Evaluating Conservation International's Marine Management Area Science Program

by

Jesse Guite Hastings

Department of Environment
Duke University

Date:_______________________
Approved:

____
Michael Orbach, Supervisor

____
Lisa Campbell

____
Larry Crowder

____
Leah Karrer

Dissertation submitted in partial fulfillment of
the requirements for the degree of Doctor of Philosophy in the Department of
Environment in the Graduate School
of Duke University

2011

ABSTRACT

Evaluating Conservation International's Marine Management Area Science Program

by

Jesse Guite Hastings

Department of Environment
Duke University

Date:_______________________

Approved:

____
Michael Orbach, Supervisor

____
Lisa Campbell

____
Larry Crowder

____
Leah Karrer

An abstract of a dissertation submitted in partial
fulfillment of the requirements for the degree
of Doctor of Philosophy in the Department of
Environment in the Graduate School
of Duke University

2011

Abstract

Environmental non-governmental organizations are now major players in environmental science and conservation. The largest now produce applied conservation science and work on local, national, and international scales and across scales to conserve marine and terrestrial ecosystems and connect local level environmental issues to international economic and political processes. However, despite the growing role of these organizations, there is still a lack of comprehensive examinations of their programs with a full analysis of programmatic design, structure, processes, and outcomes.

To fill this gap in both conservation practice and academic theory, I conducted a multi-scalar examination of Conservation International's Marine Management Area Science initiative. This $12.5 million initiative, lasting from 2005 until 2010 and funded by the Gordon and Betty Moore Foundation, had four main nodes of research and conservation work: Fiji, Belize, Eastern Tropical Pacific Seascape, and Brazil. Using non-governmental organization and science and technology studies literature as a theoretical framework, I endeavored to determine what factors affect how environmental non-governmental organizations manage the boundaries across multiple scales and between science and policy in international marine management area science initiatives. Drawing upon methodological approaches in multi-sited ethnography and participant action research, I conducted qualitative field research at each of the initiative's four main node sites and at Conservation International's headquarters, while simultaneously engaging with Conservation International so to return results back to the organization for adaptive management and learning.

My results are consistent with theoretical predictions and lend lessons learned to conservation practice. My research shows that managing the boundaries across scales and between science and policy in international marine management area science initiatives depends on how the program was initiated, the use of networks, partnerships, and coalitions, the level of programmatic participation, the degree of accountability and the ability to learn, the translation of scientific knowledge, and the assessment context. Future research on other environmental non-governmental organization programs has the potential to extend these findings.

Dedication

I would like to dedicate this dissertation to my wife, Mariam Lucila Sharaf. Mariam had patience with and love for me as I spent months burying my head in the literature, putting together proposals, waiting on grant applications, travelling abroad to multiple countries, analyzing data, and writing, writing, writing. Mariam, this dissertation is for you.

Contents

Abstract iv

List of Tables xi

List of Figures xii

Acknowledgements xiii

1 Chapter One - Introduction 1

1.1 The Rise of ENGOs 1

1.2 Introduction to Conservation International's MMAS Initiative 7

1.3 Goals, Questions, and Layout of the Dissertation 9

2 Chapter Two – Theoretical Framework 15

2.1 Defining, Creating and Managing Marine Managed Areas 15

2.2 ENGOs as Multi-Scalar Conservation Actors 23

2.2.1 ENGOs at the International Scale 23

2.2.2 ENGOs at the National Scale 30

2.2.3 ENGOs at the Local Scale 33

2.2.4 ENGOs Crossing Scales 35

2.3 Translating Science into Policy 49

2.3.1 Boundaries between Science and Policy 50

2.3.2 Boundary Organizations 52

2.3.3 Characteristics of Effective Assessments 55

2.4 Evaluating MMAS 62

3 Chapter Three - Methodology 65

3.1 Defining Multi-sited Pragmatic Action Research 66

3.2 Application of Multi-sited Pragmatic Action Research 70

4 Chapter Four - Results 87

4.1 CI as an organization 87

4.2 CI's ENGO Peers 96

4.3 MMAS Beginnings 103

4.3.1 Defying Ocean's End 103

4.3.2 The Scientific Advisory Committee and Early Projects 106

4.3.3 Move to S2A Focus 111

4.3.4 Hiring of Senior Director, Creation of Themes and Workplan 112

4.4 Structure and Staffing of MMAS 114

4.5 Fiji 128

4.5.1 Socio-economic, institutional, environmental context 128

4.5.2 Translation from International to Local 134

4.5.3 Translation from Science to Policy 143

4.5.4 Policy, Management, Capacity Building Outcomes 152

4.5.5 Emergent Themes across Case 159

4.6 Belize 163

4.6.1 Socio-economic, institutional, environmental context 163

4.6.2 Translation from International to Local 167

4.6.3 Translation from Science to Policy 176

4.6.3 Policy, Management, Capacity Building Outcomes 183

4.6.4 Emergent Themes across Case 187

4.7 Panama and Galapagos 191

4.7.1 Socio-economic, institutional, environmental context 191

4.7.2 Translation from International to Local 198

4.7.3 Translation from Science to Policy 208

4.7.4 Policy, Management, Capacity Building Outcomes 217

4.7.5 4.7.5 Emergent Themes Across Case 221

4.8 Brazil 225

4.8.1 Socio-economic, institutional, environmental context 225

4.8.2 Translation from International to Local 230

4.8.3 Translation from Science to Policy 238

4.8.4 Policy, Management, Capacity Building Outcomes 246

4.8.5 Emergent Themes Across Case 253

4.9 Translation from Local to International 257

4.9.1 Communication with the Gordon and Betty Moore Foundation 257

4.9.2 Cross-node sharing and synthesis 258

4.10 Impact on CI as an Institution 264

5 Chapter Five –Analysis of Key Factors 269

6.1. Question One: Impact of Early Decisions 270

5.1.1 Program Initiation 270

5.2 Questions Two and Three: Crossing Scales and the Science/Policy Boundary 277

5.2.1 Networks, Partnerships, Coalitions 277

5.2.2 Participation 283

5.2.3 Accountability and the Ability to Learn 289

5.2.4 Translation of Scientific Knowledge 293

5.2.5 Assessment Context 297

6 Chapter Six - Conclusion 300

Appendix A – Informed Consent Form 312

Appendix B – Interview Protocols 314

Appendix C – Stakeholders Interviewed 323

Appendix D – Grounded Theory Coding, Round One 329

Appendix E – Theory to Data Coding, Round Two 331

Appendix F – Organizational Chart of MMAS within CI 332

Appendix G – MMAS Partnership Structure 333

References 334

Biography 350

List of Tables

Table 2-1: ENGO Action at Different Scales 40

Table 3-1: MMAS Documents Reviewed 76

Table 4-1: Scientific Advisory Committee Members 107

Table 4-2: MMAS Studies and PIs 123

Table 4-3: MMAS Nodal Studies and Research Objectives 124

Table 4-4: MMAS Global Studies and Cross Node Syntheses 125

Table 4-5: FLMMA Activities and Members as of 2010 130

Table 4-6: Listing of Fiji MMAS Study Locations 135

Table 4-7: Fiji Study Final Results 145

Table 4-8: Ovalau Moturiki Yaubula Management Support Team 156

Table 4-9: Main Belize MMAS Studies and Locations 168

Table 4-10: Belize Study Final Results 178

Table 4-11: Main Panama and Galapagos MMAS Studies and Locations 199

Table 4-12: Panama Study Final Results 209

Table 4-13: Galapagos Study Final Results 216

Table 4-14: Main Brazil MMAS Studies and Locations 231

Table 4-15: Brazil Study Final Results 241

Table 4-16: The Fight to Create Cassuruba RESEX 247

Table 4-17: Cross-node disciplinary synthesis findings 263

List of Figures

Figure 4-1: Map of Fiji MMAS Study Locations, published by MMAS 134

Figure 4-2: MMAS Timeline in Fiji 136

Figure 4-3: Map of Belize MMAS Study Locations, published by MMAS 167

Figure 4-4: MMAS Timeline in Belize 169

Figure 4-5: Map of Panama MMAS Study Locations, published by MMAS.................... 198

Figure 4-6: MMAS Timeline in Panama... 200

Figure 4-7: MMAS Timeline in Galapagos 201

Figure 4-8: Map of Brazil MMAS Study Locations, published by MMAS........................ 230

Figure 4-9: MMAS Timeline in Brazil.. 232

Acknowledgements

This dissertation has been made possible by the support of hundreds of people. It is impossible to name them all here, but they are all remembered in my heart.

First, I would like to thank my committee for being an enormous source of support during my Ph.D. As my advisor, Dr. Orbach helped guide this dissertation from start to finish. His enthusiasm and knowledge made it possible to complete what I, in the beginning, saw as a mammoth undertaking, and for that I am eternally thankful. Dr. Campbell provided me with theoretical insight and valuable feedback on dissertation proposals and paper ideas. Dr. Crowder kept me on track with his thought-provoking questions during committee meetings. Dr. Karrer, as Senior Director of MMAS, played the multiple roles of being a key informant, a gatekeeper, a fact checker, a recipient of feedback, and an intellectual collaborator.

The results in this dissertation depended upon interviews with informants throughout the world. A full list of informants is in Appendix C – Stakeholders Interviewed. While all of these informants played an important role, node coordinators went above and beyond by not only being interviewed but also by helping me with logistics and giving me connections to others in their networks. I would like to, therefore, thank Mr. Lindsay Garbutt and Dr. Melanie McField (Belize), Dr. Arturo Dominici (Panama), Mrs. Loraini Sivo (Fiji), and Dr. Moura and Dr. Dutra (Brazil).

Without funding, this dissertation would have just been an idea that never got off the ground. Travel support was received from the Duke Dissertation Travel Award, the Duke International Fellowship, the Oak Foundation, and Conservation International. Ongoing support was provided by the University Scholars Fellowship, the J.B. Duke Fellowship, the Duke Endowment Fellowship, the Duke International Fellowship, and the Duke Marine Lab Writing Fellowship.

1 Chapter One - Introduction

1.1 The Rise of ENGOs

Since the middle of the 20th century environmental non-governmental organizations (ENGOs) have grown to be major players in the realm of environmental science and conservation.[1] Many ENGOs started as small regional, state or national organizations focused around single-species protection and preservation of tracks of terrestrial wilderness. Now, the largest have budgets of hundreds of millions of dollars and work on local, national, and international scales (McCarthy 2005) and across scales to conserve marine and terrestrial ecosystems and connect local level environmental issues to global economic and political processes (Arts 2004). In policy, they are involving themselves in the negotiation of international biodiversity agreements (Raustiala 1997), lobbying governments for biodiversity protection, and engaging in the creation and management of protected areas (Burris 2007). In science, they are staffed with ecological and socio-economic experts, collecting, aggregating, interpreting, and applying knowledge (Gemmill and Bamidele-Izu 2002) on conservation issues and biodiversity loss. They either manage centralized in-house science programs (Da Fonseca 2003) or focus on linking with experts from scientific knowledge communities

---

[1] In this dissertation, the term "ENGO" will refer to a value-driven non-profit organization that works, at least in part, on environmental issues. As will be discussed following, ENGOs can work on a single scale, on multiple scales, or across scales.

to provide scientific expertise (Haas 2004). ENGOs are now a power to be reckoned with, sharing the biodiversity stage with the state and local users.

Before continuing a discussion of ENGO's place in conservation in the early 21st century, it is instructive to examine what the roles of government, academia, and local and big ENGOs are, and how these roles have changed over the last few decades. In this chapter and those following, these three sectors are emphasized because they have historically had the largest roles in conservation action. While (some) private for profit industry is now working with these sectors to make their business practices more sustainable, private industry has rarely been at the forefront of conservation efforts.

Government has long been the major player in conservation (Jeffrey 2001). In the United States, government agencies established Yellowstone National Park in 1872, the first national park in the world. In 1890 – with the prompting of famous preservationist John Muir – government established Yosemite National Park. Shortly thereafter, John Muir established the Sierra Club, and worked with the US government to encourage the declaration of other national parks in the country. In Africa, numerous protected areas were established by national governments in the 20th century for trophy hunting and protection of charismatic wildlife (Derman 1995).

Only government possesses the public trust authority to craft and pass legislation, a crucial element of protected area establishment (Kelleher and Kenchington 1992). Governments pass legislation that protects natural resources from over exploitation, protects species from extinction, and regulates pollution, air quality, and water quality. In the United States, legislation includes the Clean Air Act (1963), the Endangered Species Act (1973), and the Marine Mammal Protection Act (1972). Government also is the final authority on ratification and negotiation of international biodiversity agreements. In the last 20 years, international agreements governing conservation have grown rapidly. The most prominent of these is the Convention on Biological Diversity, developed in 1992 at the Rio Earth Summit (www.cbd.org).

Out of all sectors, government's role in conservation has undergone the most prominent changes. Governments retain legislative power and, where governmental capacity and resources are strong and civil society is weak, dominance in promoting their conservation vision. However, in most cases government has been forced to cooperate with number of other actors, most prominently ENGOs (Matthews 1997; Hudson 2001) and local stakeholders (Murphy 2000). There has been an increasing recognition (based on multiple, multiple failures) that these actors have to be involved in conservation, with local participation increasing by many levels compared to decades past (Derman 1995). For example, in the United States, the establishment of both Yosemite and Yellowstone involved physically removing Native Americans that were in the area; now the US National Park service heavily emphasizes local participation (www.nps.gov).

The contributions of academia to conservation have been more fluid, more amorphous, and less tangible than government. Unlike government, academia cannot pass legislation, establish protected areas, or make final decisions in biodiversity agreements. However, academia has emphasized basic and applied research and the collection and dissemination of conservation information. Academia publishes its results in peer-reviewed journals and books, and disseminates the information to interested actors through these media and through epistemic knowledge networks (Forsyth 2003). While certainly a minor role compared to research, academia does occasionally have a more active role in setting up and managing protected areas. Some marine managed areas (MMAs) have been set up by marine laboratories (Sobel and Dahlgren 2004) and some academics have set up long-term research projects in distant countries and empowered communities to set up MMAs (Aswani and Hamilton 2004).

Over time, academia has changed from focusing on basic research to more applied biodiversity research. The study of protected areas and conservation biology has become popular (Crawford et al. 2006; Drew and Henne 2006; Lundquist and Granek 2005; Naughton-Treves, Holland, and Brandon 2005). Some universities have changed their departmental orientation to reflect an applied, interdisciplinary focus (see Duke University's Nicholas School of the Environment). There has also developed a greater (although some would argue, still not great enough) emphasis on academics working outside the "ivory tower", with a greater focus on consultancies and involvement in collaborative working groups, management councils, and interdisciplinary projects.

Against this backdrop of changing roles of government and academia has come the rise of ENGOs. Out of all actors, the role of ENGOs has experienced perhaps the most profound changes. ENGOs can be separated into local ENGOs and big ENGOs, often termed BINGOs (big international NGOs). There has long been a multitude of local ENGOs in the developed world. Local ENGOs' rise in developing countries has been more recent, especially pronounced since the rise of democratic governments since the 1980s (Bryant and Bailey 1997).

Local ENGOs in developing countries have become increasingly concerned over the destruction of biodiversity, decline of environmental conditions, and impoverishment of local livelihoods. Local ENGOs place a large emphasis on the economic concerns of grassroots actors and been vocal about the larger political processes that drive environmental change (Bryant and Bailey 1997). Often knowing the legislative, political, social, cultural, and economic terrain better than foreign actors (Avant 2004; Chapin 2004) they avoid having to answer as many questions about their legitimacy (Edwards, Hulme, and T. Wallace 1999). Where government capacity is weak, they take the lead in establishing protected areas and facilitate local community efforts to do so. Still, local ENGOs have long been constrained by a lack of institutional and political support for their activities (Bryant and Bailey 1997; Edwards and Hulme 1995).

A more supportive institutional and political environment in recent decades has allowed many local ENGOs to enter into the realm of direct political advocacy (Bryant and Bailey 1997). The international transfer of knowledge, resources, information, and advocacy strategies between local ENGOs and grassroots groups, big ENGOs, and international organizations through epistemic networks (Jasanoff 1997; Jordan and Van Tuijl 2000) has allowed local ENGOs to scale up their activities and effect conditions on a national or regional level (Hudson 2001; Josiah 2001).

The genesis of big ENGOs was with concern for first-world environmental issues, such as pollution, air quality, and water quality (Princen and Finger 1994). Over time, big ENGOs have moved wholeheartedly into concern and action for issues that primarily manifest themselves in the developing world (coral reefs, tropical rain forests, rare and threatened species). Broadly speaking, big ENGOs have focused on three tasks. First, big ENGOs are now very much involved in lobbying both their own and foreign governments and in engaging in negotiations in international biodiversity agreements. This advocacy has the intent of promoting a particular human-environmental worldview (Forsyth 2003), driving national and international environment action and creating policy changes (Jeffrey 2001), and more generally advocating for changes in the public policy and socio-economic status quo. Part of this advocacy is the collection and dissemination of ecological information that conveys the scale and extent of biodiversity threats.

Second, they are now involved in the creation and promotion of a worldwide environmental consciousness (Wapner 1996). This environmental consciousness has caused people to incorporate environmental concerns into more of their everyday activities and care about the protection of biodiversity.

Finally, big ENGOs are engaging in direct action and implementing environmental projects. The most prominent of these is protected areas, which big ENGOs have been instrumental in creating, protecting, and managing. They have promoted individual protected areas in both developed and developing countries (Campbell and Vainio-Mattila 2003), as well as encouraging the creation of networks of protected areas regionally (Dumaup et al. 2004). Big ENGOs have moved from a protected area approach that emphasizes preservation to one that stresses local participation and integration of conservation and development concerns (Campbell, Gray, and Meletis 2007).

1.2 *Introduction to Conservation International's MMAS Initiative*

Within this context of a growing role of big ENGOs came Conservation International's (CI) Marine Management Area Science (MMAS) initiative. This $12.5 million USD initiative, lasting from 2005 until 2010 and funded by the Gordon and Betty Moore Foundation (GBMF), had four main nodes of research and conservation work: Fiji, Belize, Eastern Tropical Pacific Seascape (ETPS), and Brazil. MMAS also engaged outside of these nodes in places such as the Phoenix Islands, Hawaii, the Philippines, and the Caribbean. In the process of running the initiative, Conservation International built and utilized an international network of researchers, practitioners, field offices, partner organizations, and stakeholders through which programmatic information and decisions flowed.

MMAS had three main objectives. The first objective was to answer critical scientific questions about MMAs. Despite what is known about the benefits of MMAs, the science of MMA management remains incomplete. Critical questions about MMAs in MMAS were to be answered by studying MMAs with different management schemes and drawing out the effects of those different management regimes on biophysical, socioeconomic, economic, and cultural outcomes. For example, what is the biophysical effect of a no-take reserve versus a multiple-use area where extraction is permitted? What socioeconomic costs and benefits do communities experience from different types of MMAs? What cultural traditions are linked to MMAs' existence and use? Simultaneous interdisciplinary work in multiple locations around the world was the planning framework of the MMAS program so as to draw insights from cross-nodal and cross-disciplinary comparisons.

The second objective of MMAS was to use the scientific studies to help build capacity. Primarily, capacity was to be built in the nodes through involving in-country stakeholders in research as principal investigators (PIs) and assistants, and training them in biophysical, social, economic, and cultural monitoring techniques. Institutions that worked with CI were to be strengthened through gaining access to global networks of information exchange and collaborative processes. Secondarily, capacity within CI was to be built by strengthening the institution's marine science program and establishing a cadre of MMAS staff. Through this capacity building, individuals and institutions could continue research and management efforts after the MMAS grant was concluded.

The third objective was to do "science to action" – called S2A by CI - where all of the projects would not just be oriented towards producing scientific information (and then sitting in a report on the shelf) but towards feeding into local, national, and global MMA management and policy decisions. The goal was for the science to lead to more MMAs, better MMAs, and more sustainable MMAs that would be both biophysically, socio-economically and culturally beneficial.

1.3 Goals, Questions, and Layout of the Dissertation

This dissertation aims to accomplish two goals. The primary goal of the dissertation is to contribute to the practice of conservation. ENGOs trumpet their successful outcomes in glossy brochures, the gray literature and increasingly in peer-reviewed publications; however, there is still a lack of comprehensive examinations of their programs with a full analysis of programmatic initiation, structure, processes, and outcomes. What Fisher in 1997 reported, that "there are relatively few detailed studies of what is happening in particular places within particular organizations [NGOs]" still holds true today (Fisher 1997, 441). Through an in-depth case study illustrating both MMAS' successes *and* challenges, and factors leading to each, the dissertation will point to lessons learned in order to improve the design, implementation, and management of future ENGO programs.

