement Act Chapter 37:02 <sup>34</sup>	The Marine Areas (Preservation and Enhancement) Regulations (GN 63/1974) <sup>35</sup> Marine Areas (Restricted	Not considered in data set	Not considered in data set

<sup>32</sup> these regulations focus on application procedures for tourism development

<sup>33</sup> [http://www.ema.co.tt/new/images/policies/tourism\\_policy.pdf](http://www.ema.co.tt/new/images/policies/tourism_policy.pdf)

<sup>34</sup> [http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical\\_List/lawspdfs/87.22.pdf](http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical_List/lawspdfs/87.22.pdf)

<sup>35</sup> Note that the Fisheries Act chapter 67:51 contains eight subsidiary regulations, ([http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical\\_List/lawspdfs/67.51.pdf](http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical_List/lawspdfs/67.51.pdf)). However, since these deal with regulating different fisheries, e.g., marine turtles and oysters they did not form part of the data collection and analysis.

Area) Order (GN 140/1973)				
<b>Environmental protection</b>				
<b>Department of Natural Resources and the Environment, DNRE</b>	Environmental Management Act Chapter 35:05	Certificate of environmental clearance rules (LN 104/2001), Water pollution rules (LN 230/2001) <sup>36</sup> and EIAs Environmentally Sensitive Areas Rules 2001	National Climate Change Policy <sup>37</sup> National Protected Area Policy <sup>38</sup> National Environmental Policy	“Integrating coastal area management with climate change adaptation in Tobago”  Ridge to reef strategy
<b>Water and Sewage Authority, WASA</b>	Water and Sewage Act Chapter 54: 40	Prevention of water pollution (Courland Water Works) Bye-laws (GN 61/1973) <sup>39</sup>	National Water Resource Management Policy, National Climate Change Policy National Protected Area Policy	Not considered in data set
<b>Town and Country Planning Division, TCPD</b>	Town and Country Planning Act Chapter 35:01	Development Plans Approval Resolutions (114/1972) <sup>40</sup>	Not considered in data set	Not considered in data set

## Appendix D: Invitation letter to heads of divisions, Tobago House of Assembly

Administrator

Division of Agriculture, Marine Affairs and the Environment

<sup>36</sup> The data collection and analysis was limited to the Water Pollution Rules, certificate of environmental clearance under the provisions of the Environmental Management Act chapter 35:05. The act contains a total of eleven subsidiary legislative rules, [http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical\\_List/lawspdfs/35.05.pdf](http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical_List/lawspdfs/35.05.pdf)

<sup>37</sup> [http://www.ema.co.tt/new/images/policies/climate\\_change\\_2011.pdf](http://www.ema.co.tt/new/images/policies/climate_change_2011.pdf)

<sup>38</sup> [http://www.ema.co.tt/new/images/policies/protected\\_areas.pdf](http://www.ema.co.tt/new/images/policies/protected_areas.pdf)

<sup>39</sup> the water and sewage act chapter 54:40 contains a total eight subsidiary legislation, [http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical\\_List/lawspdfs/54.40.pdf](http://rgd.legalaffairs.gov.tt/Laws2/Alphabetical_List/lawspdfs/54.40.pdf)

<sup>40</sup> the town and country planning act contains a total of seven subsidiary regulations

Tam Building, Glen Road

Tobago, Republic of Trinidad and Tobago

Tel: (868) 639-2234 ext 302

Fax: (868) 639-1746

Sir/Madam,

The Partnership for Canadian-Caribbean Community Climate Change Adaptation (ParCA) is a collaborative research project dedicated to the study of the adaptation of small and medium sized coastal community in the Caribbean and Atlantic Canada to the impacts of climate change. The ParCA initiative is a consortium of researchers involving CARIBISAVE, the University of Waterloo, Wilfred Laurier University, St Mary's University, University of Prince Edward Island and the University of the West Indies.

ParCA as part of an ongoing five-year project will be undertaking climate change research in several sites in the Caribbean including Jamaica, St Lucia and Tobago. The Tobago site includes a stretch of coastal villages from Plymouth to Crown Point on the southwestern end of the island. This work will focus specifically on vulnerability and adaptive capacity in fisheries and tourism sectors and protected areas.

On Monday 7, May 2012 representatives of the ParCA research team met with the Chief Administrator of the Tobago House of Assembly. Subsequently, ParCA has applied the Division of Natural Resources and the Environment for permission to undertake research related to the Tobago site. The sectoral interest in this project relate directly to the work undertaken by your division in the Tobago House of Assembly, given your responsibility for fisheries and natural resources. Regrettably, perhaps due to a lack of understanding of protocol, the Division of Agriculture, Marine Affairs Marketing and the Environment was not formally engaged at the beginning of this project. Therefore, on the behalf of ParCA I apologize for such oversight and take this opportunity to formally engage your division as a local partner in this research initiative. On your invitation I will arrange for a team representing ParCA's interest to pay a courtesy call on your office to further discuss the details of ParCA's research in Tobago.