The second goal of this dissertation is to contribute to academic theory. The dissertation is informed by literature from both the NGO field and Science and Technology Studies (STS). There is a small but growing body of NGO research, focusing on the increasing role that NGOs play in development, international policy making, and environmental affairs. Made up of a multidisciplinary body of researchers from political science, policy analysis, anthropology, sociology, geography, political ecology and others, this field boomed during the 1990s as it became apparent that NGOs were exerting increasing influence in the world political system. Despite the fact that big ENGOs make up a miniscule fraction of NGOs in total (education, health, development NGOs exist in much greater numbers), they are becoming a more popular area of study because of their dual roles in both biodiversity protection and human development.

The NGO literature, since it comes from scholars from multiple disciplinary traditions, tends not have a single overriding theoretical framework of how NGOs work guiding the field of inquiry (i.e. social movement theory, organizational theory, political ecology theory). Rather, the literature is brought together by the fact that it all examines the same actor category: NGOs (E. Johnson and Prakash 2007). Despite this, a general focus of NGO scholars has emerged examining NGO action (advocacy, research, program implementation, etc.) at particular scales and across scales. ENGO literature looks at how ENGOs have participated in projects ranging from local protected area projects (West 2006; Zimmerer and Bassett 2003), to advocacy campaigns where they seek to influence national and international policymaking (Jeffrey 2001) to international environmental governance regimes (Princen and Finger 1994). It also examines how ENGOs are able to link up scales and construct worldwide networks of information sharing and political action (Hudson 2001; Jordan and Van Tuijl 2000).

Research grounded in STS has sought to uncover factors that impact the effectiveness of science in moving policy. Scholars have found that for this translation to be successful there must be work across *boundaries* (Jasanoff 1987), defined as the "socially constructed and negotiated borders between science and policy, between disciplines, across nations, and across multiple levels" (Cash et al. 2002, 1). Scientists and policymakers draw intellectual boundaries around their areas of expertise, and resist intrusion by outsiders in order to protect their claims of authority and legitimacy (Gieryn 1995; Jasanoff 1987). However, boundaries are not immutable barriers, but rather are continually socially reconstructed and thus amendable to spanning (Jasanoff 1987; Star and Griesemer 1989).

Despite the growing body of ENGO literature, little research has examined the structure, function, and outcomes of ENGO initiatives that primarily focus on conservation *science*, with a full macro and microanalysis of the multi-scalar drivers of programmatic decisions and outcomes. In the STS literature, little research has focused on ENGOs as a unit of analysis. The CI MMAS initiative, with its local nodes as well as international foci of action and science, offers the perfect opportunity for a case study that can help improve the conduct of conservation science and inform theory in multiple fields.

The central question of this dissertation is "**What factors affect how ENGOs manage the boundaries across scales and between science and policy in international MMA science initiatives?"** This central question will be answered by answering the following questions specific to MMAS:

1. How were the priorities and objectives of Conservation International's MMAS initiative developed? What key decisions were made, and what impact did these decisions have on the initiative's development?

2. How were programmatic goals, scientific priorities, and scientific results translated between the local, national, and international scales? Where was this translation more successful and what programmatic factors contributed to this success?

3. How was science translated into management, policy and capacity building changes at the four node sites and CI? Where was this translation more successful and what programmatic factors contributed to this success?

Due to the nature of the research questions, **this dissertation will focus on the processes and outcomes at the four node sites and within CI**. So-called global and non-node studies – research and processes that took place outside of the four main nodes - will not be examined. Additionally, as there was much literature coming out of MMAS on the findings of the science itself – including academic publications and synthesis reports – this dissertation will not focus on the scientific results except as they relate to the three questions above. Extensive information is available at www.science2action.org and www.conservation.org. This dissertation is arranged into four substantial following chapters, with a conclusion and appendix following.

1. The Theoretical Framework chapter elaborates on the benefits of MMAs, which many in the conservation field see as an important tool to reduce marine biodiversity loss and help improve local livelihoods. It will also explore the role of ENGOs as multi-scalar actors and science-policy translators, drawing on the disciplinary traditions of NGO research and STS. The chapter will conclude by unveiling a consolidated list of 6 factors that literature indicates enables successfully managing the boundaries between

scales and across the science-policy divide. These factors will be iteratively returned to, as MMAS will ultimately be evaluated with these factors in mind.

2. The Methods Chapter will discuss the methodological approach used in this research for studying MMAS, called multi-sited pragmatic action research.

3. The Results Chapter will present the main findings of the research. As the results are presented by node, it will highlight emergent themes and connect them back to the six factors discussed in Chapter Two.

4. The Discussion chapter will discuss the results more extensively and connect it to wider conservation practice and the literature. What themes are there across nodes? What does example of MMAS tell us about effective conservation practice and NGO and STS theory?

2 Chapter Two – Theoretical Framework

To thoroughly examine MMAS and to answer the central question of this dissertation, it is first necessary to answer several more basic theoretical questions. These questions are: (1) what are MMAs and what is the most effective way for them to be created and managed? (2) How do ENGOs act as multi-scalar conservation actors? What do they do on each scale and how do they attempt to cross these scales? (3) How can an organization produce or aggregate science and translate that into effective policy action? MMA literature addresses the first question, NGO literature addresses the second, while STS addresses the third.

2.1 Defining, Creating and Managing Marine Managed Areas

One specific type of protected area that both local and big ENGOs have engaged with is MMAs. MMAs and marine protected areas (MPAs) have grown in leaps and bounds in popularity in the last twenty-plus years as a way to protect, preserve, and promote the health of marine ecosystems and fisheries' stocks (Culotta 1994; P. Jones 2001; Sobel and Dahlgren 2004), promote sustainable uses of the marine environment (K. Brown et al. 2001; Dixon 1993) and even reinvigorate communities' relationships to their marine resources (Johannes 2002). While in 1986 there were 430 MPAs listed worldwide (Silva, Gately, and Desilvestre 1986) , by 1995 there were 1306 MPAs (Kelleher, Bleakley, and Wells 1995). The definitions of MMAs and MPAs are fluid and not always agreed upon. The most popular definition of an MPA is "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Kelleher 1999, 98).

This definition has left people arguing about what an "MPA" and an "MMA" can include. Some scholars and practitioners use "MPA" synonymously with marine reserve, to refer to an area under complete protection, with no human extractive uses permitted (Sobel and Dahlgren 2004). Others believe that the term MPA can refer to an area that accommodates multiple uses, with different areas zoned for different activities, including limited fishing, tourism, boating, research, and no-take zones. Others differentiate MPA and MMA by management style. This dissertation will subsume the term MPA into MMA, and use MMA to refer to a spatially defined marine area that is managed by someone (national government, state, local community, co-managed by multiple groups, etc) for some beneficial marine purpose (protection or restoration of marine biodiversity, fishery stock insurance, eco-tourism, traditional practices, etc.) with either one-use or multiple use zoning. This corresponds with the use of MMA by the MMAS program, and thus will reduce confusion. Humans are not seen as separated from an MMA, but rather an integral part of its ecosystem, management and planning. The dissertation will use the term "marine reserve" to refer to a spatially-defined no-take marine area in which all extractive uses are prohibited (Sobel and Dahlgren 2004).[1] Marine reserves are almost always part and parcel of MMAs and subsumed within the wider MMA framework.

MMAs are looked upon as desirable by preservationists and conservationists for a number of ecological, social, and economic reasons. MMAs can bring many biophysical and fishery benefits to the marine environment. Provided that the MMA is managed and enforced adequately, MMAs can , according to the National Research Council (2001): (1) conserve biodiversity and marine habitat, (2) protect depleted, threatened, rare, or endangered species, (3) preserve or restore the viability of representative habitats and ecosystems, (4) control fish stock exploitation rates, (5) protect critical stages of fish species' life history, (6) reduce secondary fishing impacts, (7) ensure against fishery failure, and (8) conserve fishery life-history traits and genetic diversity (National Research Council 2001). Jones (1994) says that, in terms of social and economic benefits, MMAs can (1) promote research and education, (2) enhance and control tourism and recreation, (3) promote integrated coastal management, (4) maintain ascetic values, and (5) maintain traditional values (or enhance/revitalize traditional resource management practices) (P. Jones 1994).

[1] The exception is when this dissertation is discussing MMAs in Belize, where "marine reserve" can mean a multiple use zoning area.

MMAs can be developed in three ways: top-down, bottom-up, or a combination of both. Jones (2001) defines the top-down approach as being characterized by executive cross-sectoral authority, education to justify and promote compliance with restrictions, emphasis and primacy of biophysical science to guide MMA planning, and little scope for compromise (P. Jones 2001). The author defines the bottom-up approach as being characterized by stakeholder participation and cooperation, education to promote and support participation, science used as guidance when available, and larger scope for compromise (P. Jones 2001).

The most important criteria in determining the existence and scale of MMA social and biophysical benefits are the level of participation and input of local people in MMA design, implementation, and management. Without local participation, enforcement of MMA rules becomes infinitely more difficult, ultimately undermining the biological objectives of the MMA regardless of how well the MMA was designed in reference to biophysical goals. Most MMA advocates now recommend a heavy emphasis on local participation, engagement, and input in the MMA process (Mascia 2003; Morin 2001; White, Vogt, and Arin 2000). There are limited situations where a top-down approach can be appropriate. For example, in situations where the capacity of the state is high and the social capital of the community is very low (i.e. they are unable to cooperate or work together towards common goals) (Rudd et al. 2003), a top-down approach would allow a functional MMA when a bottom-up approach may not.

MMA researchers have found, through years of trial and error, that ideal progression for MMA development includes several steps. First, national, state, or local government officials approach stakeholders or stakeholders approach national, state, or local government officials with interest in creating an MMA. There should be a legal framework for the creation of the MMA, although MMAs have been successfully created and managed without the legal framework (Chuenpagdee, Fraga, and Euan-Avila 2002). All stakeholders should discuss and agree upon goals and objectives for the MMA. Goals need to be clear, well defined and realistic (Lundquist and Granek 2005). Available science should be used to guide goals and objectives and put them in their correct context (Lundquist and Granek 2005). For example, stakeholders should not expect immediate biological results (increased abundance and biomass of fish within the reserve, immediate spillover of fish outside of the reserve and into the MMA) within an unreasonably short amount of time. Such results generally at least take a few years to develop (Russ and Alcala 1999).

Second, all stakeholders together should develop a management plan. A big part of the management plan should be developing spatially defined no-take areas and multiple use zones. This should be done in a participatory process between scientists and stakeholders. Scientific data and information concerning the area in question should be used to guide MMA area/zone selection, with an eye to protecting species through all stages of their life history (Jennings, Arnstein, and Polunin 1996). Baseline measures of fish/invertebrate/habitat health should be taken, as well as baseline measures of socio-economic indicators (income, CPUE, etc.) There should be representation of all important habitat types and a sufficient area protected to ensure protection of biodiversity and fishery stocks (Stevens 2002). There should be a striving for an equal amount of costs and benefits accruing to all stakeholder groups (Capitini et al. 2004). This stage can be the trickiest one, in that ecological and socio-economic goals can often conflict. While those stakeholders that value biodiversity protection and fisheries' insurance can want areas in a marine reserve as high as 30-50% (Friedlander et al. 2003) other stakeholders (fishers in particular) can want smaller marine reserves. In some situations where enforcement will be difficult or absent, zoning might be better done with an eye to simplicity, with MMAs within sight of land and with straight, clearly delineated boundaries (McClanahan et al. 2006).

The management plan should include such issues as how stakeholders will be included in the governance of the MMA (Fauzi and Buchary 2002), how the MMA will be enforced and financed, how new biophysical and socio-economic data will be incorporated into the MMA management process (Agardy 1994) and how MMA performance will be measured through monitoring mechanisms (Pomeroy, Parks, and Watson 2004).

Finally, after the MMA is established and the management plan is written and developed, there should be consistent, regular and scientifically valid monitoring of both ecological and socio-economic indicators (Pomeroy, Parks, and Watson 2004). These data should be used to inform adaptive management (Helvey 2004) with management techniques changed as new conditions arise. Essentially, there needs to be a constant evaluation of the MMAs performance and effectiveness. Determining MMA effectiveness is a much written about topic (Jameson, Tupper, and Ridley 2002; P. Jones 2001; Pomeroy, Parks, and Watson 2004), with much effort spent to study the how and when of measuring MMA indicators. Many MMAs around the world have been established only to languish in management ineffectiveness, in effect being ineffective parks (McClanahan 1999) that are merely lines on a map.

Biophysical indicators are most often measured using biological census techniques, including snorkel or SCUBA transects and quadrats. Belt transects are a widely recognized way of monitoring plant, invertebrate, and vertebrate abundance, as well as documenting habitat health (Sobel and Dahlgren 2004). Belt transects, and its variant the quadrat, has the benefits of being quantitative and well respected, easily learned, and effective for deriving density, biomass, and abundance estimates. For habitat, transects and quadrats are an effective tool for estimating percentage of live coral cover and other health characteristics (Sobel and Dahlgren 2004).

Socio-economic indicators are most often measured using social science techniques such as questionnaires/surveys and semi-structured interviews. Surveys, competently organized and written, are recognized as a valid and useful way to collect quantitative data on a variety of topics (Fowler 1996). Semi-structured interviews are a "standard ethnographic method for gathering information in an open-ended format" (Huntington 1998, 238). People measuring socio-economic indicators should be social scientists trained in the relevant methods, so as to not bias the results (Mascia 2003). Governance indicators are measured through surveys and semi-structured interviews, but are usually complemented through document analysis and direct observation (Pomeroy, Parks, and Watson 2004).

Finally, enforcement of the MMA's boundaries and regulations is necessary to ensure that all the work in management, governance, and monitoring is not wasted. There is an enforcement chain of awareness of regulations, detection, capture, and the judicial system. The level of resources needed for enforcement will vary based on a variety of factors, including the level of participation and buy-in of local users into the MMA's objectives (Walmsley and White 2003). If a community feels more engaged with an MMA, they will be more likely to self-enforce and mobilize others to follow the rules (White and Vogt 2000). Regardless of the degree of enforcement, sanctions need to be applied regularly and consistently for violators; irregular enforcement and bias may lead to distrust (Sandersen and Koester 2000).

2.2 *ENGOs as Multi-Scalar Conservation Actors*

ENGOs wield influence on multiple scales. For the purpose of this dissertation, scale is defined simply as "any specific geographically or temporally bounded level at which a particular phenomenon is recognizable" (Cash and Moser 2000, 110). The phenomenon of ENGO action is most recognizable at levels that correspond to socio-political levels – local, national, and international (including regional) scales. Biological ecosystems and the socio-economic processes that depend upon them are not necessarily coterminous with or bounded by these levels, but ENGOs must operate politically within existing authority structures, thus they are the most logical frameworks for ENGO scalar analysis. Scale must be taken into account when analyzing ENGOs as scale influences the mechanisms through which ENGOs can affect change (Chartier 2006).

The following text explains what ENGOs do at the international, national, and local scales, and how they cross these scales.

2.2.1 ENGOs at the International Scale

As the complexity of global environmental problems has increased, ENGOs have become intimately involved in the development of international environmental agreements. While involvement in these agreements used to be state-only affairs, they have increasingly opened access to a wider participation of civil society. A partial list of agreements that ENGOs have influenced the development of includes the Convention on International Trade of Endangered Species (CITES), the Convention of Wetlands of

International Importance (RAMSAR), the Antarctic Environmental Protocol, the Vienna Convention and Montreal Protocol of the Ozone layer, the Atmospheric Nuclear Test Ban, the Convention on Climate Change, Agenda 21, the Convention to Combat Desertification, the NAFTA supplemental environmental agreement, the Biosafety protocol, and perhaps most importantly, the UN Convention on Biological Diversity (Arts 2004; S. Sanderson 2002).

The above list is extensive, but the question remains - how do ENGOs fit and exert influence within an international governance framework developed for and controlled by states? There is no hard and fast rule for ENGO inclusion in international negotiations; the degree, level, and terms of participation are governed by the agreements' rules, which in turn have been created by state agreement. For UN negotiations, all ENGOs that wish to participate must become accredited (Raustiala 1997). There are now over 2000 NGOs (including ENGOs) accredited to participate in the UN system as of 2010 (http://esango.un.org/civilsociety). ENGOs are fundamentally unlike states; they cannot create authoritative sanctions if their terms are not met. Rather, ENGOs depend upon persuasion to influence behavior (Betsill and Corell 2001).

ENGOs persuade in multiple ways. Providing environmental research during agreement negotiations is one of the biggest and most significant ways that ENGOs do so. Many big ENGOs, such as IUCN, are "dedicated to the production of accurate, up-to-date research and data on the most pressing environmental issues" (Gemmill and

Bamidele-Izu 2002, 11), and providing the results of this research can give conference delegates a look at the consequences of making particular policy decisions or give insights into how to solve complex environmental issues. This research is not necessarily presented during plenary sessions; rather, it may be given on the side to conference delegates during unofficial functions (Gemmill and Bamidele-Izu 2002).

Environmental research provided by ENGOs often joins the pool of research provided by state research agencies and academic institutions. Scientific information can be a major contribution to global environmental governance and is used to fill in gaps in state knowledge. It can be particularly useful for developing countries - while developed countries may have well-funded scientific funding agencies and a large cadre of environmental scientists on governmental payroll, developing countries may not. These states often have to choose between economic development and provision of basic services and may have little funding available for environmental research; thus, ENGO research helps these countries realize a fuller role in environmental negotiations and allows them to reallocate minimal resources (Raustiala 1997).

ENGOs providing credible environmental research can help to reorient environmental orthodoxies espoused during international environmental negotiations. Orthodoxies, or commonly held beliefs, often arise surrounding particular environmental issues and are difficult to dislodge (even if false), but the presentation of new and conflicting environmental research can serve to cause states and other actors to begin to question these orthodoxies. According to Jasanoff, "NGOs may usefully open up the debate either by questioning prevailing expert opinion or by expanding the available information base with relevant bodies of local knowledge" (Jasanoff 1997, 581).

A second way for ENGOs to persuade during the development of environmental agreements is to scrutinize the compliance of individual states to their treaty commitments. ENGOs, by researching, observing, and reporting whether states are in compliance with environmental treaties, serve as pressure/shaming groups that hold states to account (Raustiala 1997). Greater transparency is introduced into the process, and the concept that states have binding environmental *obligations* is strengthened (McCarthy 2005). It is more difficult for states to claim environmental compliance based on their own numbers when a respected ENGO introduces data to the contrary.

ENGOs also engage in direct lobbying during the environmental agreement development (Oberthür et al. 2002). Lobbying in this context can be defined as attempting to pressure or change the actions of conference delegates through personal interactions. Just as representatives of government and the private sector, ENGO representatives interact with delegates during informal meetings, cocktail hours, and in corridors, and use the power of relationships that they had built previously to sway them to the ENGO's point of view (Betsill and Corell 2008). One such example is when Greenpeace used World Trade Organization and G8 summits as an opportunity to lobby for international forest conservation (Chartier 2006). Forms of lobbying can also include brokering compromises between environmental and commercial interests (Simmons 1998) or creating position statements and handing them out to conference delegates timed to coincide with maximum impact.

When ENGOs feel as if direct, in-person involvement in development of environmental agreements is not sufficient, they can work to strengthen their positions by mobilizing public opinion. This is part and parcel of their mission to create a broader environmental consciousness (Wapner 1996) but also is intended to increase pressure on conference delegates through management of public support (Simmons 1998). ENGOs can mobilize public opinion through outreach – press releases, radio and television sports – as well as through direct appeals to members.

Besides information dissemination, monitoring, advocacy, and mobilizing public opinion in the context of international environmental agreements, ENGOs are working to build an environmental consciousness among the general public on the international scale. The aim of this environmental consciousness is not just to mobilize public pressure on governments and business to pass environmental laws and engage in sustainable business practices (although this is part of the reason). More broadly, it "strives to sting people with an ecological sensibility regardless of occupation, geographical location, and access to government officials" (Wapner 1996, 54) and encourage people to consider environmental concerns in how they act in their personal and professional lives. Wapner (1996) states that ENGOs seek to overturn and replace traditional understandings of the causes of environmental degradation, thus contributing towards a cultural shift to environmentally friendly way of living. Using the example of Greenpeace, Wapner (1996) describes how this ENGO strives to build an environmental consciousness by bringing public attention to issues such as whaling, rainforest degradation, and species extinction, and revealing the space between public statements and environmental actions of business, government, and private groups and pushing these actors to live up their obligations (Wapner 1996).