I have attached a summary of the ParCA project proposal for your perusal. I anticipate your favorable response to this invitation.

### **Appendix E: Information form and consent for semi-structured interviews**

Partnership for Canada-Caribbean Community Climate Change Adaptation (ParCA) Project:  
southwest Tobago study site Information letter and consent for semi-structured interviews

Date

Dear Participant

This letter is an invitation for you to consider participating in a study I am conducting in Tobago by the Department of Geography and Environmental Management, University of Waterloo, Ontario, Canada. This study forms part of a larger project investigating the impacts of climate change on the tourism and fisheries sectors across several sites in the Caribbean and Canada, under the direction of the Partnership for Canadian-Caribbean Community Climate Change Adaptation, (ParCA). ParCA is a research group that includes faculty and student researchers from Canada, the United Kingdom and the Caribbean. The group also includes Non-Government Organizations from Canada and the Caribbean. My research entails an examination of the impacts of changing climatic conditions on the coastal area and tourism sector of southwest Tobago. This study is being supervised by **Dr. Johanna Wandel and Dr. Derek Armitage**. I will like to take this opportunity to brief you on some of the details of the study and the likely nature of your involvement should you decide to participate.

The impacts of climate change on coastal systems have become a major challenge for coastal islands in the Caribbean. Many of these changes have affected the coastal areas of Tobago. In 2012, the Partnership for Canadian-Caribbean Community Climate Change (ParCA), under the general supervision of the Dr. Johanna Wandel and Dr. Derek Armitage, embarked on a five-year research project to study the impacts of these changes on both fishing and tourism communities in Tobago, in an area encompassing several villages along the southwest coast from

Plymouth to Crown Point. During the months of May and June of 2012, a team of ParCA researchers interviewed a large number of tourism and fisheries stakeholders using a Community Based Vulnerability Assessment (CBVA) protocol.

As the project continues, the focus of the research shifts to dealing with how different stakeholders in Tobago have worked together using integrated coastal management approaches, in responding to the effects of changing climatic conditions on coastal systems in the southwest region of the island. Given the importance of tourism to the Tobago economy, particular emphasis is being placed on climate related impacts on the tourism sector.

Since you have been involved in collaborative efforts related to coastal management within the southwest area, I will like to interview you regarding the nature and scope of your involvement in coastal management projects or programs. The interview will focus on several themes including:

1. Your involvement with other stakeholders in projects or programs related to coastal management
2. The changes you have observed within the coastal area and the opportunities you perceive to exist to deal with these changes
3. The existing institutional and governance arrangements currently in place in Tobago to respond to these changes
4. The linkages between tourism and the coastal area and the way in which tourism has been affected by changes in coastal systems

Your participation in this study is voluntary. Your involvement will be limited to an interview that will last for approximately one hour. The interview will occur at a location and time that is convenient to you. You are not obliged to answer any question with which you are uncomfortable. Additionally, you may withdraw from this study at any time without advance notice to the researcher. With your permission, the interview will be audio recorded to facilitate a more comprehensive collection of the information you will provide. Later, this information will be transcribed and analyzed. A copy of the transcript will be sent you. This will provide you with the opportunity to verify the content of our conversation. At that time you may wish to add or clarify any information contained in the transcript.

The information you provide during the interview is confidential. Consequently, your name will not appear in any publication related to this study. All information related to this study will be presented in aggregate. As such, no individual participant will be identified in any final report. With your consent, anonymous quotations may be used in the presentation and analysis of the data.

Data collected during this study will be retained for a period of ten years in a secure location at the University of Waterloo. Only researchers associated with this project will have access to this data. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about your participation, please contact me at 1-519-505-2716 or by email at [a9thomps@uwaterloo.ca](mailto:a9thomps@uwaterloo.ca). You can also contact my supervisors **Dr. Johanna Wandel** at 519-888-4567, Ext. 38669, email, [jwandel@uwaterloo.ca](mailto:jwandel@uwaterloo.ca) or **Dr Derek Armitage** at 519-888-4567, **Ext. 35795, email: [derek.armitage@uwaterloo.ca](mailto:derek.armitage@uwaterloo.ca)** at the University of Waterloo.

ParCA has applied for and has received permission from the government of Trinidad and Tobago to conduct this research in Tobago. This permission was granted by the Department of Natural Resources and the Environment, Tobago House of Assembly.

This project has been reviewed and received ethics clearance through a University of Waterloo, Research Ethics Committee. However, the final decision about participation is yours. If you have any comments or concerns resulting from your participation in this study, please contact Dr. Maureen Nummelin in the Office of Research Ethics at 1-519-888-4567, Ext. 36005 or [maureen.nummelin@uwaterloo.ca](mailto:maureen.nummelin@uwaterloo.ca).

I hope that the results of this study will be beneficial to those organizations directly involved in the study, the wider coastal community in southwest Tobago, decision makers involved in coastal management and stakeholders in the tourism sector.

I hope that you will find the time to participate in this research project and I look forward to speaking with you in the future.

Yours Sincerely,



.....  
**Alvin Thompson**

**PhD Candidate**

**University of Waterloo, Department of Geography and Environmental Management**

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### **CONSENT FORM**

By signing this consent form, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

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I have read the information presented in the information letter about a study being conducted by **Alvin Thompson** of the Department of **Geography and Environmental Management** at the University of Waterloo. I have had the opportunity to ask any questions related to this study, to receive satisfactory answers to my questions, and any additional details I wanted.

I am aware that I have the option of allowing my interview to be audio recorded to ensure an accurate recording of my responses.

I am also aware that excerpts from the interview may be included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous.

I was informed that I may withdraw my consent at any time without penalty by advising the researcher.

This project has been reviewed by, and received ethics clearance through a University of Waterloo Research Ethics Committee. I was informed that if I have any comments or concerns resulting from my participation in this study, I may contact the Director, Office of Research Ethics at 519-888-4567 ext. 36005.

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES  NO

I agree to have my interview audio recorded.

YES  NO

I agree to the use of anonymous quotations in any thesis or publication that comes of this research.

YES  NO

Participant Name: \_\_\_\_\_ (Please print)

Participant Signature: \_\_\_\_\_

Witness Name: \_\_\_\_\_ (Please print)

Witness Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix F: Supplemental Interview Data

### Chapter 4: Interviews selected from dataset of 75

Organization	Number of interviews
Tobago Hotel and Tourism Association	2
Tobago Bed and Breakfast Association	2
Reef Tours Association	3
Tobago Dive Association	3
Tobago Chamber of Commerce	2
<b>Total</b>	<b>12</b>

### Chapter 4: CBVA interviews selected from dataset of 140

Organization	Number of interviews
Canaan Bon Accord Village Council	2
Black Rock Village Council	2
Buccoo Village Council	2
Environment Tobago ET	3
Buccoo Reef Trust BRT	1
Department of Natural Resources and the Environment DNRE	1
Department of Marine Affairs and Fisheries DMAF	3
Tobago Emergency Management Agency TEMA	2
Department of Tourism and Transportation	5
Water and Sewage Authority WASA	1
South West Tobago Fisherfolk Association	14
All Tobago Fisherfolk Association	2
Reef Tours Association	3
Tobago Taxi Drivers Association	2
Tobago Jet Ski Association	2
Save Our Sea Turtles SOS	1
Guesthouse owners	2
Craft vendors	2
<b>Total</b>	<b>50</b>

### Chapter 5: CBVA interviews selected from dataset of 140

<b>Organization</b>	<b>Number of interviews</b>
Canaan Bon Accord Village Council	2
Buccoo Village Council	2
Environment Tobago ET	3
Buccoo Reef Trust BRT	1
Department of Natural Resources and the Environment DNRE	3
Department of Marine Affairs and Fisheries DMAF	3
Tobago Emergency Management Agency TEMA	2
Environmental Management Authority	1
Water Resource Agency	1
Department of Tourism and Transportation	3
Water and Sewage Authority WASA	1
<b>Total</b>	<b>22</b>

### Chapter 5: Interviews selected from dataset of 75

<b>Organization</b>	<b>Number of interviews</b>
Department of Planning	1
Division of Meteorological Services	1
Department of Natural Resources and the Environment DNRE	5
Department of Marine Affairs and Fisheries DMAF	1
Tobago Emergency Management Agency TEMA	1
Department of Tourism and Transportation	2
Water and Sewage Authority WASA	1
<b>Total</b>	<b>12</b>

### Chapter 6: Interviews selected from three collaborative projects

<b>Project</b>	<b>Organization</b>	<b>Number of interviews</b>
Integrating watershed and coastal area management (IWCAM)	(5) from IWCAM management committee (3) Buccoo Reef Trust and (2) from AFECO	10
Integrating coastal zone management with climate change adaptation (ICZM/CCA)	(4) from the ICZM Steering Committee and (2) from the coastal vulnerability subcommittee	6
National sea turtle tagging and monitoring program (NSTMP)	Coordinator of NSTMP in Trinidad, coordinator of NSTMP in Tobago, member of Save Our Sea Turtles SOS, Tobago, one member of community group involved in NSTMP	4
<b>Total</b>		<b>20</b>

### Chapter 6: Interviews used to frame conceptual background

<b>Organization</b>	<b>Number of interviews</b>
The Oil Spill Contingency Committee	5
Tobago Hotel and Tourism Association	2
Tobago Bed and Breakfast Association	2
South West Tobago Fishermen Association	1
Defunct Buccoo Reef Management Committee	2
Tobago Dive Association	3
Buccoo Village Council	2
<b>Total</b>	<b>17</b>