Some scholars have argued that this consciousness that ENGOs try to spread is westernized, dominant, and overrides individual cultural interpretations of the human-environment relationship (Bryant 2002; Escobar 1998; Forsyth 2003). In particular, they argue, ENGOs' focus on loss to biodiversity is seen as problematic. Escobar (1998) argues that there is a "biodiversity production network" where biodiversity is not an actual thing that science reveals, but rather a term that articulate a new relationship between nature and society – a relationship that emphasizes human-nature dichotomy and promotion of western values (Escobar 1998, 54). Escobar continues by saying 'biodiversity' has been disseminated through a globalized network of academic institutions, ENGOs, international organizations (such as the World Bank), and national governments to keep the focus on proximate threats to habitats and species and away from addressing systematic threats to the global environment – namely, the capitalist regime and economic growth and development (Escobar 1998). Other authors argue that ‘biodiversity’ is simply a technocratic label for international conservation action and “this technocratic term is difficult to integrate with culture and does not represent the feelings, meanings, and practices of everyday life” (Jepson and Canney 2003, 273).

Different ENGOs craft and brand different approaches to protecting biodiversity at a regional scale. These approaches serve to differentiate big ENGOs from each other in the eyes of donors as well as provide the ENGO a way define the scale and extent of their efforts. ENGO regional approaches can divide the world based on species, ecosystems and habitats, ecological processes, and other criteria (Redford et al. 2003). Some examples of these branding efforts include the Global 200 by the World Wide Fund for Nature, seascapes by Conservation International and the Natura 2000 by the European Commission (www.natura.org) (Redford et al. 2003). Working on the regional scale requires dealing with multiple legal, jurisdictional, and cultural frameworks. With the WWF Sulu-Sulawesi Ecoregion, for example, WWF works with the government and civil society in Indonesia, Malaysia, and the Philippines (www.wwf.org).

Part of the intention behind these regional approaches is to enable the creation of protection area networks. ENGOs work to combine protected areas within national jurisdictions together into networks that allow movement of organisms across biophysical, economic, political, and geographic boundaries. The Convention of Biological Diversity (CBD) includes a commitment to the creation of regional and global networks of protected areas on land by 2010 and in marine areas by 2012. Progress towards this goal, especially in the marine realm, has been halting, uneven, and unsatisfactory (Coad et al. 2008). However ENGOs are still trying to create these networks, believing that protected areas *only* at the local scale are not sufficient to protect the world's biodiversity given the level of threat.

2.2.2 ENGOs at the National Scale

Many of the techniques used in expanding influence during international agreement negotiation and implementation are also used during national efforts: providing credible environmental research to legislators that illuminates policy outcomes or overturns environmental orthodoxies (Gemmill and Bamidele-Izu 2002; Jasanoff 1997), bringing state non-compliance to agreements to greater attention, mobilizing public opinion, building consciousness, lobbying, and brokering compromises between businesses, government, and non-profit sectors (Simmons 1998). Talking to ministers, legislators, government employees and the like shapes government opinion and causes more favorable consideration of legislation or environmental action in line with ENGO interests. Personal relationships between staff of ENGOs and government are crucial. Lobbying requires an in-depth understanding of the political process and may necessitate a devoted, charismatic individual to make and cultivate contacts (Jeffrey 2001). Timing – influencing the right people at the right time – is important, as being too late may mean that government employees have already made a decision (Jeffrey 2001), while being too early may mean that that particular environmental issue is not on the government's radar.

In cases where the power of the state is weak or non-existent, ENGOs increasingly *implement* state policy, taking on the role of governments in areas such as regulation enforcement and protected area management. In Matthews (1997), speaking of the shift towards NGOs and away from the state in the last decades, the author states that "NGO's role and influence have exploded in the last half-decade… in many countries they are delivering the services… that faltering governments can no longer manage" (Mathews 1997, 53). While Matthews refers to education, health care, and development NGOs, the idea of NGOs delivering services when and where the state cannot is increasingly the norm with ENGOs as well. In Burris (2007), a Belizean ENGO Green Reef Environmental Institute manages the Bacalar Chico National Park in concert with the Ministry of Fisheries, the Department of the Environment, and others (Burris 2007). In Derman (1995), the organization CAMPFIRE, with the support of the Zimbabwe government, delivers development support to rural communities while also helping to protect local wildlife (Derman 1995). In Avant (2004), WWF assisted with the enforcement plan of northern white rhinos in Garamba National Park, the Democratic Republic of Congo (Avant 2004).

Acting as policy implementers can bring advantages– ENGOs can ensure that environmental action is being taken because they are the ones taking it. ENGOs can operate outside of the bureaucratic, legislative, and financial constraints that governments possess, lending increased flexibility and adeptness to projects. Employees at ENGOs can be more enthusiastic and educated and bring linkages to local community concerns. ENGOs can be more trusted than the state by the general public, seen as the new "super brand, surpassing the stature of major corporations, government bodies, and even the media among consumers" (Wootliff et al. 2001, 158).

Policy implementation by ENGOs also brings risks. Minimally, it can add another management layer to environmental governance, increasing management confusion. Perhaps more harmfully, becoming close to the state risks intentionally or unintentionally reinforcing state power vis-à-vis local stakeholders and causing local stakeholders to submit to greater state control. The examples given previously reinforce that ENGO implementation of policy is neither uniformly positive nor negative, but rather that outcomes are project dependent and implementation is a logistically and ethnically complex process. Burris details how the involvement of Green Reef Environmental Institute made a complex management arrangement coordinating various government departments even more complex, Derman discusses how CAMPFIRE must walk a fine line between accountability to the government and to the local communities they serve, and Avant reveals that WWF involvement in rhino protection led to a choice between militarism and conservation, and ultimately necessitated WWF pulling involvement from the area (Avant 2004; Burris 2007; Derman

1995). Another example is in Peluso (1993), where involvement in protection of elephants from poachers led to WWF funding questionable activities (including heavily armed anti-poaching helicopters that gunned down poachers) by the Kenyan government (Peluso 1993).

2.2.3 ENGOs at the Local Scale

ENGOs work directly with local communities to implement community-based conservation projects. A cornerstone of these projects is typically the establishment and sustainable management of protected areas. There is a long history of ENGOs having supported the preservationist approach to protected areas (Campbell, Gray, and Meletis 2007), where there is heavy emphasis on enforcement and policing. However, due to the widespread failures of this approach and the perception that ENGOs and local communities are both interested in biodiversity protection (although for different reasons), there is now a greater emphasis on these groups working together. Naughton-Treves, Holland and Brandon (2005) state:

> The coincidence of interests between indigenous peoples and conservationists, especially given large-scale threats, is high, even though critics of such alliances abound…. Strengthened alliances between indigenous people and conservation organizations are likely in the future, as both sides better understand and respect mutual positions, and as a common set of external threats increases in scope and scale (Naughton-Treves, Holland, and Brandon 2005, 244).

Part of this work has manifested itself in the crafting of projects where conservation and development concerns are incorporated simultaneously. Since the 1990s, these integrated conservation and development projects (IDCPs) have become a popular way for ENGOs to attempt to exert influence on a local scale in a sustainable fashion. ICDPs have met mixed reviews, and critics of ICDPs abound. Critiques include that ICDPs have missed many of the lessons of participatory development (Campbell and Vainio-Mattila 2003), that they "proceed from untested biological and socioeconomic assumptions… which are likely to be false in many, if not most situations" (Barrett et al. 2001, 498), and even that biodiversity conservation and development are simply not compatible and these approaches are doomed to failure (Robinson 1993). Failures of ICDPs have caused a rise in calls for a return to preservationist approaches to protected areas (Terborgh 2004; Wilshusen et al. 2002). The debate between those in favor of preservationist versus ICDP approaches is not settled, and continues in the ENGO community to this day.

Particularly when big ENGOs are operating in developing countries, ENGOs try to build technical, financial, and scientific expertise of partner institutions and of local communities. Local capacity building is considered to be an essential element of long-term project sustainability. Capacity building can include academic-based training (Rodriguez et al. 2005), enhancement of organizational financial capacity (Eade 2007), field skills-based training (Roberts, J. P. Jones, and Frohling 2005), or the enhancement of professional networks that connect locals to opportunities for additional resources (Girgis 2007).

While capacity building offers many benefits, ENGOs have found that it is something to be done with care. Without due attention, junior partners in a capacity building relationship may find that a one-way transfer of financial resources is actually disempowering as it makes them dependent (Eade 2007), with the project standards of the stronger partner imposed on the weaker one (Roberts, J. P. Jones, and Frohling 2005). According to Girgis (2007), capacity building should be based in 'friendship work', made up of negotiation, helping, and dialogue (Girgis 2007). Negotiation is working on improvement through ongoing discussion; helping is about recognizing and adding to local skills and expertise; and dialogue is about giving ideas and translating them to the local arena (Girgis 2007).

2.2.4 ENGOs Crossing Scales

ENGOs now play a huge role in environmental governance at the international and regional, national, and local scales. They influence international environmental agreements and create a global environmental consciousness. They help to develop regional conservation approaches and protected area networks. They engage in national political advocacy and lobbying, and assist in policy implementation. They become involved in local environmental governance and work with communities to integrate conservation and development concerns, with varying degrees of success. However, perhaps more important than work on one scale is how ENGOs manage the boundaries *across* scales. To act on only one scale risks ignoring interconnected factors driving environmental degradation, and through ENGO linking "actors at all levels begin to realize and act on the interconnections and begin to understand the local in terms of the global, and vice-versa" (Princen et al. 1994, 227).

Arts (2004) crystallizes many of the current normative claims about ENGOs by arguing that ENGOs are linking scales, re-articulating scales, and organizing beyond scales (Arts 2004). First, Arts argues that ENGOs are bringing local environmental issues to attention of international actors. During the negotiation of international environmental agreements, ENGOs may submit local degradation examples or even invite stakeholders from sites far afield to join the debate. Second, Arts argues that ENGOs are changing the definition of scale, and thus working to redefine the definition of "local" and "global" in environmental governance. Certain environmental issues such as desertification were previously considered a national issue. Desertification is now considered an international issue because of the work of ENGOs illustrating how desertification can be caused by regional water management issues and international issues such as global warming. Finally, Arts argues that ENGOs organize beyond scales through building 'glocalised' networks of multiple sectors – government, NGO, business, local actors - that work together to solve environmental issues and engage in international advocacy campaigns (Arts 2004).

McCarthy (2005) reports that ENGOs redefine the relationship between scales so that local concerns are taken into account in the national and international arenas. Because of ENGOs, local voices are heard and listened to, and incorporated into environmental debates. ENGOs also participate in the construction of a new scale – that of "international economic and environmental governance" (McCarthy 2005, 747). While doing so, however, ENGOs defend established scales through recognizing the sovereignty of the nation-state in making environmental decisions. Rather than being forced to work towards their goals on one scale, cross-scalar management can allow ENGOs to "pursue these strategic goals in multiple arenas simultaneously, using tactics appropriate to each arena" (McCarthy 2005, 732).

While much ENGO literature on scale management and linkages has been complimentary, some has questioned whether ENGOs are truly representing the interests of actors at all scales. While acknowledging the impact of collaborations set up between big and local ENGOs and government, Romero and Andrade (2004) wonder if junior partners (i.e. those in developing countries with less access to funds) are having their voices heard, and if approaches advocated by big ENGOs – in this case forest conservation through land acquisition rather than sustainable use – are dominating the conservation agenda (Romero and Andrade 2004). The authors question whether there needs to be a rethinking of conservation approaches taken by big ENGOs so that there is a greater focus on local people, institution and governments.

In other literature, Bryant (2002) states that cross-scalar action by ENGOs, rather than empowering local interests, can actually strengthen state power in controlling local groups through the "systemic incorporation and regulation of hitherto marginal social and natural relationships into the mainstream…" (Bryant 2002, 285). ENGOs, in this case in the Philippines, forced indigenous groups into state-centric ways of thinking through 'empowerment' and resource mapping exercises (Bryant 2002). Fisher (1997) states that despite the fact that NGOs are held up as a way for local interests to be heard, NGOs (due in some cases to closeness to the state) can fail to challenge the status quo and preserve traditional power arrangements that are beneficial to elites (Fisher 1997). Peluso uses a case study to Africa to illustrate that ENGOs can undermine local actors by giving the state financial resources intended for conservation but that ultimately end up allowing the state to enforce its political and economic agenda (Peluso 1993). Juanita Sundberg, writing in Zimmerer and Bassett (2003), analyzed how an ENGO network working in a protected area in Guatemala disseminated powerful conservation discourses that were used by local actors to empower themselves vis-à-vis the NGO and other local groups, and also served to disempower certain groups of locals who didn't fit into the NGOs view of conservation (Zimmerer and Bassett 2003).

The most famous paper questioning the positive nature of ENGO cross-scalar work is one titled *A Challenge to Conservationists*, authored by Mac Chapin and published in WorldWatch in 2004. In this article, Chapin launches a broadside against the actions of big ENGOs and how they build and conduct action with groups in the 'Global South'. Drawing upon personal experience and insider ENGO documents, he states that the big ENGOs relationship with indigenous groups has degenerated, that these same ENGOs use talk of partnerships for image building but have one-sided relationships, that the shift to large-scale conservation approaches has disempowered local people, and that the new alliances of big ENGOs with business have accelerated the destruction of ecosystems (Chapin 2004). This article was met with a strong response from representatives of big ENGOs and foundations, with groups such as CI, WWF, the Nature Conservancy, and the Ford Foundation responding. Responses to Chapin ranged from defensive to thoughtful, with many groups making a strong recommitment to working with indigenous people but also using sound science as a backbone to conservation decisions.

Table 2-1 summarizes ENGO actions on different scales and across scales. Note that this is not an all inclusive list but rather summarizes the predominant ENGO actions at each scale. There is inevitably some overlap; for example, ENGOs may also work with governments (national scale) to build capacity.

Table 2-1: ENGO Action at Different Scales

<table>
<tr><th>International</th><th>National</th><th>Local</th></tr>
<tr><td>Involvement in international environmental agreements:
- Providing environmental research
- Scrutinizing state compliance
- Direct Lobbying
- Mobilizing Public Opinion

Building an environmental consciousness

Linking to global entities such as corporations

Regional approaches, creation of protected area networks</td><td>Providing environmental research

Scrutinizing state compliance

Mobilizing public opinion

Direct Lobbying

Building an environmental consciousness

Policy implementation</td><td>Integrated conservation and development projects

Establishing and managing protected areas

Building capacity

Providing environmental research</td></tr>
<tr><th colspan="3">Across</th></tr>
<tr><td colspan="3">Bringing local issues to the attention of international actors
Redefining definitions of scale
Building and using cross-scalar networks, partnerships, and coalitions
Sharing knowledge and experiences</td></tr>
</table>

The NGO literature identifies three factors that enable ENGO cross scalar work: (1) networks, partnerships, and coalitions, (2) participation, and (3) accountability and an organizational ability to learn. The building and use of networks, partnerships and coalitions (NPCs)[2] are perhaps the most critical element. NPCs allow organizations to

[2] The terms "networks", "partnerships" and "coalitions" are often used interchangeably in the NGO literature. The clearest difference between networks and coalitions comes from

work together they connect organizations virtually and in-person with others with their same values and goals (Nelson 1997), and those actors with less information and power can become empowered. ENGO NPCs have decades of history; one early event where ENGOs started to realize the power of NPCs was a parallel NGO forum to the 1972 UN Conference on the Human Environment in Stockholm where ENGOs established common goals and built trust (Keck and Sikkink 1998). While ENGOs have become increasingly more important players in environmental governance, they still are not equivalent to large multi-national corporations that have funds for field offices everywhere that they want to do business. Thus, cross-scalar work through NPCs allows ENGOs to expand their influence in "quantitative, substantive, and spatial terms" (Roberts, J. P. Jones, and Fröhling 2005, 1846) in a way that an individual ENGO would have difficulty doing. Josiah (2001) describes some of the benefits of networks (extendable to NPCs generally) as follows:

> Networks allow the exchange of ideas, resources, and experiences; provide services and support to members; coordinate member activities to identify and attain common goals; median state-NGO relations and advocate for policy change; and channel funds to national and grass-roots NGOs. They can improve

---

Yanacopulos (2005). In this paper, networks refer to numerous organizations motivated by shared values working together towards a common goal. Coalitions have more permanent links and wider strategic goals, often lasting beyond single issue campaigns. Coalitions require higher levels of commitment from their members (Yanacopulos 2005). I define partnerships as similar to coalitions but with a smaller number of members, generally two. The encompassing term NPCs will be used when differentiation isn't needed.

> efficiencies, concentrate and focus limited resources, use facilities and staff more effectively, avoid duplication of effort, and engage personnel across the organizational spectrum to solve difficult, large-scale problems at relatively low cost (Josiah 2001, 615).

NPCs have already shown themselves to be positive mechanisms in expanding impact and forcing changes in the global environmental status-quo. For example, a coalition of ENGOs brought the issue of Amazonian deforestation, previously considered a national issue, to the fore through international advocacy campaigns, and compelled changes in forestry practices through supporting the Forest Stewardship Council (Arts 2004). The Climate Action Network, now a network of around 500 NGOs, was able to influence the negotiation of the Kyoto Protocol through specialized information, advocacy, roundtables and workshops (Betsill and Corell 2008). The Antarctic Southern Ocean Coalition, an advocacy coalition of ENGOs including Greenpeace, Oceana, and WWF, has supported the implementation of the Antarctic Protocol and works on behalf of Southern Ocean fisheries, MMAs, and shipping impact mitigation (www.asoc.org).

Knowledge, funding, and personnel flow through these NPCs (Roberts, J. P. Jones, and Fröhling 2005). The majority of the flow goes from big ENGOs to local ENGOs and can assist in capacity building and organizational strengthening. Big NGOs have what local ENGOs often lack – money. For example, in 2009 the WWF network had an income of €444 million (wwf.panda.org/who_we_are/organization/finance/). It is important that these resources, however, are not used as a form of control over local groups, although this sometimes happens (Chapin 2004). NPCs can provide local NGOs with access to scientific data that they would otherwise lack and linkages to policymakers that they alone would have difficulty accessing. NPCs that include local stakeholders can more easily incorporate the concerns of grassroots or indigenous groups in their program planning.

NPCs are not only the coming together of ENGOs to work towards common goals. ENGO NPCs can create and build linkages to government, business, and local stakeholders. With business, the goal is to both raise funds but also work to make business operating practices more sustainable and environmentally friendly. This particular type of NPC has been described as 'strategic bridging', where ENGOs "provide corporations with ecological, scientific, and legal expertise [and]… can leverage and broker corporate linkages with other diverse stakeholders" (Stafford, Polonsky, and Hartman 2000, 123). ENGO-business relationships are fraught with hazards – corporations can be accused of greenwashing and the ENGO risks losing public confidence- but they can also contribute to launching of credible corporate environmental programs and practices (Stafford, Polonsky, and Hartman 2000).

One important form of NPCs is umbrella organizations. Umbrella organizations, otherwise known as bridging or intermediary institutions, bring organizations from multiple sectors together and encourage effective environmental governance and resource sharing (Josiah 2001). Umbrella organizations serve as a clearinghouse for funds and knowledge and provide a framework for ENGO sharing. Umbrella organizations in developing countries or where conservation funds are scarce can "capitalize on local NGO's strong linkages with individual communities, while tapping the resources and expertise of larger development organizations and governments" (Josiah 2001, 615).

Besides NPCs, effective ENGO cross-scalar work is linked to program participation of actors at all scales and their subsequent buy-in into program objectives. A common complaint of ENGO cross-scalar work is that their programs are run in ways that are too top down and unresponsive to local development and environmental concerns (K. Brown 2003; Rodriguez et al. 2007), that dialogue about participation of actors on all scales is a smokescreen for a concentration of power in decision-making at the top (Chapin 2004). Protected areas established and managed without the buy-in and input from local stakeholders have proven to be more prone to conflict and failure (Lundquist and Granek 2005; Mascia 2003; Sandersen and Koester 2000); the same is true of any sort of cross-scalar program that relies (at least in part) on local buy-in.

To ensure effective scalar boundary management, true participation of actors at all scales is necessary. True participation is not simply education to get local stakeholders on board with a pre-ordained agenda (Campbell and Vainio-Mattila 2003). Rather, participation involves dialogue and stakeholder engagement and a commitment to power sharing. Arnstein (1969) describes an eight step ladder of increasing citizen participation levels, ranging from manipulation and informing to partnerships, delegated power, and citizen control (Arnstein 1969). In an ENGO cross-scalar program, full citizen control is unlikely due to a need to control overall program objectives; however delegated power and partnerships can be ideal levels of participation. Participation takes time that must be planned for in the schedule of any project; time spent discussing programmatic objectives, methods, and processes is time well spent as it builds trust and confidence. Brown (2003), talking specifically about integrated conservation and development projects but relevant to all conservation cross-scalar work, sums up the dominant thinking when she says:

> First, inclusion of all relevant actors necessitates a very thorough and rigorous analysis of stakeholders: it requires that many different techniques are used to encourage people to participate and articulate their views. Secondly, building trust in the process and between different stakeholders takes time but is vital for the success of both process and outcome. Participants have to be confident that their views are heard and noticed, and decision making and priority-setting have to be transparent and accountable (K. Brown 2003).

International ENGO programs that simply paste unaltered models onto local contexts with no local participation into design or management are doomed to failure. As Rodriquez et al. states, "Generalized global approaches fail for biodiversity conservation at local scales, because solutions must integrate extremely diverse natural, socio-economic, and cultural systems and usually require a sense of community ownership" (Rodriguez et al. 2007, 755).

As Arnstein's ladder indicates, one level of participation can be program delegation. Actors at the local scale generally have a better knowledge of the biophysical, socio-economic, cultural, and political context of countries and regions where an ENGO NPC wants to work. Delegation, by giving these actors power to implement their vision, increases the effectiveness of ENGO interventions through allowing the application of this contextual knowledge. Delegation can run the gamut all the way from local institutions taking the lead, to local and global institutions sharing programmatic implementation responsibilities (Rodriguez et al. 2007).

Incorporation of traditional ecological knowledge (TEK) in ENGO cross-scalar programs can be another way for stakeholders to participate and can provide new perspectives on ecological or management challenges. Firkit Bekes, one of the world's most foremost experts in traditional ecological knowledge, defines TEK as "a cumulative body of knowledge, practice, and belief evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and their environment" (Berkes, Colding, and Folke 2000, 1252). TEK is more than simple ecological information. It is a system where knowledge on folk taxonomy and systematics, population-level knowledge, and ecological relationships is made use of by actors to interact with their natural world and subsumed inside of a holistic ecological worldview (Drew 2005). Ecological practices/institutions can include common pool resource management systems (Cinner and Aswani 2007) customary sea tenure, and/or other ways of interacting with and relating to unpredictable natural environments (Usher 2000). Ecological worldviews generally include ecological ethics and values (Berkes, Colding, and Folke 2000) and define how individuals view the human-environment relationship and the nature-society dichotomy.

According to Brown, "it is often at the interface between different ways of knowing and different forms of knowledge that innovations in resource management and practice can be made" (K. Brown 2003, 90). For example, when dealing with ENGO cross-scalar programs that focus on the creation of MMAs, TEK can provide MMA planners with valuable information such as locations of fish spawning sites, fish/invertebrate behavior and breeding patterns, knowledge of diets, habitat preferences, and population sizes, as well as predatory relationships between species (Drew 2005). Traditional ecological practices can also be of use to MMA development (Johannes 2002). Customary sea tenure can provide an institutional framework for establishment of marine management where governmental capacity is low (Aswani 1999; Aswani and Hamilton 2004; Aswani 2005). Beyond the practical benefits, use of TEK has the potential to show local stakeholders that their ways of knowing have value, thus increasing trust and buy-in into program objectives.

Organizational factors are widely recognized as an important factor influencing how an organization operates and interacts with external actors across scales (Edwards

1999; Lewis 2003; Lewis et al. 2003; Schwartzman 1993). Two factors are particularly relevant for ENGO programs: accountability and an ability to learn. Accountability is defined as “the process of holding actors accountable for their actions” (Fox and L. D Brown 1998, 12). Comprehensive ENGO accountability extends beyond accountability upwards to donors and foundations; it should include accountability downwards to program beneficiaries, generally those at the local scale, but differing depending upon the objectives of the program (Ebrahim 2003; Edwards and Hulme 1995). Upwards accountability has historically been the most focused upon; donors often have strict reporting requirements in order to release or continue funding (Edwards and Hulme 1995). Running an ENGO cross-scalar program without some degree of upwards accountability is rare; upwards accountability is needed so that donor funds are not wasted or unaccounted for. However, downwards accountability, connecting with the needs and concerns of local stakeholders, is equally important to give programs legitimacy in the eyes of actors at all scales. Mechanisms to enhance downwards accountability include social audits, self-regulation, and local participation in program evaluations (Ebrahim 2003).

When an organization has the ability to learn, they can adapt as the circumstances external to their projects change, bringing organizational strength and improving project performance (Doyle and McEachern 2007; Edwards 1999). This can allow an ENGO to “fulfill their full potential as facilitators of social learning… [with]

provisions for critical self reflection and external evaluation" (W. C. Clark et al. 2002). Accountability is strongly linked to an ability to learn. Without accountability mechanisms, an organization does not have the ability to know when its project is failing, and thus does not have the opportunity to change.

2.3 Translating Science into Policy

Translating scientific results into policy action is not an easy or simple task. It is not just a matter of scientists doing science and then delivering the results onto the desk of a policy maker, at which point they immediately read the report and use it to incorporate policy changes. To start with, scientists and policymakers can have very different views of what type of science is important, and how this science should be applied. Still, some scientists and the policymakers *do want* to engage with the other, as some environmental scientists – a field based in studying the causes and solutions to environmental stress – want to see their work be applied in the world of policy (Christie et al. 2005; Sorensen 1997), while many managers and policymakers want rigorous scientific knowledge to inform as well as support their decisions (Tribbia and Moser 2008).

How science is translated into policy action and sustainable development solutions across multiple scales is a major area of interest for STS scholars (Cash and W. C. Clark 2001; Guston 1999; Haas 2004; Jasanoff 1996). Without moving policy in both local and global contexts, science stays simply words on paper and articles in dusty journals with no real world relevance. Any ENGO that is engaging in cross-scalar work that has scientific research as part of its mandate must consider how to do this translation in order to be effective. The science and technology studies literature (STS), while not talking specifically about the cross-scalar work of ENGOs, does have a lot to say about how organizations can do this translation.

2.3.1 Boundaries between Science and Policy

STS scholars have postulated that there exists a 'boundary' between science and other activities. Scientists draw intellectual boundaries around their areas of expertise and resist intrusion by outsiders in order to protect their claims of authority and legitimacy (Gieryn 1983; Guston 1999; Jasanoff 1987). According to Gieryn (1983), science bases its claims of authority and legitimacy on its ability to discover knowledge about the world through repeated observation, experimentation, reason, and falsification (Gieryn 1983). Science, then, must constantly strive to create a boundary between science and non-science in order to prevent the ideal of science from being debased. Over time, there has been a particular focus on demarcating science from religion and mechanics, religion being based in faith and the supernatural (not reason) and mechanics not going beyond "observed facts to discover causal principles that govern unseen processes" (Gieryn 1983, 786).

There is also a boundary between science and policy. Jasanoff (1987) argues that science sees its power as coming from being objective and unbiased; this differentiates it from policy and politics, a realm in which various interests jockey for position and process and different human values may matter more than objectivity. Jasanoff states, "the authority of science is seriously jeopardized when scientists are called to participate in policy-making… the policy process simultaneously casts doubt on the disinterestedness and the certainty of science" (Jasanoff 1987, 197) . Policymakers meanwhile, as they must balance multiple interests, don't wish to appear as if science is the primary driver of their decisions. Politics must happen through a process where these interests are all considered, weighed, and judged. Science should be objective, reliable and valid, but is never normative. Policy-making is *always normative* in that it depends on the application of human values to alternative courses of action. Thus, both sides benefit from there being a science-policy boundary (Jasanoff 1987). However, despite the fact that both sides benefit from the boundary, both sides also are inhibited by it. When trying to do science to policy translation, this boundary can be an obstacle to effective communication and joint benefits.

The boundary between science and politics is built, constructed, and maintained by the scientists and policymakers themselves. It is *socially constructed* but also socially contested, with efforts to define the exact location of the boundary "politically charged" (Jasanoff 1987, 224). Since this boundary is constantly moving and so politically volatile, it takes special procedures to coordinate, communicate, and discuss across this boundary in order to begin the science to policy translation process. Star and Griesemer state that science needs to cooperate with other 'social worlds' in order to keep its relevance as a source of knowledge (Star and Griesemer 1989). One mechanism to do this is by the use of *boundary objects*. Boundary objects are analytical constructs that can be used by stakeholders in different social worlds but maintain a coherent identity across worlds, thus allowing cooperation and discussion (Star and Griesemer 1989). Some examples of boundary objects may include scientific publications, scenarios, reports, and models. In an example from the Museum of Vertebrate Zoology, California is even referred to as a boundary object as maps of the state were used by both conservationists and professional biologists to find joint meaning (Star and Griesemer 1989). Boundary objects are similar to Latour's immutable mobiles, "objects which can be transported over a long distance and exchange unchanging information" (Latour 1987; Star and Griesemer 1989, 411).

2.3.2 Boundary Organizations

First introduced by Guston (1999), *boundary organizations* have become an important concept in the STS literature. Boundary organizations are an expanded form of boundary object. They are a way for stakeholders to communicate across the science policy boundary, while the organization simultaneously remains stable to the politically charged forces buttressing the boundary. Boundary organizations, Guston argues, differ from boundary objects in that the use of boundary objects depends on mutual consent, while boundary organizations exist independently of both sides of the boundary. Boundary organizations operate by "existing on the frontier of two relatively distinct social worlds with definite lines of responsibility and accountability to each" (Guston 1999, 93). In Guston's paper, he uses the Office of Technology Transfer in the US as an example of an organization that connects scientists to politicians (Guston 1999).

Described in Jasanoff's *States of Knowledge: the Co-Production of Knowledge and Social Order* (Jasanoff 2004), co-production is a way of understanding the interconnections between knowledge and society. Co-production acknowledges that the production of knowledge is not separated from how those doing the producing see the world, but rather intimately connected to it. Sites of co-production are where knowledge and social order are produced simultaneously (Jasanoff 2004). Boundary organizations are sites of co-production, as they facilitate communication and discussion between scientists and others, and because they create a space for social order to be produced (St Clair 2006). When boundary organizations are engaging in co-production in a trans-disciplinary context, co-production can mean to produce knowledge utilizing insights from various disciplines and stakeholders from multiple sectors (Pohl 2008).

Boundary organizations must possess five general characteristics in order to be effective. First, boundary organizations must have accountability and linkages to both sides of the science/policy boundary (Cash 2001; Cash and W. C. Clark 2001; Cash et al.

2003; W. C. Clark et al. 2002; Guston 2001). This accountability allows boundary organizations to understand what each side of the boundary needs, and thus provides a site for debate and collaboration (Cash and Moser 2000). Second, boundary organizations need to be able to translate information across scales as well as between scientists and policymakers (Cash 2001; Cash and Moser 2000; Cash et al. 2003). Mutual comprehension of scientific results, facilitated by the boundary organization, allows for better cooperation. Third, boundary organizations must be able to understand research needs of policymakers, and communicate these research needs to scientists (Cash and Moser 2000). Fourth, boundary organizations must insulate themselves from pressure from either side of the boundary, and have a commitment to managing the boundary. Boundary objects can provide a means of boundary management (Guston 1999; Star and Griesemer 1989). Finally, boundary organizations must provide space for discussion, debate, and communication, as well as the building of trust and feedback (Cash and Moser 2000).

It is instructive to consider what types of institutions can most effectively serve as boundary organizations. Boundary organizations must be able to produce (or at least aggregate, synthesize, or analyze) scientific information and then be able to translate this information into a language that managers and policymakers understand. They must have a foot in both the scientific community and the policy community, so as to enable this translated information to flow between worlds of each. Historically, the production of scientific information has been the purview of academic institutions. Academia has produced individuals who study ecological relationships in the natural world for hundreds of years. Academia disseminates its results through publication in peer-reviewed journals and participation in conferences where scientists interact with other members of knowledge communities (Forsyth 2003). However, despite the move to more applied research, the nature of the promotion system within academia – advancement based on scholarly published contributions – makes academia a sub-optimal position from which to launch an effort to translate science into policy (Walker 2007). ENGO's cross scalar connections have been extensively discussed earlier in this chapter; they are accountable and connected to both the world of policy and the scientific community on multiple scales. Therefore, ENGOs are immediately recognizable as boundary organizations (Pohl 2008).

2.3.3 Characteristics of Effective Assessments

In 2006, an interdisciplinary team of scholars at Harvard University completed the Global Environmental Assessment (GEA) research project. Lasting from 1995 until 2006, with a comprehensive website available at www.hks.harvard.edu/gea/, the research project explicitly looked at factors that contribute to effective science/policy boundary management. This team brought together over 50 political scientists, policy experts, and science and technology scholars, and produced dozens of publications including three books.

One of the papers produced by the GEA project was by Cash and Clark (2001) *From Science to Policy: Assessing the Assessment Process* (Cash and W. C. Clark 2001) . With the research using the Global Biodiversity Assessment (GBA) as a case study, it found that despite GBA's output of hundreds of pages of text, at least 1,500 international scientists participating, and being backed by the UN system and the Global Environmental Facility, the GBA had little success in meeting the effectiveness goals that it set out to meet (Cash and W. C. Clark 2001). Policy uptake of the results was very low. Clearly, the credibility of the assessment and the UN system was not enough to drive policy changes. Finding that this experience is far from unique, the paper found that the GBA's effectiveness suffered because (1) the assessment did not understand the historical context in which it operated, (2) the assessment was not salient to the users to which it was delivered, (3) the assessment assumed that products were enough, and did not treat it as a comprehensive, ongoing communication process, and (4) the assessment did not connect scales, and assumed that the information on global changes would be relevant to local users (Cash and W. C. Clark 2001). This paper echoed others produced by the GEA project, and pointed to a need for assessment producers to not only pay attention to the credibility of the science, but also characteristics of the assessment and the user and historical context when designing effective assessments.

The GEA project found that to be effective, science must be viewed as salient, credible, and legitimate. Salience is the direct relevant of the information to an actors' decision making process, credibility is whether the information meets scientific technical standards of (Cash et al. 2002) and legitimacy is whether the information has been created in a way that is 'fair' and inclusive in its information gathering approach, respectful of the differing beliefs of stakeholders (Cash et al. 2003). Assessments cannot be viewed as completely salient, credible, and legitimate; rather, they must only reach minimum thresholds in the eyes of the assessment users.

But balancing these competing needs in science is not easy or simple. An increased focus on one element will often involve tradeoffs in the other two (Cash and W. C. Clark 2001). Moreover, different groups of stakeholders can view the importance of each of these attributes differently. According to Cash (2002), the scientific community often places a premium value on credibility – "authoritative, believable, and trusted information… produced through peer review, rigorous vetting of participants" (Cash et al. 2002, 2). Meanwhile, local stakeholders may place a higher value on legitimacy - science that incorporates their knowledge and is more democratic and fair in its approach. Environmental managers may place the highest value on saliency and the relevance of the information to their immediate decision making needs (Eckley 2001).

So how, then, is it possible to enhance salience, credibility, and legitimacy of science and balance the tradeoffs between them? The GEA project found that this depends on engaging in several important activities during the assessment. Far from an assessment being simply a product, it must instead be treated as an ongoing social process. Attention to process is increasingly recognized as a crucial focus for crossing the science/policy interface (Cash and W. C. Clark 2001; Mitchell et al. 2006; Miller 2006).

The first factor that appears to be important during an assessment is how that assessment was initiated, what the early goals of the assessment were, and the process by which these goals were decided. Early decisions can have ramifications throughout the life of an entire program. For example, the organizational context of an assessment, or the identity of the assessment initiator, can affect the perceptions of stakeholders of the overall assessment design and the ability to reach salience, credibility, and legitimacy. According to Farrell and Jager (2006), "the goal determined at the start of the assessment strongly influences the choices of participation, the way uncertainty is addressed, and which material should be included in the assessment" (Farrell and Jager 2006, 283). Furthermore, recipients of an assessment may reject its findings as illegitimate if they view the program's goals as being determined externally or without sufficient local input (Mitchell et al. 2006).

One of the most crucial factors in the assessment process is communication (Cash et al. 2003). Early, regular, and iterative communication between scientists and policymakers helps both sides understand the goals, values, and objectives of the other, and thus enhances the assessment's salience, credibility, and legitimacy. Without this sort of communication, there is a risk that "experts can end up addressing yesterday's problems, or decision makers end up with yesterday's knowledge" (Cash et al. 2003, 8088). Communication allows both sides to feel as if they are being heard. It is important that communication is not just at the beginning of an assessment process, or at the end. Rather, it is necessary to have multiple communication opportunities, such as workshops, meetings, and newsletters, throughout the entire science production process to ensure that scientists and policymakers are staying on the same page. One-way communication where one side is just talking at the other is also detrimental in that it does not involve sharing understandings (Cash et al. 2003).

Translation of scientific knowledge, defined as ensuring mutual understanding and moving past differences in "jargon, language, and experiences" (Cash et al. 2003, 8088), is a crucial factor in enhancing scientific credibility. Differences in understanding can be based on sector (i.e. whether the individual is a policymaker, scientist, local, etc) or based on scalar position (Cash et al. 2006). The products that speak to a scientific audience – scientific papers filled with dense prose and complicated graphs and charts – are not the same that speak to policymakers and local stakeholders. Individuals and organizations that wish to enhance scientific assessment effectiveness must engage in a translation process where complicated products are made accessible and understandable to those across the science/policy boundary. Using boundary objects can be one way enable this translation, sharing meaning through models, reports, and multimedia (Cash et al. 2002).

Communication and translation are not enough; there must be genuine participation of stakeholders on both sides of the science/policy boundary to drive scientific legitimacy. As legitimacy relates to whether or not stakeholder feel the process is 'fair', greater participation drives feelings of fairness by enhancing buy-in and support. Farrell and Jager (2006) divide participation into two sorts: nominal and engaged. Nominal participation is where there are attempts to gain input into decision making processes, participation is written into the assessment process, but participants may lack understanding or capacity to actually engage in a substantial way. Engaged participation is where there is "active participation in meetings, attempts to influence decision, contributions to writing and editing of reports, and so forth" (Farrell and Jager 2006, 12). Engaged and broad participation has a great potential to increase legitimacy. As with ENGO cross-scalar work, participation must be genuinely empowering and involve power sharing rather than simply being a front for promoting pre-ordained decisions. Linking science to policy and riving effective science also necessitates managing priorities and participation among different actors at varying scales (Cash and Moser 2000); creating scientific outputs that have only global relevance ensures that they fall on deaf ears when interpreted by local actors.

The nature of interactions across the science/policy boundary also serves to affect the salience, credibility, and legitimacy of science in assessments. On one end of the spectrum, scientists and policymakers may be isolated from each other, while on the other end, participants may play the role of both scientist and policymaker simultaneously (Farrell and Jager 2006; Farrell, VanDeveer, and Jäger 2001). Most important is to recognize where, how, and why boundaries are where they are in a given assessment (Jasanoff 1994). However, if the boundary is too solid, it can be beneficial to work to make it less so. Through work with US government agencies, Jasanoff (1994) found that blurring the boundary led to more effective science to policy translation while solidifying it led to less effective translation work (Guston 1999; Jasanoff 1994). In Cash et. al, the authors state that mediating across a porous boundary can enable multiple stakeholders getting timely information (Cash et al. 2002). Boundary organizations, discussed earlier, are one way to blur and negotiate the position of the boundary.

Beyond the characteristics of the science and the assessment process, the GEA project found that both the user must be receptive to the information and the context must be ripe for an assessment to be effective (Mitchell et al. 2006). More specifically, the user must have an interest in the information presented, as well as the capacity to understand it and openness to hearing a wide range of findings and multiple channels for doing so (Cash and W. C. Clark 2001). Context is related to societal constraints, institutional background, the issue domain, and even stages of the political attention cycle (Eckley 2001), and can obstruct assessment effectiveness even if all other factors are present. For example, an assessment might end up being ineffective because political attention has moved to another issue, or because it is introduced into a society where information is sharply curtailed and conflicting viewpoints are not acceptable.

2.4 Evaluating MMAS

The list below represents factors aggregated from the literature that influence ENGO cross-scalar and science/policy boundary management. When a factor has been revealed to be important for both crossing scales and the science/policy boundary, it has been consolidated into a single item. Boundary organizations can possess characteristics that enable these factors to be present. These factors will be used in evaluating the success of MMAS as an international MMA science initiative.

1. **Program initiation.** Early decisions have outsized ramifications on the design, process, and outcome of the entire ENGO program. Stakeholders may be resistant to a program when it is viewed as externally designed.

2. **Networks, partnerships, and coalitions**. Networks, partnerships, and coalitions allow big ENGOs to understand the local context, share information and resources, and better leverage scientific results.

3. **Participation across scales and the science/policy boundary.** Participation means to have early, ongoing, systematic engagement with a wide range of stakeholder groups across scales and the science/policy boundary. Communication and feedback are a key part of participation and are crucial to create buy-in and salience. Participation allows the science/policy boundary to be slightly porous; scientists can get involved in the policy process and policymakers can provide substantial input into the science.

4. **Accountability and the Ability to Learn.** Organizations must be accountable both upwards and downwards, and must possess an ability to learn from their mistakes and adapt as circumstances change. Accountability enables learning opportunities.

5. **Translation of Scientific Knowledge.** Active knowledge translation ensures that complex scientific information becomes understandable, accessible, and more easily used. Having at least a single individual dedicated to translation can increase effectiveness.

6. **Assessment Context.** Different contexts are differently ripe for science to have an impact. The political, socio-economic, or even cultural circumstances of a particular program site can alter cross-scalar and science/policy boundary management effectiveness.

Through a review of the literature, this chapter has attempted to answer three questions: (1) what are MMAs and what is the most effective way for them to be created and managed? (2) How do ENGOs act as multi-scalar conservation actors? What do they do on each scale and how do they attempt to cross these scales? (3) How can an organization produce or aggregate science and translate that into effective policy action? The answers to these questions – in particular the second and third - provide a framework for theory testing with MMAS. The next chapter will focus on the methodology used to evaluate MMAS. A mixture of participant action research and multi-sited ethnography, multi-sited pragmatic action research allowed me to gather the data needed for a comprehensive analysis of the program.

3 Chapter Three - Methodology

In the fall of 2008, I spent a month in Fiji doing a pilot study for my proposed PhD research. Spending one and a half weeks in Suva and two and a half weeks in indigenous Fijian villages, taking part in funeral feasts and waking to the sound of rosters under my hosts' homes at 3 AM, I was preparing myself for what I fully expected would be in the tradition of Franz Boa, namely "the lone fieldworker taking up prolonged residence in a small community" (A. Wallace 1972, 479). I had plans to do village-based fieldwork in Fiji for over a year focusing on the use of traditional ecological knowledge in MMA management.

Unbeknownst to me at the time, my Ph.D. would take a different turn. My advisor was deeply involved with MMAS, and over the course of several meetings I became more interested in examining the structure, processes, and outcome of this program than in pursuing my originally planned Fiji-based research. The idea of constructing a methodological approach to studying MMAS was both exciting and terrifying. Exciting, as data would be gathered in multiple foreign field sites (in tropical, exotic locations), and terrifying, because it was clearly not a traditional single-site analysis. MMAS was an international project that had four main field sites, two of which (Brazil and Fiji) were separated by more than 9000 miles of flying distance! Many MMAS participants were not isolated villagers but rather educated scientists and conservationists who, while separated from me by culture, were similar to me in terms of class and education and had the ability to register their opinions (Gusterson 1997).

The basic research strategy I used to examine MMAS was that of a case study using data collection methods of multi-sited ethnography and participant action research. This hybrid I termed 'multi-sited pragmatic action research' (MSPAR). MSPAR is multi-sited, focused on projects, amenable to limited time frames, and enables creating reciprocal benefit for both the researcher and the organization/social group being studied. MSPAR recognizes that social scientists must work closer with ENGOs to enable both biological and cultural biodiversity preservation (Orlove and Brush 1996; Peterson et al. 2008) and improve the practice of running ENGO conservation and science programs. With MMAS, multi-sited research allowed me to uncover processes and outcomes unique to particular nodes as well as those that were systematic across the nodes and within the larger program, and action-based research laid groundwork for mutual benefit for both myself and Conservation International.

3.1 Defining Multi-sited Pragmatic Action Research

Ethnography has been described as both a fieldwork activity and a style of written product (Van Maanen 1988). In traditional single-site ethnography, gathering data through long-term participant observation has been heavily emphasized (Atkinson and Hammersley 1994; Sanday 1979; L. M. Smith 1978). The product to emerge from this long-term immersion is expected to be filled with 'thick description' (Geertz 1973) of a culture or society (J. C. Johnson 1990). Ethnography done in multiple locations is nothing new. Malinowski was doing this sort of ethnography during his study of the

Kula in the Western Pacific in the early 20th century (Malinowski 1922). However, multi-sited ethnography as a concept was not fully articulated until George Marcus described its pitfalls and promises in his seminal 1995 paper, *Ethnography in/of the world system: The emergence of multi-sited ethnography* (Marcus 1995).

Marcus defines multi-sited ethnography as "moving out from single sites and local situations of conventional ethnographic research designs to circulation of cultural meanings, objects, and identities in diffuse time-space" (Marcus 1995, 96). Marcus subsequently expands on the concept (Marcus 1998; Marcus 1999; Marcus 2002) and other scholars latched on, writing a myriad of papers applying the concept to the study of migrations (Fitzgerald 2006; Shami 2004), commodity chains (Bestor 2001; Freidberg 2001), news (Hannerz 2003; Hannerz 2004), and even the internet (Beaulieu 2004; Hine 2000). The core element of multi-sited ethnography is following (people, things, metaphors, etc) something in the field in order to create one fluid interpretive ethnographic product (Marcus 1995). As the field for multi-sited ethnography potentially expands outward from a single site to the entire world, it is necessary to delimit what compromises the field for any particular research project. Choosing sites for multi-sited ethnography has been characterized as "a selection of sites from among those many which could potentially be included" (Hannerz 2003, 207).

While multi-sited ethnography has already contributed greatly to theoretical and applied knowledge of diffuse phenomenon, it also suffers from a challenge - namely, what are the objects of study, be they sushi middlemen (Bestor 2001) or transnational migrants (Fitzgerald 2006) – getting out of the ethnographic process? This is an important moral and logistical issue. Informants commit their time and effort to a research project that they may not see any benefit from; they often commit their friendship to a researcher who spends just a few months or weeks in any one particular site. It has been argued that scientific results enhance general academic knowledge, improving the world somewhere down the line (Walker 2007). When conducting a multi-sited ethnography on an organization, this argument can be unconvincing to gatekeepers (Morrill et al. 1999), especially when research threatens to expose issues with the organization's work and the research will take away from the organizations most valuable asset, time (V. Smith 2001).

One way that I saw to create benefit for the organization studied, CI, was through incorporating principles of participant action research (PAR). PAR combines credible research with real world efforts at social and/or organizational change (Baskerville and Wood-Harper 1996; Whyte 1989). Thus, PAR researchers work closely with the organization or social group to develop the research focus and questions so that they will be directly applicable to their goals (Baskerville 1999; Park 1999). Methodologically, the researcher does not conduct all of the research independently of the organization/social group, to be delivered at the conclusion of the research period (Cassell and P. Johnson 2006). Rather, the research process is iterative, with the researcher discussing findings as they appear with partners, and having the staff participate in data discussions (Whyte 1989). Pure PAR includes multiple cycles of a five stage process of diagnosing, action planning, action taking, evaluation, and specifying learning (Cassell and P. Johnson 2006; Susman and Evered 1978).

PAR's ideal of reciprocal benefit and close collaboration with the organization being studied (Eden and Huxham 1996) can meet the benefit challenge inherent in multi-sited ethnography. Organizations or social groups can see how the research will benefit them, and the researcher can accomplish their own research goals as well as contribute to applied practice. This style of research is most effective for when researchers are looking to be a 'seed' of improved knowledge rather than a 'hatchet' of critique (Robbins 2004), and when dealing with an organized group that is able to participate in discussions and planning.

For those with a short time frame for research such as myself, the five stages of PAR are difficult to complete. Therefore, an alternative research framework where the five cycles of action research are not all completed (Cassell and P. Johnson 2006) could be more accurately described as pragmatic. Pragmatic action research takes advantage of the research time that is available. The organization (Baskerville and Pries-Heje 1999) is involved in the forming of the research questions for organizational learning and stays heavily involved through regular discussion of data findings. However, the research focus is more on evaluating actions already undertaken, with the client free to continue to start another cycle with diagnosing, action planning, and action taking if they so choose. This is close to empirical action research where, the researcher "evaluates the actions undertaken by the client system and feeds data back to it" (Chein, Cook, and

Harding 1948; Susman and Evered 1978, 588). It also retains many elements important to participant action research, including full collaboration with and benefits to organizational participants (Baskerville 1999). Drawing on and contributing to theory is important, both to ground specific findings and to make results generalizable to broader practice (Dick, Stringer, and Huxham 2009).

The following section explains key elements of MSPAR, and how I applied these elements to my research of MMAS.

3.2 Application of Multi-sited Pragmatic Action Research

Gaining access is a principal concern in MSPAR. Without access to informants who know the most about a project or phenomenon, research is difficult or impossible. In organizational research, informants are often educated individuals working in an organizational culture that may value confidentiality and control. Access, however, boils down to the same elements inherent in all types of ethnography, relying primarily on rapport building (Nader 1972). Techniques for rapport building with organizations can include cold-calling and extensive formal negotiations (Hodgson and Alcadipani 2008) building relationships with gatekeepers (Morrill et al. 1999), gaining access in stages (Gummesson 2000), and using social networks to gain access (Andersen 1995; Hammersley and Atkinson 2007).

As with multi-sited ethnography, access must be gained at several sites in MSPAR rather than simply one. Sites can be geographically distant and it may be necessary, due to considerations of time, to gain some form of access before actually arriving at the sites. One of two techniques can be used to handle this difficulty. First, a researcher can put in the effort to independently build rapport with key informants at all sites. Time here is the primary issue, potentially leaving less time for actual research (Wittel 2000). This technique is most relevant when working with non-hierarchical organizations. When working with hierarchical organizations, access can first be gained at the top of the project command structure. Once this access has been granted and the MSPAR project is introduced by management, it becomes easier to work with informants at all sites, as the manager has helped to open all the doors of access simultaneously (Feldman, Bell, and Berger 2003). This technique has the potential to save a large amount of time. It does necessitate consideration of the ethics of consent of those further down the command structure (Hodgson and Alcadipani 2008). To mitigate this issue, effort should still be taken to build some sort of rapport before site visits, with early e-mail and phone conversations with informants at project sites playing a key role.

My access to MMAS was gained through social networks, with my advisor using professional connections to pitch the idea to Dr. Karrer, the Senior Director of the MMAS program. My advisor had been working with CI for some time and thus was well placed to help me gain entry. Additionally, at that point Dr. Karrer was on my committee and thus had greater than average knowledge about my skills, expertise, and research objectives. Once her consent was granted, she worked to help me gain access to key project informants at all sites. Thus, Dr. Karrer was very much fitting the role of a gatekeeper (Feldman, Bell, and Berger 2003; Hammersley and Atkinson 2007).

Determining which sites to be studied in organizational MSPAR is part of access negotiations. Markowitz, in *Finding the Field: Notes on the Ethnography of NGOs*, describes a 'following' most useful for ENGO research: follow the project (Markowitz 2001). Following the project means just that: limiting informants and scope of study to that relevant to the project, focusing on the network of relationships and programmatic action over multiple scales between donors, employees, and stakeholders (Markowitz 2001). Not forgetting the 'pragmatic action research' part of MSPAR, negotiating benefit makes up part of the access process. Specifics of the research proposal should be discussed in order to orient the project towards organizational learning and improvement (Whyte 1989). There should also be a period of negotiation of expectations on both sides. The amount of time devoted to answering researcher's questions and level of organizational involvement in collecting data may be open to debate, as well as funding for research expenses. Full disclosure is important; techniques that rely instead on covert techniques or deception (Alvesson and Deetz 2000; Hammersley and Atkinson 2007) are not ethically sound, and virtually always result in adverse consequences.

MSPAR also requires a mechanism for ensuring research rigor. While the MSPAR project is oriented towards organizational improvement, it is still necessary to ensure that the results are free of bias or covering up of unpleasant findings. The researcher should be able to publish freely and use the lessons learned in the research project as a way of improving practice with other organizations. A memorandum of understanding (MOU), jointly discussing and created before the research commences, can be useful in ensuring rigor and avoiding misunderstandings.

In an early in-person meeting with the Arlington VA-based MMAS team and over email with node coordinators (field CI employees or contractors that coordinated science and engagement in the science and policy process at each site, to be discussed more extensively later) there were extensive discussions about projects goals, methods, mechanism for feedback, and timeframes. My unedited project proposal was presented and analyzed, with CI employees discussing various elements of it and thinking about how I could create products that would be useful for the organization. CI and I jointly created an MOU that described responsibilities and freedoms of both sides (i.e. I could publish freely, when to provide interim reports, how the information will be used for learning), allowing expectations to be set early on.

MMAS' focus on nodes made for a delimited field. Following the project (Markowitz 2001) was by far the most logical approach. We determined that I would make visits to the four node sites (Belize, Brazil, Panama, and Fiji) as well as the administrative site of Arlington Virginia, while using email and phone to connect with a wider network of administrators, donors, and scientists. Galapagos, part of the Eastern Tropical Pacific Seascape (while peripheral compared to Panama) was factored out due to costs, and plans were made to do interviews there via teleconference. MMAS had approximately a year until program completion, and was moving into a distinctive phase of ramping up efforts to insert the scientific results into node and global policy processes. Recognizing this, we planned multiple stage research. One stage would be in the summer and fall of 2009, and one stage would be in the spring and summer of 2010, enabling me to see more of the unfolding program impacts. Exact weeks of node visits were determined after extensive discussions with node coordinators and depended on informant schedules, public holidays, and stakeholder meetings.

Once access is granted, the task of conducting multi-sited fieldwork begins. Sites in the field remain concrete, physical areas of space in the world that must be reached. Due to the nature of MSPAR entailing following particular projects and having had earlier negotiations with the organization, the particular sites to be visited will already have been decided at this stage. However, raising funds to access these sites can present a large obstacle. When doing a global MSPAR project, the plane ticket costs alone can run into the tens of thousands of dollars. Compounding this is the unfortunate fact that funding agencies can either be focused on the model of continuous research in one site or their research awards may be insufficient for the travel required.

The solution to this dilemma is twofold. First, it is necessary to piece together research support from a variety of sources, including departmental awards, national funding agencies, and foundations. If doing multiple-stage MSPAR, frequent flier miles accumulated during the first stage of the research can be used for tickets during the second stage, reducing travel costs. Second, because MSPAR is benefitting the organization being studied, it is not inappropriate for it to be partially funded by that organization, as can be done in participant action research (Baskerville and Wood-Harper 1996).

The first serious challenge to MMAS MSPAR was funding. Between travel to Arlington VA and two trips each to four node sites, travel expenses alone approached $25,000, an intimidating amount to fundraise for PhD research (in comparison, NSF Doctoral Dissertation Research Improvement grants funding PhD research average $10,000 - $15,000). The largest amount was plane tickets; each one had to be bought separately as an around the world ticket (Hendry 2003) was neither geographically nor logistically feasible. CI had agreed to fund approximately ½ of my total travel expenses. Covering the remainder of the gap required applications to a myriad of funding sources. Like piecing together a puzzle, every little bit counted and added to the whole. This process was heartening and discouraging – heartening when funding arrived from unexpected sources, discouraging when funding applications were rejected. Eventually, I managed to fill the gap from a mixture of small departmental and university grants.

While still emphasizing thick description, MSPAR offers fewer opportunities for participant observation. Time is spent dispersed over multiple sites and with multiple social and/or organizational groups. Participant observation can be fruitless and limited in organizational contexts where informants spend much of their days in front of computers and hold meetings at far flung locations, necessitating spending time travelling that may not be available (Gusterson 1997; Markowitz 2001). Data gathering in MSPAR must then rely more on “polymorphous engagement” (Gusterson 1997, 116), utilizing semi-structured interviews conducted by techniques that allow linkages to disparate locations. While interviews with locals that do not have continuous access to effective electronic communication systems (fishers in a developing country, for example) should be done in person, interviews with mobile trans-national elite can be done by e-mail or video conference. Fortuitous opportunities should be taken advantage of for interviews (such as coincidental attendance at the same professional conference). Data can also be gathered through document reviews: minutes from organizational meetings, text from websites, project progress reports, and project workplans.

Documents I reviewed are listed in Table 3-1 below. I combed project progress reports, workplans, budgets, and minutes of project meetings to get further insights into the program.

Table 3-1: MMAS Documents Reviewed

Yearly progress reports to the Gordon and Betty Moore Foundation, 2007 through 2010
2010 MMAS final report
MMAS organizational matrix including goals and timelines
MMAS budgets
MMAS scientific project tracking chart
Scientific workplans, progress reports, and final reports of individual studies
MMAS publications in peer-reviewed journals (where available)
Internal memos
Internal notes and e-mails
Original 2003/2004 MMAS proposal to the Gordon and Betty Moore Foundation
Electronic and physical newsletters, status updates
Glossy S2A materials – pamphlets, booklets, posters
MMAS node synthesis reports and cross-node disciplinary reports
MMAS science to action matrices

Interviews with informants at CI, at node sites, and elsewhere were conducted in line with informed consent procedures, with Duke's Office of Research Support –

Institutional Review Board (IRB) approving my research plan and my informed consent form (See Appendix A – Informed Consent Form). Informants were largely selected based on being directly involved in MMAS research or implementation, their direct exposure to MMAS projects or staff, or their connections to institutions that had worked with MMAS. The informants list started with a list derived from documents or provided by the node coordinator, and then expanded based on peer-referrals.

During the interviews, the semi-structured interview format was found to be the most useful, allowing collection of in-depth data on topics that were both relevant and topical. Appendix B – Interview Protocols shows the interview protocols. Note that because these were semi-structured, these protocols served only as guides, with flexibility key in informant conversations and additional questions or subtracted for particular informants. Interviews began based on a standard interview protocol and additional questions were added as data emerges or points become more or less salient.

Skype was important both before fieldwork began and between visits to field sites. This teleconferencing and international calling tool allowed me to interview members of the Science Advisory Committee (a formal committee that had been set up to guide MMAS' development in the early days) in places as far flung as Malaysia, talk with the Gordon and Betty Moore Foundation, discuss logistics with CI employees in node sites to set the stage for my arrival, and interview MMAS-involved scientists that were dispersed throughout the United States and Canada.

In May 2009, I spent 2 weeks in Arlington Virginia interviewing and observing Conservation International headquarters staff. With informed consent, I gained data from attending MMAS meetings, sitting in on MMAS phone calls, and otherwise observing interactions between MMAS team members and other parts of CI. Besides interviews with the core MMAS team, I also conducted interviews with CI employees not directly involved anymore with MMAS, but having had a role in its development or implementation. A key aspect of these early interviews was not only asking about MMAS, but also learning about CI as an organization. Questions were asked about its culture, its potential for learning, its accountability mechanisms, its history, its goals and mission, and other criteria.

Besides conducting interviews with employees of CI, I also conducted interviews with employees of marine programs at The Nature Conservancy, World Wildlife Fund – US, and the Wildlife Conservation Society. The intention of these interviews was to get a better understanding of how other big ENGOs somewhat similar to CI manage international conservation science initiatives. How do they structure their programs and manage their relationships with field offices, and how does this differ from CI? While this limited information was not sufficient to perform a full comparative analysis, each organization had a slightly different approach and thus helped me to compare CI's approach to its contemporaries.

Returning to theory during this formative phase was crucial. In particular, I continually returned to theories on managing the science to policy transition and boundary work (Cash and W. C. Clark 2001; W. C. Clark et al. 2002; Farrell and Jager 2006; Gieryn 1983) and the multi-scalar interactions inherent in NGO projects (Arts 2004; Princen and Finger 1994; Wapner 1996; Zimmerer and Bassett 2003). Literature discussed earlier in Chapter 2 provided the theoretical framework for my ongoing analysis. E-mail discussions with the core MMAS team in Arlington allowed verification of emerging facts and helped to lay the groundwork for successful field visits.

The first phase of international field travel began in July 2009, and until November of that year it was a frenzy of activity and travelling. Starting with Belize and moving through to Panama, Fiji, and Brazil, I racked up tens of thousands of frequent flier miles and began to see the American Airlines Priority Access™ line in the airport as my good friend. At each site, I relied heavily on the assistance of MMAS staff. The node coordinators gave me a contact list of informants that were most connected to the project and (in some cases) helped to set up the interviews. When they were attending conferences that would potentially provide me with information, they invited me and allowed me to participate. I interviewed between 20 and 40 informants at each of these sites, ranging from local fishermen to scientists to high level environmental managers. A wide range of informants in different occupations and at different scales was necessary to get a range of perspectives across the science-policy boundary (Guston 2001).

As I progressed, node coordinators helped with data gathering by providing materials they themselves had acquired or produced, such as science to action matrixes (plans of action for targeting the policy process with MMAS science), scientific findings, pamphlets, videos, and internal reports. At each site, I visited both the major cities where the node coordinators, scientists, and partner institutions were based as well as the more remote locations where the MMAS scientific studies had taken place.

Language can and often will be an issue in MSPAR. The paradigm for single-site ethnography is for the researcher to have a complex grasp of the native tongue so to better understand the web of meanings linking culture and language. Much multi-sited ethnography has been done primarily in English-speaking settings (Hannerz 2003; Marcus 1995). If extending research beyond English speaking countries, a competency in all languages relevant at the sites of MSPAR is ideal. This can be impossible due to time and personal constraints – in a project spanning five countries, for example, there can be at least five languages, if not more due to differences in dialect! In these cases, use of experiences interpreters doing simultaneous translation can make the difference in project completion. Post-interview discussions with interpreters can ensure that the researcher understood the web of meanings inherent in the discussion.

Language was an issue during the field visits. Four nodes meant three languages (English, Spanish, and Portuguese), of which I was native or conversational in only two (English and Spanish). For my visits to Brazil, I hired a full-time interpreter to travel with me and assist in interviews and social interactions. In the end, the interpreter did more than interpret – as a trained environmentalist himself, he was able to provide insights into project implementation that had eluded me at first pass and was critical to getting a full understanding of informant perspectives.

As MSPAR relies heavily on engaging deeply with the organization, employees can (and should) be involved in data gathering and analysis. Independently produced mid-term reports and preliminary findings discussions can encourage the organization to reevaluate actions taken and begin making plans for organizational improvement. Reports can provide motivation for the researcher to crystallize findings. Full results should be returned to the organization being studied within a reasonable timeframe. It is important to make arrangement to return results to multiple levels of the organization, thus not privileging structures of existing power and control. Informants who volunteered their time and effort should be provided with copies of written work so to to comment and discuss. While the researcher should have the final say in written materials, gaining the feedback of the organization in this final stage is instructive to add another stage to research rigor. As the organization will have the full copy of the research findings, they can then use these findings to perform future action planning. If possible, the researcher can be involved in these discussions, moving closer to completing the five full stages in PAR (Davison, Martinsons, and Kock 2004).

After November 2009 I quickly moved into an analysis of my results, producing a mid-research progress report by the end of January 2010. In February of 2010 I discussed this report with the core MMAS team in Arlington, making a presentation and staying on-site for a day for discussions, critique, and suggestions. Copies of the report were sent to node coordinators and several consultants working with CI, enabling dissemination and learning throughout the project structure. While there was not complete agreement on my conclusions (as was to be expected with any report that has an element of critique), it stimulated a constructive debate on how MMAS has been implemented and how it could best move forward, enabling positive tweaks to program management.

CI had long planned on conducting a "Science to Action Assessment" in the spring of 2010. The point of this assessment was to determine to what extent MMAS science had led to MMA policy outcomes in the four node sites and the factors leading to these outcomes. Because I had gained an extensive knowledge of the MMAS program, I was formally asked to be part of the assessment team. Travelling and working with two consultants from April to June of 2010, I returned to node sites and was a key driver in interviewing, travelling, planning, analyzing, and writing. Again, the node coordinators played a crucial role, setting up interviews, helping with logistics, and providing documents, workplans, reports, and insights. Many of those interviewed during the first phase were interviewed again, adding the ability to see project changes and additional impacts over time.

After the second phase of field research was completed, I was heavily involved in co-authoring four evaluative reports and took part in another Arlington Virginia meeting where the reports were discussed. CI once again engaged in a process of learning, tweaking, and planning. In early August 2010, I participated in a "S2A Workshop", where I and other experts at translating science into policy brainstormed and began developing a booklet for conservation practitioners. In October 2010, the final draft of the "Science to Action" assessment was delivered to CI. This dissertation, available in mid 2011, will also be available to CI staff. A shorter executive summary will also be available. With these products, CI can continue the PAR stages of action planning and action taking as they deem necessary.

Data analysis for this dissertation consisted of stages of data entry, coding and preparation, and developing overall conclusions. After recording interviews using a digital voice recorder, they were transcribed both manually and using Dragon Naturally Speaking™ voice recognition software. With an interview to transcribing time ratio of approximately four to one, this involved hundreds of hours of transcribing work. Once this work was completed, the interview transcripts were coded using NVivo™ qualitative analysis software (Richards 1999). NVivo™ is a software tool that allows the researcher to code sections of text as belonging to particular themes, and then arrange these themes based on their relationships to each other (Crowley, Harre, and Tagg 2002). NVivo™ also allows the quantification of themes so as to see which themes were dominant, frequently mentioned, or central in a transcript.

While coding, my qualitative data analysis approach was a mixture of the theory to data and grounded theory approach (Glaser and Strauss 1967). Thus, having research questions as opposed to hypothesis testing was an intentional research design decision. Due to timing, funding, and practicality reasons inherent in PhD research, I did a literature review early in order to theoretically frame my study. Thereafter, as I collected data, it was an iterative process between engaging with literature and my data in order to build my conclusions.

Specifically, my phased approach for data analysis went as follows. First, I did a literature review while writing my proposal, in order to become familiar with the general concepts discussed in the NGO and STS literature. Second, while collecting the data, and in preparation for a CI progress report delivered in January 2010, I did an initial round of coding to identify the emergent themes in the MMAS case, focusing solely on the nodes. This approach was that of grounded theory; while the literature was in the back of my mind, I consciously tried to draw as many themes as possible out of the first round of interview transcripts. This coding scheme is listed in Appendix D – Grounded Theory Coding, Round One. Third, following the second round of field research, I returned to the literature and did further reading on the themes discovered during my first round of coding, and build a comprehensive list of theoretical concepts that were connected to NGO and STS literature in general as well as to MMAS themes. Finally, I used this list and my dissertation outline as a framework for a final round of coding, coding based on program phases (including activity at CI headquarters and during the program's founding). This was a theory to data approach. This coding scheme is in Appendix E – Theory to Data Coding, Round Two.

To give one example of this iterative process, I was familiar with the power of participation and engagement in enhancing the effectiveness of ENGO cross-scalar programs. While in Fiji, I learned about the Fiji Locally Managed Marine Area Network.

After the importance of FLMMA was brought out in the initial round of coding, I returned to the literature and read up more about networks, partnerships, and coalitions. Following this, I then went back into the text that related to all the nodes and saw more specifically how networks, partnerships, and coalitions had an impact on program implementation. This process was similar with other concepts.

For developing overall conclusions, I used three techniques: pattern matching, time series analysis/process tracing, and cross case synthesis. Pattern matching involves comparing empirically-based and predicted patterns (Yin 2008). I compared the results of the case studies, based on all the types of evidence I had collected (documents, interviews, etc.) with my original questions. This is the essence of the discussion chapter. I also constructed chronologies of each MMAS node, building a chain of logic (Betsill and Corell 2001) that will connect events with effects. The material presented in the results chapter is presented (roughly) chronologically and thus builds this chain of logic for MMAS (Yin 2008). Finally, cross-case synthesis was crucial in my project to compare results from individual cases, and bring out patterns across cases and lend to overall conclusions.

In the following text, interview quotes are referred to by group labels, i.e. "core MMAS team member", "government employee", "NGO employee", "local community stakeholder", etc. Most group labels are self-explanatory or will be explained later in the dissertation. Unless otherwise stated, group labels mentioned in node sub-chapters are associated with that particular node (i.e. a NGO employee mentioned in the Fiji chapter is assumed to be an individual working at an NGO in Fiji). A list of interviewees willing be identified is included in Appendix C – Stakeholders Interviewed (there are additional informants interviewed not included in this Appendix due to requesting anonymity). However, names are not associated with particular quotes. Although interviewees agreed to be named, their specific identity is not important to understand text or analysis, so I coded them to conceal their identity.

This chapter has attempted to describe the methodological approach used to research MMAS. Using approaches from participant action research and multi-sited ethnography combined into multi-sited pragmatic action research (MSPAR). MSPAR served to enlist CI employees in data gathering, provided benefit for both myself and CI, and allow a comprehensive review of the program. Data analysis was done through standard qualitative analysis techniques, including grounded theory and theory to data coding, pattern matching, time-series analysis, and cross-case synthesis. The next chapter will introduce the results of my research.

4 Chapter Four - Results

4.1 CI as an organization

Conservation International is a large international environmental non-governmental organization headquartered in Arlington, Virginia USA. As indicated in its name, its focus is on conservation outside of the United States. CI was formed in 1987 after the international staff from The Nature Conservancy (TNC) left amid tension with other TNC programs and central management; in 1989, international staff from WWF also joined the fledgling organization (Chapin 2004). Now, CI has over 900 employees and 30 offices around the world (www.conservation.org), making it one of the world's largest conservation organizations.

A core strategy in CI's work is partnering with other organizations to multiply and enhance their impacts. CI's website indicates 1000+ partner organizations (www.conservation.org). Being a pragmatic organization, CI not only partners with other NGOs and governments but forges strong linkages with businesses. According to CI's IRS Form 990 for Fiscal Year 2009, CI's board of directors includes authors and scientists such as Jared Diamond, celebrities such as Harrison Ford, philanthropists such as Gordon Moore, but also business people such as Rob Walton (of Walmart), Judson Green (CEO of Navigation Technologies Corporation), and Wes Bush (CEO of Northrop Grumman). Thus, CI is actively involved in business strategic bridging (Stafford, Polonsky, and Hartman 2000).

In 2008 and 2009, CI went through an organizational restructuring. Driven by the CEO, Peter Segilmann, and the Board of Directors, the restructuring came from an increasing recognition that there was a need to fully incorporate socio-economic/cultural concerns when running biodiversity programs and creating protected areas. While the field offices of CI had recognized this for quite a while, and social science/human concerns had already been incorporated into various CI programs, the restructuring served to give the organizational change an official stamp. Changing the mission statement and vision were part of this transformation. According to a core MMAS team member, speaking about CI's change:

> Our mission changed within the last six months to focus from biodiversity to biodiversity and human well-being. So we are not becoming CARE, Red Cross, but we are expanding our horizons to care about them. So to shift, it was before all about species and habitats. Now it is about species, habitats, and people, which I think is great, because as a social scientist I think you should be thinking about how things impact people or you will be screwed.

CI's mission is described on the website as, "Building upon a strong foundation of science, partnership, and field demonstration, CI empowers societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity" (www.conservation.org). CI's vision, also described on the website, is to "imagine a healthy, prosperous world in which societies are forever committed to caring for and valuing nature, for the long-term benefit of people and all life on earth" (www.conservation.org). These high-minded and hopeful statements make explicit a devotion to human needs as well as the needs of biodiversity, and stress the emphasis on using science and cooperation as a backbone to their programmatic decisions.

CI focuses on six main initiatives: climate change, freshwater security, human health, food security, cultural services and biodiversity. These areas make up the core of its work. To work on these issues, CI is separated into various divisions and programs. Divisions include Science + Knowledge, Global Strategies, Center for Conservation and Government, Ecosystem Finance, Global Marketing and Communications, and Global Marine. Within these divisions are numerous centers and programs, including the Global Conservation Fund, the Rapid Assessment Program, Verde Ventures, the Population, Health, and Environment Program, the Center for Environmental Leadership and Business, the Sea Turtle Flagship Program, the Conservation Stewards Program, Indigenous and Traditional People's Program, and the Marine Management Area Science program.

CI works in dozens of countries with programs on six continents and marine areas (www.conservation.org). They brand and focus their conservation efforts through the designation of 'biodiversity hotspots', 'wilderness areas', and 'seascapes'. Most relevant to marine work are the seascapes. There are four seascapes; the Eastern Tropical Pacific Seascape (ETPS), the Sulu Sulawesi Seascape, the Abrolhos Seascape, and the Bird's Head Seascape. Both the Sulu Sulawesi Seascape and the Bird's Head Seascape are part of the Coral Triangle area, which encompasses the Philippines, Indonesia, Papua New Guinea, the Solomon Islands, and Malaysia.

CI is a fairly centralized, hierarchical organization. CEO Mr. Peter Segilmann, President Russell Mittermeier, and the Chief Operating Office Mr. Neils Crone make up the Chairman's Office, and are in charge of making key strategy decisions. A Board of Directors also assists with decisions. Directly beneath these individuals is a bevy of Vice Presidents in charge of various divisions. Another layer of senior staff is beneath these individuals and staff with less management responsibilities beneath them. Appendix F – Organizational Chart of MMAS within CI is a (partial) organizational chart showing where MMAS within CI, as well as showing how MMAS connected to various CI marine field offices during the initiative. Note that this is a simplified organizational chart only; much collaboration across divisions and programs occur in day to day work.

CI periodically evaluates their divisions and programs. There is an annual organization wide planning session, where the heads of different divisions and programs come together to talk about program successes, opportunities and challenges, and make plans and budgets for the following year. This allows CI to be adaptive and correct programmatic mistakes. Due to the fact that CI is a small organization, there is regular communication across programs. During annual planning, individuals from CI in Arlington go to regions to specifically discuss collaboration opportunities.

Being a conservation organization, CI is staffed by people who care about the environment. The employees are generally educated, enjoy outdoor activities, and are politically aware and liberal. Employee relations at the Arlington VA office, both among employees on the same level as well as those on different levels, are friendly, open, and communicative. There is an annual Christmas party, occasional picnics, and happy hours on Fridays. There are yearly bonuses and personnel awards given for excellent performance. There is an annual employee evaluation process. While the structure is hierarchical – there are forms to be filled out and bureaucracy to deal with – individual employees feel that they can communicate good ideas when they have them to upper levels of leadership. When asked how willing leadership was to listen to ideas from below, a core MMAS team member responded:

> I think they are. There are a couple ways of doing this. You can just write to Peter or Russ or be on one of their various committees on different issues. For example, when they are doing the strategic plan if I had an issue I could talk to one of the people on the committee, and they tried to be transparent on, when there are these different initiatives on climate change… It's small, there only 300 people here. So for headquarters is a lot easier.

This relative smallness of CI and quality of staff (while a large ENGO, still small compared to organizations generally) has meant that despite centralization, CI has been able to be agile programmatic and strategically. Another core MMAS team member says:

> I was delighted to have the opportunity to work with CI. Because for all their warts, they are the most effective at what they do…I don't think they even appreciate what they have in that department. Their major modus operandi is to

> work in a political agenda… the political arena in areas of great concern and threat to biodiversity. They really get into it, and hire people from those places…. I believe that the purity of purpose across the board of the staff is something special and there are wonderful people in other organizations, but I don't see the same type of pragmatism and focus on outcomes.

However, as with many organizations, CI has some problems with institutional long-term memory. Program successes and strategies often depend upon the strengths of personnel, and when those personnel leave the lessons that their successes taught can be lost. There is also a sense among some CI headquarters staff that the ideas that percolate throughout CI are not harnessed as well as they could be, leading to additional information loss. An employee at CI states:

> Part of the problem has been, unfortunately, like a lot of institutions, good ideas have suffered from a lack of attention, lack of funding, and lack of follow through and therefore they were never replicated in different areas or institutional support wasn't given to them, so they may have languished and disappeared over time… quite a few cases of initiatives such as priority setting exercises that changed when people left and came on and changed again. So innovation, but not necessarily a systematic way of harnessing that innovation.

Recognizing this failing and recognizing the difficulties of having institutional memory with multiple international offices, CI created a Learning Network group. The responsibilities of this group include keeping abreast of what is going on in the field and distilling key lessons from successes and challenges. The group then disseminates these key lessons throughout the organizational structure.

Being a private non-profit organization, CI depends on fundraising and grants to operate. Unlike membership organizations such as WWF, CI acquires a large majority of its funding from several major donors, including the Global Environmental Facility, the Gordon and Betty Moore Foundation, the MacArthur Foundation, and the World Bank (Chapin 2004). Large grants from the private sector are not uncommon. Much of this fundraising success depends on the charisma and fundraising prowess of those of the top of the CI structure.

According to CI's 990 IRS Form, available at www.conservation.org, for the fiscal year July 1st 2008 until June 30th 2009, CI had approximately $109 million in contributions and grants, $110 million in total revenue, $51 million in total grants paid, $50 million paid in salaries and compensation, and $288 million in total assets left at the end of the year. However, 2008-2009 was a low revenue year for CI due to the global financial crisis. For the fiscal year 2007-2008, CI had $232 million in contributions and grants, $240 million in revenue, $52 million in total grants paid, $47 million in salaries and compensation, and $320 million in assets at the end of the fiscal year. Those at the top are paid high salaries compared to the US median income, yet modest compared to CEOs in the private sector in the US. In 2009, Mr. Peter Segilmann received $474,000 in total compensation, Mr. Russ Mittermeier received $384,000 in total compensation, and Mr. Neils Crone received $312,000 in total compensation.

Conservation International has a special relationship with the Gordon and Betty Moore Foundation. Mr. Gordon Moore built his fortune as the co-founder of Intel, and founded the Gordon and Betty Moore Foundation in 2000. The foundation is based in

San Francisco, California. It is rumored that the relationship between CI and Gordon Moore goes back to 1987, when Peter Segilmann and Gordon Moore became personally acquainted after Gordon Moore gave a $100 donation (MacDonald 2008). Mr. Moore quickly became one of CI's largest backers. In 1998 Mr. Moore gave $35 million to start the Center of Applied Biodiversity Science (CABS), and in 2001 made a large $261 million grant to CI to be spread over multiple divisions and programs (Chapin 2004; MacDonald 2008).

Like many global organizations, CI must maintain good relations between its headquarters and its field offices. Field offices operate quasi-independently; they can tweak their own priorities in line with the local context but must still adhere to the core CI mission and vision and be in line with CI core programs. Funds for field offices come partly from CI headquarters and partly from their own fundraising efforts. The relationship between the two groups is relatively good, yet must be constantly managed in order to meet the expectations of both sides. Balancing the needs of both the headquarters and field offices is one of the main challenges for creating successful conservation programs. An employee of CI says:

> I think this is a challenge for any global organization, I think often realities are different if you work in field offices or a national office or an international office. At each of those levels there are important issues that should be considered, and when a program is mainly conceptualized at one of those levels and then communicated to others, there is a risk that people at those other levels may have other considerations that hadn't been considered during the conception and development of the program.

Another CI employee noted that there can be a "tension and friction" between the headquarters and the field offices. Part of this disconnect is due to different demands and different realities apparent to each respective group. Field offices are closer to the reality on the ground and more aware of how human needs and conservation priorities must be balanced; headquarters needs to keep global priorities and strategies in mind. The employee went on to say,

> And it's because of the different demands, the different realities we live in. In Washington, D.C., we are dealing with donors, we are having to raise a lot of money, many scientists here who have very little direct interaction with the field, where the field people are just immersed in that and the daily realities of that and what they do to make things work, and the scientific realities might be too far away from them to get a handle on… It's one of those things, normal human being relationships where it is hard to relate to what the other people are dealing with.

Part of CI's agility comes from the partnerships that they form in the places that they work. For example, in the Coral Triangle Initiative, CI has partnered with other NGOs (including other big ENGOs like WWF, TNC, and WCS), academic institutions, government and local people to create MMAs that preserve the at-risk biodiversity of the region. CI gives a large amount of its funding to partners. Partnerships with businesses such as with Wal-Mart and Starbucks allow CI to reach a wide audience of consumers by convincing business to change their practices.

Because CI depends on long-term donors and large donations, keeping donors happy is an extremely important aspect of CI's work. They have a large development division that nurtures financial relationships with individuals, foundations, the private sector, and governments. The Sojourner program is a way for CI to bring wealthy donors on board by travelling with them to some of the most diverse areas on earth. There are two types of grants made to CI – unrestricted and restricted. Unrestricted funds can be used by CI however they wish and give programmatic flexibility. When a donor makes a restricted grant, CI and the donor often create a granting agreement detailing objectives, timelines, reporting requirements, and interim and final deadlines. Funding that is extended based on meeting interim goals is not uncommon.

CI has a mixed reputation working with non-CI partners and local stakeholders internationally. Various publications, such as Chapin's 2004 article and the book *Green Inc.: An Environmental Insider Reveals How a Good Cause Has Gone Bad,* have characterized CI's work as heavy-handed and manipulative. Insiders within CI as well as local stakeholders interviewed for this dissertation paint a picture of an organization that, while it makes mistakes, makes a genuine effort to engage with stakeholders and include their perspectives in program planning. Relationships are very country and program specific. Viewpoints of those that interacted with CI through MMAS will be extensively explored later in this dissertation.

4.2 CI's ENGO Peers

Being a young, politically involved, internationally focused, heavily science based, centralized and hierarchical organization differentiates CI from its large ENGO peers. The most similar ENGOs to CI are WWF, WCS, and TNC. The following sub-chapter will briefly describe WWF, WCS, and TNC so as to contrast them to CI.

Founded in 1961, with work in almost 100 countries, WWF operates as a network. Its main international office is based in Gland, Switzerland. However, unlike the more hierarchical structure of CI, the WWF international office is focused on global initiatives and programmatic/administrative support for field offices rather than being an office that sets overall WWF strategy. Each office sets its programmatic and science priorities and come together for "network initiatives". An employee of WWF - US explains:

> What WWF is being organized around now, from WWF-International, are these things called network initiatives, which are a few, fewer, priorities which are large-scale and then multiple offices are supposed to contribute their resources towards achieving conservation success in those areas. And so, these top three are marine network initiatives, and there are some others as well, but there is a smaller number that supposed to have a greater proportion of resources. So that's one way that WWF is different from some of the other big international nongovernmental organizations.

The employee at WWF – US talks about WWF's science program, which is focused around those offices with more scientific capacity helping out those offices with less, and on scientific collaboration:

> WWF US is the only WWF network that has a science program. We are also then supposed to serve as a network service where other places whom are necessarily on WWF US list of priorities can also get some support and technical assistance from our shop… I head up a pretty small marine team, it is 2 ½ people, so we

> divvy up our technical support to these places, and then collaborate on bigger research questions.

Some of WWF's offices are larger and better funded than others. As mentioned previously, the entire network had an income of €444 million in 2009. Much of WWF' offices funding comes from private donations, meaning that those located in developed countries are better situated to fundraise effectively. Offices in the US, the UK, the Netherlands, and other European locations are the best capitalized. WWF offices are nominally in charge of their own fundraising; however, head offices often help those in developing countries with funding.

WWF focuses its conservation and science efforts by dividing the world into conservation planning "ecoregions". Ecoregions are meant to be representative areas of terrestrial and marine biodiversity around the world, and operate both as a branding and conservation strategy. Ecoregions are based on broad-scale biodiversity distribution and thus cross political and geographic boundaries. The 'Global 200' ecoregions were determined by WWF to be the most "biologically distinct terrestrial, freshwater, and marine ecoregions on the planet" (www.worldwildlife.org). WWF – US, one of the largest and best funded WWF offices, works and does science in six marine ecoregions: the Coral Triangle, East Africa, the Bering Sea, the Galapagos Islands, the Gulf of California, and the MesoAmerican reef. This science informs conservation advocacy efforts; WWF gets involved with politics and engages in advocacy campaigns where it feels like this direct action will make a difference.

WCS was started in 1895 as a zoological organization in New York City, NY. In 1993, it changed its name from the New York Zoological Society to the Wildlife Conservation Society. WCS runs an aquarium and four zoos in NYC as well as conservation projects in over 60 countries. WCS is similar to CI in that it is a more hierarchical, centralized organization. While field offices have a degree of autonomy and decisions are made collaboratively, final decisions on strategic direction and programs are made by headquarters in New York City.

WCS' focus is on using science to conserve the Earth's "wildlife and wild places" (www.wcs.org). Several hundred on-staff scientists are given flexibility to conduct their projects, after which results are fed into international conservation initiatives. WCS describes itself as "non-advocacy", it does not engage in political lobbying but instead works cooperatively with governments using the scientific results of their projects. WCS raises its funds with support from individuals, foundations, and governments as well as admission fees for its zoos and aquarium. According to the IRS form 990, for the 2009 Fiscal year, WCS had total revenue of $197 million (www.wcs.org).

WCS focuses its science and conservation on areas that are still ecologically diverse and face biodiversity threats. Ability to leverage funds and cooperate with host stakeholders also plays a role in geographic conservation science priority setting. An employee at WCS explains:

> How we pick it as an institution is that we are looking for places that have considerable intactness… we tend to focus on places that are ecologically intact but if we don't take action they may soon be under some pressure… Sort of an overlay of biodiversity, demand driven -- where people want us to help -- and then countries that otherwise would not really usually spend their resources on this type of thing.

The employee at WCS continued, and emphasized that WCS is very much science driven, that WCS "leads with their science" and ensures that science dictates their conservation actions rather than vice-versa.

> Very much science is how we lead…We like to think of ourselves as a mud and boots organization, we are people that tend to spend a lot of time finding and gathering the data necessary to really inform conservation.

Having started just over ten years ago, the marine program at WCS is relatively young compared to the life of the entire organization. WCS marine works in marine areas in waters off of Belize, Fiji, Kenya, Madagascar, Papua New Guinea, Indonesia, Nicaragua, Argentina, Gabon, and Congo (www.wcs.org). Programs based around species, such as sea turtles, sharks, and cetaceans, allows WCS to focus its efforts where needed outside of these seascapes. The employee gives an example of how science helped their conservation efforts in Belize:

> [A scientist], who was working with us at the time, and a number of people worked on putting together the data to demonstrate the decline of the Nassau grouper. That data then was used as the cornerstone of a conservation program to protect spawning aggregations through Belize, and now has ended up later down the line in government policies to put severe restrictions on the catch of Nassau grouper throughout the year.

Out of all big ENGOs, The Nature Conservancy has the largest domestic (United States) component. Founded in 1951, TNC was originally focused on terrestrial habitat preservation in the US through purchasing land and protecting it from development. This is still a large part of their domestic strategy; as of the 2009 TNC annual report (www.nature.org) their total assets were $5.6 billion, of which approximately two thirds were assets in the form of conservation land or conservation easements. 2009 total revenue was $547 million: low, due to the global economic crisis – in Fiscal Year 2008, it was $1.1 billion (www.nature.org). Now, TNC has expanded to work overseas with partners to further conservation goals. Partnership work can include TNC's partner buying land, but has expanded into alternative approaches such as discussing legislation, encouraging protected areas, and working with other ENGOs to implement regional strategies.

TNC operates non-hierarchically. Not a network like WWF, but not a more centralized organization like WCS, TNC has chapters in 50 states and operations in 30 countries. In each state, the chapter receives strategic direction from headquarters but is responsible for raising its own funds and working on programmatic details on its own. Overseas, each international country program sets its own priorities, creates its work plans, and gets yearly approval from its regional office.

TNCs strong finances and global reach means that they can have TNC staff on the ground to implement their programs in addition to having to work with partners.

For example, the TNC Indonesia program has almost 200 employees, of which the great majorities are Indonesian. This is different than with CI, a smaller organization that depends more on relationship leverage. An employee at TNC explains:

> I think one of the things that CI does is that they do have a lot of central science and thinkers, and they get, they work broadly, but they don't usually have as many staff in place to implement. We are more of the on the ground implementers than CI, not that they don't do it, its just it is really how we do our work. We are really place based, and they have a broader approach.

TNC focuses its science and conservation by using a "strategic, science-based planning process called Conservation by Design… landscapes and seascapes that promise to ensure biodiversity over the long term" (www.nature.org). The science informs TNC of key threats, and these key threats inform the areas for policy and implementation effort. The employee at TNC continues to say:

> We really prioritize [science] topically based on threats. What are the critical threats, and what are the things we can do something about… Our sciences said these are the key threats, these are the things we need to be addressing, and that gets translated out to a variety of different implementation areas, whether it's policy, management, best practices, it sort of depends.. We do a lot of prioritization exercises, global mapping exercises, different habitats and mapping the threats, just trying to figure out where the threats are coming from.

TNC incorporates a marine focus in many of their chapters and international programs; they also have a Global Marine Program. Staffed by just over a dozen scientists, the global marine program works to develop tools and strategies for managers and shares these lessons with their international programs. One capacity building tool recently developed was an online toolkit where MMA managers can quickly and easily access information about adaptive strategies and communicate with others.

4.3 MMAS Beginnings

4.3.1 Defying Ocean's End

In 2003, the Gordon and Betty Moore Foundation funded a conference in Los Cabos, Mexico called Defying Ocean's End (DOE). Organized by Conservation International in response to the continuing degradation of the world's ocean's ecosystems, the intention was to produce an agenda to "to address the sharp decline in ocean wildlife, the disturbing increase in ocean pollution and the neglect of policies and resources to solve these problems" (www.conservation.org).

Lasting from May 29th until June 3rd, the conference brought together over 100 conservationists, including high profile marine conservationists such as Dr. Sylvia Earle and Jean-Michel Costeau, to discuss an action agenda for marine conservation. Among others, Dr. Kaufman and Dr. Orbach were in attendance. The conference was broken down into discussions of case studies and involvement in working groups. Working groups included Ocean Governance, Restoring and Maintaining Ecosystem Function, Communication, Economic Incentives and Disincentives, the Unknown Ocean, Land-Ocean Interface, and Ocean-Use Planning and Marine Protected Areas (http://en.wikipedia.org/wiki/Defying_Ocean's_End).

During the conference, there was some dialogue about whether or not Mr. Moore wanted to actually fund a project to help save the oceans. Mr. Moore agreed to receive a marine initiative proposal from CI. The proposal was originally conceived as $22 million, meant to be focused entirely upon marine science – no conservation or intervention efforts – studying whether or not no-take marine reserves were making a difference ecologically. An employee at CI, who was at the DOE conference as well as intensely involved in crafting the original proposal, explains:

> Gordon was interested originally in the notion of whether no take reserves actually worked. He expressed an interest in work being done to move that along, to document that. The MMAS program evolved out of that, the scope of the original proposal. Subsequent work has moved beyond documenting whether no take reserves work or not, but that was the impetus, whether MMAs work or are effective management tools or not.

Dr. Kaufman took the lead role in writing the proposal. Dr. Kaufman worked collaboratively with individuals at CI, such as Dr. Roger McManus in the Global Marine Division and Dr. Tom Locker, Dr. Gustavo Da Fonseca, and Dr. Sheila McKenna at the Center for Applied Biodiversity Science to focus the scientific ideas and make sure the format and content was in line with CI's goals. Dr. Barry Gold at the Packard Foundation (soon to move to the GBMF) and Dr. David Kingsberry in the Marine Conservation Initiative at the GBMF were also heavily involved in proposal discussions. Outside of the US, CI-Brazil gave input; trips were made to Brazil by CI employees in Arlington to gain input.

During these discussions, there were some minor concerns and disagreements over what the proposal should include. Some CABS scientists saw the proposal as a way to do species assessments, build CI's marine capacity, create seascapes, and fill funding shortfalls in various country programs. Meanwhile, Dr. Kaufman and Dr. McManus were uneasy that the proposal included only science and not an effort at conducting conservation. A core MMAS team member says:

> We were both very queasy about the fact that Moore didn't want us doing any conservation. That just seemed bizarre. The oceans are in such desperate straits, you get an opportunity like that, and you are not supposed to do anything? And that's an odd attitude for a scientist, because normally you just want to do science.

After intensive debate, the original proposal was finished and submitted to the GBMF at the end of 2003. Four core goals are mentioned in the proposal: to demonstrate through science the effectiveness of MPAs in conserving biodiversity, to develop and test MPA models, to increase political will to create MPAs, and to build capacity within CABS. Within these goals existed a focus on species assessments, MPA mapping, and rapid assessment protocols (RAPs). After further conversation between CI and the GBMF, the proposal amount was reduced to $12.5 million and there was a move away from species assessments, MPA mapping, and extensive CI capacity building. The GBMF further requested that the term MPA was replaced with MMA, envisioning MMAS as an initiative that would study the full range of human activities within the marine and coastal zone. Outcomes of MMAS started to center around those that would eventually be MMAS' focus – MMA science, capacity building at node sites (with limited capacity building at CI), and S2A.

4.3.2 The Scientific Advisory Committee and Early Projects

Refining of the proposal continued into 2004. As these negotiations were ongoing, Dr. Kaufman established the Scientific Advisory Committee (SAC), a requirement of the GBMF. The SAC's members were often within Dr. Kaufman's professional and personal network, but were selected based on their expert knowledge and range of expertise, input and suggestions from CI, GBMF and Dr. Kaufman, and whether individuals were "really interested in this opportunity do an experiment that involved different human impacts" (personal interview, core MMAS team member) The committee was made up of advanced conservationists in both the natural and social marine sciences, and was intended to help focus the MMAS proposal and workplan development. It served as a sounding board for Dr. Kaufman and CI as they worked on the proposal. Individuals that served on the SAC, at any point, are included in Table 4-1. Not all individuals listed served for the entire tenure of the SAC.

Table 4-1: Scientific Advisory Committee Members

Dr. Les Kaufman (Chair), Boston University
Dr. Ratana Chuenpagdee, Memorial University of Newfoundland
Dr. Mark Hixon, Oregon State University
Dr. Michael Orbach, Duke University
Dr. Steve Palumbi, Stanford University
Dr. Charles Peterson, University of North Carolina
Dr. Andy Rosenberg, University of New Hampshire
Dr. Enric Sala, National Geographic
Dr. Rashid Sumaila, University of British Columbia
Dr. Keith Sainsbury, Commonwealth Scientific and Industrial Research
Dr. Matthias Ruth, University of Maryland
Dr. Steve Hall, WorldFish Center

The SAC and Dr. Kaufman selected the core MMAS nodes over the course of a MMAS preparatory stage lasting six to eight months in 2004 and 2005. CI gave the SAC a list of 10 areas where the organization would be interested in working. This list included the four existing nodes as well as locations such as Indonesia, Madagascar, Baja California, Bahamas, and the Sea of Cortez. Using a selection process developed by Dr. Hall that took into account political stability, logistics, biological diversity and ability to perform the MMA monitoring project, anticipated site interest, existing infrastructure, and synergy with local partners, the SAC voted on the nodes until only six nodes remained – the existing MMAS nodes and Madagascar and Indonesia. After the SAC presented these nodes to CI, CI selected the four existing nodes. ETPS was originally selected as a seascape, and then was focused down to Panama and Galapagos in 2005 and 2006.

With the exception of Brazil, there was little ongoing communication with potential nodes during this process. Dr. Kaufman was communicating with professional colleagues at some node sites. However, there was not an institutionalized effort by CI or the SAC to have all potential partners at node sites consulted. It was felt that extensive partner consultations would be premature and perhaps counterproductive because the GBMF had not yet fully committed the funding. A core MMAS team member, not yet part of MMAS in 2004 and 2005 but reflecting back on the process in a 2009 interview, explains:

> But the reality is, you are in a global conservation program funded by a large donor. The donor ends up having a fair bit of influence as to what gets decided, so it becomes this balance... But the locations hadn't been decided. So it would have been impossible to go to every country in the world and say, there is this 5% chance that your country is going to be selected, but what are your priorities.

The core idea behind the SAC was to bring multi-disciplinary experts together to give their advisory input, and to ensure scientific rigor and objectivity in MMAS planning. Valuable advisory input was received through one-on-one conversations between members of the SAC and members of the core MMAS team. However, some members of the SAC felt like the large committee meetings added little value, unsure whether members existed as a review, advisory, or decision making body. In an interview about his time on the SAC, a SAC member said:

> I didn't feel the SAC tasks were as clearly set out as they should have been; it wasn't clear what products they wanted the advisory board to produce. It was

> mostly just discussion. A lot of presentations, and in general discussion, but not so much we want specific advice on this point or that point.

A general sense of confusion and disorganization emanated from interviews with SAC members. Some SAC members were concerned that the committee held little real power, with the meetings taking place simply to review MMAS strategic decisions already made by Dr. Kaufman and (later) by Dr. Karrer. A member of the SAC said:

> What I experienced it to be was not a lot, actually. The meetings are held, we are usually told what is going on, and what has been happening. Occasionally we are asked our opinions and ideas about things. But it almost... for this particular committee, it has seemed as if many of them initiative procedures are foregone conclusions… so my experience of most of the meetings is that the committee is sort of told as to what's happening, rather than consulted regarding what is happening.

Another issue was that early on in the SAC's functional life, many relationships with node sites had not been built yet. This made it difficult to have collaborative SAC-node conversations. SAC members, as well as node scientists, felt as if greater opportunities for interaction would have been helpful. Because of this timing conflict, SAC members found it difficult to give advice for projects based in Brazil, Belize, ETPS, and Fiji. A third SAC member explains:

> I guess where it was a little bit difficult really understanding when issues were raised about difficulties [at nodes], how big of difficulties they really were. And in a sense the SAC could never get that, because there is an underground content specific reality to working with partners and others that I think makes those kinds of judgments hard to make.

Later on, there were several SAC meetings where node coordinators had the opportunity to attend. This step was helpful in that it greatly increased the SAC's insight into node activities. However, these meetings happened relatively late in the SAC's functional life.

After the nodes were selected and the final MMAS proposal was approved by the GBMF, Dr. Kaufman used MMAS funding to quickly get several MMAS projects up and running. The intention was to get early scientific results so as to increase MMAS' credibility and indicate to the GBMF and CI that MMAS could deliver progress. Early funding was more opportunistic, and supported rapid basic MMA science projects rather than long-term monitoring or projects oriented towards S2A. Projects funded at this stage included the study on Hawaii Aquarium Fish Collecting Impacts, the Ecological Effectiveness of MMAs in the Philippines, Coral Resiliency in the Bahamas, and the Fish Genetic Connectivity project run by Dr. Paul Barber and Dr. Joshua Drew (then a Ph.D. student). The total amount of MMAS' funding spent on these early projects was around 4% of the total $12.5 million.

Opinions on the wisdom of implementing these projects were mixed. Key individuals at CI and the GBMF felt that the fast tracking of these projects led to early MMAS disorganization and diluted MMAS' focus on core science at the four main node sites. Additionally, the actual roll out of some of the projects – in particular the Fish Genetic Connectivity project in Fiji – led to problems with node partners. Dr. Kaufman, however, believed that these projects were necessary to show the GBMF that MMAS could produce results. A core MMAS team member explains the impetus to fast tracking these projects:

> I basically came up with a machine that I thought would have essential pieces and then fast tracked, negotiated with potential contractors or grantees, and then fast tracked those projects, so there would be something early in the life of the project, so wouldn't look like just fluff and imagination. If I hadn't taken advantage of some existing opportunities, we couldn't have produced that in the time that we did.

4.3.3 Move to S2A Focus

Over 2005, MMAS moved increasingly from a science-only focused initiative to an increased focus on S2A and capacity building at node sites. The move to a S2A and increased capacity building focus was seen by many within MMAS as a critical point in MMAS' development. There is some disagreement in the interviews about whether CI or the GBMF drove this change. Dr. Kaufman and individuals in the SAC and CI report that they had been engaging in repeated discussions with the GBMF seeking this transformation, and that these discussions had slowly begun to have an impact on the GBMF's thinking; simultaneously, individuals at the GBMF feel that they drove CI to make this change.

At the GBMF, Ms. Meaghan Calcari at the GBMF had moved into a bigger role in overseeing MMAS. Ms. Calcari, a Duke graduate who worked with Conservation International before moving to the Marine Conservation Initiative at the GBMF, felt that

MMAS presented a large opportunity to do conservation and capacity building that could not be missed. Contemporary exposes in the media about the ineffectiveness of conservation and foundation work further encouraged the GBMF to ensure that their initiatives made a conservation difference. An employee at the GBMF explains in a 2009 interview:

> And the Moore foundation didn't want the program to just be about science, we thought the science to action piece … was really important. And then there'd been a bunch of exposes around that time, the Chapin article and the ineffectiveness of large BINGOs, we were concerned that... we wanted the emphasis to be on the field … So we also tried to emphasize different ways for in country capacity building to happen.

Regardless of which organization was the driving force, the strong S2A and capacity building transformation of 2005 set the stage for MMAS in the years to come.

4.3.4 Hiring of Senior Director, Creation of Themes and Workplan

In September 2005, Dr. Leah Karrer was hired to be the MMAS Senior Director. In late 2005, following her hiring, the GBMF, Dr. Karrer, other CI employees, and certain members of the SAC worked to give MMAS a greater structure. This emphasis was in direct response to some of the experiences of the early MMAS projects, which – as noted – were seen as unmoored from MMAS' core goals. The SAC, Dr. Karrer, Dr. Kaufman, the GBMF and others began work on selecting themes that would organize the projects into a logical format and increase understanding of MMAS by non-MMAS stakeholders.

The exact shape of the themes was finalized over the course of 2005. The themes of management effectiveness, population and habitat connectivity, climate change and resiliency, economic and cultural values, enforcement, and conservation and economic development were selected because they were seen as core MMA issues that would be relevant everywhere in the world.

Around this same time period, Dr. Karrer catalyzed three major transformations within MMAS. First, she increased numbers of and funding to social science research projects. Being a social scientist and valuing the human component of MMA science, Dr. Karrer felt this stronger emphasis was necessary. Second, Dr. Karrer solicited more social scientists to sit on the SAC. These social scientists helped to balance out the biophysical scientists that made up [until then] the majority of the committee. More social scientists contributed to more interdisciplinary discussions and provided a feedback mechanism for socio-economic, cultural, and economic workplan development. Dr. Karrer's work with the SAC ensured that social and natural science were integrated and balanced. Finally, Dr. Karrer carved out a specified amount of funding for S2A.While the overall emphasis on S2A had already been agreed to, Dr. Karrer set up the MMAS budget so that 15% of the total was specifically set aside for S2A activities. This was to guarantee that this money wouldn't disappear through science cost overruns or administration fund transfers and would be available for building a relationship between scientists and node coordinators, as well as for science communication, S2A workshops, and S2A products.

Several administrative tasks followed. One of Dr. Karrer's first administrative tasks was to fully staff MMAS in Arlington, VA. She hired Mrs. Rustandi to handle finances and administration immediately and shortly thereafter brought Dr. Samonte-Tan and Mr. Tschriky on board to oversee the (still being developed) scientific projects. Secondly, Dr. Karrer oversaw an effort by CI and the GBMF to fully flesh out the entire terms of the MMAS initiative, set the budget, list the projects, and create an MMAS overall workplan. At this point in MMAS, the MMAS overall workplan existed as a general framework. By November, as node coordinators and scientists were brought on board, the overall workplan was completely filled in and would be used to judge progress and report back to the GBMF. The workplan lists desired MMAS outcomes and tracked items such as budget allocation, study sites, principal investigators, contributions to MMA science and the like.

4.4 Structure and Staffing of MMAS

At this point in time, MMAS now had an SAC, themes, nodes, a focus on S2A and capacity building, full staff in Arlington Virginia, and a truly interdisciplinary scientific focus. MMAS then began building relationships and developing individual scientific workplans at node sites. Before focusing on action at node sites, however, it is instructive to more closely examine the structure and staffing of MMAS.

The MMAS program was within the Science + Knowledge Division of CI. The Science + Knowledge Division was formed during CI's restructuring and is an amalgamation of the Conservation Strategies Division and CABS, with most of the staff coming from CABS. The Science + Knowledge Division is the clearinghouse for scientific work within CI.

As mentioned, Dr. Leah Karrer was the Senior Director for MMAS. Having acquired her PhD at the Duke University Marine Laboratory in 1997, Dr. Karrer is a marine conservationist and a social scientist. After consulting for the World Bank and working at the National Oceanic and Atmospheric Administration directing their international socio-economic initiative, Dr. Karrer moved to head MMAS in 2005. With an understanding of both the biophysical realities and the socio-cultural elements necessary to do good conservation work, Dr. Karrer was seen as the ideal choice to head the program. Dr. Karrer reports to the head of the Science + Knowledge division and works with the staff of the Global Marine Division. She is based in Arlington VA and was responsible for ensuring that everything in MMAS got done – achieving programmatic objectives, setting up and maintaining relationships with partners and field offices, overseeing the development of scientific workplans, ensuring science to action progress, fundraising, capacity building, and reporting back to the GBMF.

Dr. Karrer's scientific counterpart was Dr. Les Kaufman. A biophysical marine scientist with a focus on tropical evolutionary ecology, Dr. Kaufman was the Senior Principal Investigator for MMAS. As an advanced academic and practitioner, Dr. Kaufman has been involved in much conservation work over the years, including working with WCS and leading a Global Environmental Facility research project at Lake Victoria in Africa. Together with others in and out of CI, Dr. Kaufman was responsible for drafting the original MMAS proposal. For the majority of MMAS, he had been involved in the oversight of the science, including ensuring rigor, performing cross-node analysis, overseeing workplans, etc. Dr. Kaufman did not have any direct administrative or management responsibilities; rather, he focuses his efforts on intellectual contributions. He was considered 25% staff by MMAS as he was funded to work on MMAS 25% of his time by CI and maintained responsibilities at Boston University for the rest of his time.

Reporting to Dr. Leah Karrer at the CI headquarters in Arlington VA were three individuals: Mr. John Tschriky, Director for Natural Science Research and Outreach, Dr. Giselle Samonte-Tan, Director for Social Science Research and Outreach, and Mrs. Septiani Rustandi, Financial manager. Mr. Tschriky has been working as a marine biologist for over 23 years with the Museum of Natural History, TNC, and WCS, mainly in Latin America and the Caribbean. He joined CI in 2006. Dr. Giselle Samonte-Tan is a natural resource economist. She was working on fisheries and social science issues in

Southeast Asia before she joined CI in 2006. Both of these individual's responsibilities were to work directly with MMAS scientists and the node coordinators to oversee the research projects and provide direct scientific and management support. Mr. Tschriky oversaw the natural science projects while Dr. Samonte-Tan oversaw the social science projects. Mrs. Rustandi managed the finances of all MMAS projects, dealing with grants, paperwork, and logistical support.

These four people at CI in Arlington Virginia and one person at 25% time in Boston made up the core MMAS team in the United States. The "core MMAS team" will be used as a term throughout the dissertation to refer to action by any combination of these individuals. However, individuals in the United States made up only a small part of MMAS' staffing. Node coordinators and MMAS scientists were equally important. A core MMAS team member describes the relationship between the core MMAS team, the node coordinators, and the MMAS scientists as a "triangle of collaboration", where each of the three points is connected to, and dependent upon, the others for full success.

Each of MMAS' main nodes of Belize, Brazil, Fiji and the Eastern Tropical Pacific Seascape had at least one node coordinator working on MMAS and reporting to their field office lead. The responsibility of the node coordinator was to "ensure that the science is useful and that it is influencing conservation in-country" (Personal Interview, core MMAS team member). This manifested itself through several tasks[1]. On the science side, node coordinators were responsible for helping to construct scientific workplans, identifying country-specific science needs, networking with in-country scientists and coordinating scientific progress, maintaining a relationship with the core MMAS team, communicating up and down the MMAS organizational structure, and synthesizing the scientific results. On the S2A side, node coordinators were the principal actors in charge of working with stakeholder's in-country to ensure that the scientific results led to policy action. Acting as science-policy translators, node coordinators communicated MMAS results – they held private and public meetings with policymakers and local stakeholders to discuss ongoing MMAS work, lobbied politicians, held networking events, and fed science into ongoing policy and management efforts, and produced S2A communication products. Some of the node coordinators were CI employees while others were not.

In Belize, the node coordinator was a Belizean, Mr. Lindsay Garbutt. Before beginning work with CI, Mr. Garbutt worked in Belizean protected area management, first with the Toledo Institute for Development and Environment (TIDE) as the deputy executive director in Toledo, and then with Friends of Nature (more recently known as the Southern Environmental Association) in Placencia. Mr. Garbutt sat on multiple

[1] The exact work of each of the node coordinators has depended upon the node; more details of how node coordinators have contributed to MMAS progress will be discussed later in this dissertation.

fisheries and protected area boards including that of the National Fisheries Advisory Board and the National Tourism Board. There was also a S2A coordinator for Belize, Dr. Melanie McField, hired in 2009. Dr. McField has been living in Belize and contributing Belize's marine conservation sector since 1990. At the time of her hiring, Dr. McField was coordinating the Healthy Reefs for Healthy people Initiative, an initiative focused on 15 NGOs collaborating to feed back monitoring results into management.

In Brazil, there were two node coordinators, Dr. Guilherme Dutra and Dr. Rodrigo Moura. Both were Brazilian. Dr. Dutra, Director of the CI-Brazil Marine program, and Dr. Moura, Ecosystem Service coordinator for the CI-Brazil Marine Program, have each been involved with CI-Brazil's marine program in Bahia, Brazil for years. Both marine biologists, sitting on protected area councils and involved in political processes, they were familiar with the scientific and political needs of the region and were seen by MMAS as the ideal science-policy translators. They got involved with MMAS in 2004 shortly after the conception of MMAS at the DOE Conference in Baja, Mexico.

In Fiji, the node coordinator was a Fijian, Mrs. Loraini Sivo. Before MMAS, Mrs. Sivo had worked in MMA design and planning for almost a decade. Well familiar with the small Fijian marine conservation community, Mrs. Sivo was brought on board MMAS in 2007 after a memorandum of understanding had already been signed between CI and the Fiji Locally Managed Marine Area network (FLMMA) in Fiji regarding work in Fiji as a node. Her late start was due in part to the originally envisioned node coordinator in Fiji, an employee of CI-Fiji, passing away unexpectedly (to be discussed later).

In ETPS, there were several node coordinators. In the Galapagos Islands, ETPS marine program coordinator Dr. Fernando Ortiz filled the role. Working with CI for over five years, Dr. Ortiz is a marine biologist with over 20 years of conservation experience in the Galapagos Islands. Dr. Ortiz was tapped by Dr. Scott Henderson, overall Director of the CI ETPS program, due to his expertise and his close connections to academic and research institutions and protected area councils. In Panama, the node coordinator was Dr. Marco Quesada with CI-Meso Sur Costa Rica, then subsequently Dr. Arturo Dominici in Panama. With an area of expertise in marine ecology, Dr. Dominici worked with the Smithsonian Tropical Research Institute and the government of Panama before starting with CI. Further, Dr. Juan Mate at the Smithsonian Tropical Research Institute in Panama oversaw much of the MMAS work there, yet was not formally a "node coordinator" through CI. Dr. Mate is a reef biologist and the marine and coastal policy advisor for STRI, and was a lead consultant for Coiba National Park's management plan.

Besides the core MMAS team in the US and the node coordinators, MMAS has cross-node coordinators who are in charge of synthesizing core scientific findings within particular disciplines across the four nodes and the global studies. Dr. Kaufman served as the ecological cross-node PI, Dr. Samonte-Tan at CI in Arlington served as the socio-economic cross-node PI, Dr. Linwood Pendleton serves as the economic valuation cross-node PI, and Dr. Michael Orbach at Duke University as the cultural cross-node PI.

At the GBMF, Ms. Meaghan Calcari and Mr. Barry Gold were involved in liaising with CI and ensuring upwards accountability of MMAS. During the bulk of the initiative, Ms. Calcari was the main GBMF contact.

There were approximately 50 studies in the four nodes of Belize, Brazil, Fiji, and Panama and outside of these nodes in locations such as the Caribbean, the North Pacific, Philippines, and Hawaii, among others. These studies and the corresponding S2A efforts have depended upon hundreds of scientists and over 75 partner organizations. The 50 studies are divided into six general thematic categories: management effectiveness, population and habitat connectivity, climate change and resiliency, economic and cultural values, conservation and economic development, and enforcement.

While these themes nominally divide the MMAS studies, the *scientific* core of MMAS can be understood through seeing the entire initiative as a global MMA monitoring project based in adaptive management. The MMA monitoring studies – ecological monitoring, socioeconomic and governance monitoring, cultural roles, and economic valuation – are therefore the heart of the initiative, carried at all four nodes. A second tier of studies – the MMA management modeling program (MIDAS), cross-shelf habitat linkages, inter-reefal habitats, enforcement chain analysis, and extinction resistance – support these core studies. Other studies within the 50 are valuable but not the scientific heart of MMAS. A core MMAS team member explains:

> So we said, let's organize our project under themes. The purpose of the themes was only to communicate the projects in a logical way. There was no grand scheme there. The grand scheme was in the monitoring design… The core of the project was setting up a global network of learning communities, all of whom had self-elected to have some sort of spatial management scheme, and needed science to tell them if and how it was working… that's the heart of the project.…

Studies were considered to be either a node study, a non-node study, a global study, or a cross-node synthesis study. Table 4-2 breaks down the studies by type with a listing of the PIs, and Table 4-3 and Table 4-4 lists the study and each study's research objectives (abstracted from MMAS overall workplan and individual scientific workplans).

Table 4-2: MMAS Studies and PIs

Study Name	Belize	Brazil	Panama (Galapagos)	Fiji
STUDIES AT ALL FOUR NODES				
Core MMA Ecological Monitoring	Shank	Moura	Guzman (Banks)	Bertrand
Core MMA Socioeconomic & Governance Monitoring	Haylock/Catzim	Curado	Mate/Suman (Quiroga)	Fong
Core MMA Economic Valuation	Hargreaves- Allen	Amend	Montenegro	Korovulavula
Core MMA Cultural Roles	Palacio	Curado	Cordero	Veitayaki
STUDIES AT 2 NODES				
Visualization and Spatial Analysis (MIDAS)	Gopal		Gopal	
Cross-Shelf Habitat Linkages	Romero/Ricketts	Moura		
Inter-Reefal Habitats	Lobel	Moura		
Enforcement Chain Analysis	Neal		Rosero	
Extinction Resistance			Edgar/Brooks	Edgar/Brooks
STUDIES AT 1 NODE				
Cruise Ship Ecological Impacts	McField			
DNA Conch Genetic Connectivity	Cigliano/Kilman			
Larval Dispersal Modeling	Paris-Limouzy			
Ecotourism Effects on Spawning Fish	Heyman			
Fisheries Assessment			Vega	
Multi-Species Aggregations		Moura		
Fish Genetic Connectivity				Barber/Drew
GLOBAL AND NON-NODE STUDIES				
MMA Global Management Effectiveness	Dahlgren/Pomeroy/Campson			
Global Socioeconomic Conditions of MMAs	Loper			
Economic Incentives	Niesten			
Advanced Biosensors: NFkB Expression	Finnerty			
Advanced Biosensors: Microbial	Rowher			
Hawaii Aquarium Fish Collecting Impacts	Hixon			
Cost Effectiveness of MMAs	Sumalia			
Deepwater Shelf Connectivity	Stone			
Coral Connectivity in the Pacific	Palumbi			
Diagnostic System for Ecosystem Health	Sala			
Coral Resiliency (Bahamas)	Mueller			
Coral Resiliency (Univeristy of Miami)	Langdon			
Ecol. Effects of No-Take MMAs (Phillipines)	Vincent			
CROSS NODE SYNTHESIS				
Ecological Cross-node synthesis	Kaufman			
Socio-economic Cross-node synthesis	Samonte-Tan			
Economic Cross-node synthesis	Pendleton			
Cultural Cross-node synthesis	Orbach			

Table 4-3: MMAS Nodal Studies and Research Objectives

Study Name *(Theme)*	**Description (Abstracted from MMAS scientific workplans)**
STUDIES AT ALL FOUR NODES	
Core MMA Ecological Monitoring *(Management Effectiveness)*	Determine ecological effects of MMAs and the critical ecological factors contributing to these outcomes at the four nodes by establishing ecological monitoring inside and outside MMAs.
Core MMA Socioeconomic & Governance Monitoring *(Management Effectiveness)*	Determine the socioeconomic and governance effects of MMAs and the critical socioeconomic and governance factors contributing to these outcomes at the four nodes.
Core MMA Economic Valuation *(Economic and Cultural Values)*	Determine the economic values of marine goods and services associated with MMAs at the four nodes.
Core MMA Cultural Roles *(Economic and Cultural Values)*	Determine the socio-cultural roles of marine goods and services associated with MMAs at the four nodes.
STUDIES AT 2 NODES	
Visualization and Spatial Analysis (MIDAS) *(Management Effectiveness)*	Provide a management tool for *predicting* MMA effects based on ecological, socioeconomic and governance variables, as well as outputs showing results of various management actions.
Cross-Shelf Habitat Linkages *(Population and Habitat Connectivity)*	Employ multiple, independent techniques to assess the connectivity among species in deepwater and shallow water (coral reef, mangrove, and seagrass) habitats.
Inter-Reefal Habitats *(Population and Habitat Connectivity)*	Map inter-reefal habitats using high resolution imagery and quantitative *in situ* assessments of presence/absence, diversity and abundance of marine species to determine the ecological function of these habitats.
Enforcement Chain Analysis *(Enforcement)*	Assess the chain of enforcement from detection to arrest to prosecution to conviction in three or more countries to identify the weakest links and to improve enforcement.
Extinction Resistance *(Management Effectiveness)*	Assess patterns of biodiversity to determine the effectiveness of MMA networks at maintaining threatened/endangered species.
STUDIES AT 1 NODE	
Cruise Ship Ecological Impacts *(Management Effectiveness)*	Evaluate the extent to which environmental operating practices for the marine recreation sector influence tourism related impacts on coral reefs visited by tourists.
DNA Conch Genetic Connectivity *(Population and Habitat Connectivity)*	Assess levels and patterns of DNA sequence variation in Belize populations of the queen conch, Strombus gigas.
Larval Dispersal Modeling *(Population and Habitat Connectivity)*	Develop a high-resolution coupled physical-biological model to track the larvae of coral reef organisms.
Ecotourism Effects on Spawning Fish *(Conservation and Economic Development)*	Examine the ecological effects of divers on various species of spawning reef fish.
Fisheries Assessment *(Management Effectiveness)*	Measure species diversity and abundance, effects of fishing hooks, importance of nursery habitats for fish.
Multi-Species Aggregations *(Population and Habitat Connectivity)*	Test the hypothesis that multi-species aggregations occur predictably at the windward shelf edge of sharply bending reef promontories adjacent to deep (>200m) water.
Fish Genetic Connectivity *(Population and Habitat Connectivity)*	Test the hypothesis that the local forms of widely distributed marine taxa are distinct species which are localized on the spatial scale of island groups and, therefore, require individual conservation.

Table 4-4: MMAS Global Studies and Cross Node Syntheses

GLOBAL AND NON-NODE STUDIES (*Theme*)	**Description (Abstracted from MMAS scientific workplans)**
MMA Global Management Effectiveness Case Study *(Management Effectiveness)*	Examine 15 case studies around the world to determine the socioeconomic, governance and ecological effects of MMAs since they were established and determine the critical socioeconomic, governance and ecological factors leading to these outcomes.
Global Socioeconomic Conditions of MMAs *(Economic and Cultural Values)*	Synthesize individual MMA site assessments to determine regional and global level trends in people's dependence on marine resources, perceptions of resource conditions and threats, use levels, and status of governance around the world.
Economic Incentives *(Conservation and Economic Development)*	Analyze economic incentive strategies in MMA sites around the world to determine reasons for success and/or failure.
Advanced Biosensors: NFkB Expression *(Management Effectiveness)*	Development of genomic and molecular assays for identifying environmental stress responses in the coral *Pocillopora damicornis* and the sea anemone *Nematostella vectensis*.
Advanced Biosensors: Microbial *(Management Effectiveness)*	Establish the correlation between human impacts and microbial numbers in coral reef habitats and establish a protocol for microbial monitoring.
Hawaii Aquarium Fish Collecting Impacts *(Population and Habitat Connectivity)*	Understand the biological ability of MPAs within MMA networks to replenish fish populations.
Cost Effectiveness of MMAs *(Conservation and Economic Development)*	Assess how MMA financial resources are allocated (e.g. funds spent on outreach v. research v. enforcement) and the returns to determine the most effective "bang-for-the-buck".
Deepwater Shelf Connectivity *(Population and Habitat Connectivity)*	Study deepwater habitats of continental shelf and upper slope (100-700m) of the Phoenix Islands to determine the functional links to shallow water MMA systems.
Coral Connectivity in the Pacific *(Population and Habitat Connectivity)*	Establish the relationship among geographical scale, mode of dispersal and degree of genetic differentiation exhibited by common Pacific Ocean coral species.
Diagnostic System for Ecosystem Health *(Management Effectiveness)*	Develop and pilot a standard diagnostic system to evaluate the ecosystem health of marine systems within an MMA.
Coral Resiliency (Bahamas) *(Climate Change and Resiliency)*	Create a set of diagnostics for determining organismal resiliency at the level of individuals and colonies of species.
Coral Resiliency (Univeristy of Miami) *(Climate Change and Resiliency)*	To determine the effects of atmospheric CO2 and ocean acidification on coral (*Montastrea faveolata*) resiliency.
Ecological Effects of No-Take MMAs (Phillipines) *(Management Effectiveness)*	To determine how the various MMA management regimes have affected the health of nearshore tropical marine systems in the Philippines and the human welfare of communities.
CROSS NODE SYNTHESIS	
Ecological Cross-node synthesis *(Management Effectiveness)*	Synthesis of ecological findings from four nodes and globally.
Socio-economic Cross-node synthesis *(Management Effectiveness)*	Synthesis of socio-economic findings from four nodes and globally.
Economic Cross-node synthesis *(Economic and Cultural Values)*	Synthesis of economic findings from four nodes and globally.
Cultural Cross-node synthesis *(Economic and Cultural Values)*	Synthesis of cultural findings from four nodes and globally.

Each of these studies had a scientific workplan that was developed in consultation with the PI, the core MMAS team, the node coordinator (if applicable), and other relevant stakeholders in-country. Development of the workplans was a major focus in the early stages of MMAS initiative. The workplans all were developed from a standard format; a format that emphasized rigorous methods, knowledge of existing conservation and science efforts, capacity building, and science to action efforts. The standard MMAS workplan included the following elements: (1) objectives, (2) existing relevant conservation efforts, (3) anticipated conservation impacts, (4) existing relevant science efforts, (5) anticipated contributions to MMA science, (6) target audience and how they would be involved, (7) in and out of country researchers and their roles, (8) in-country capacity building efforts, (9) deliverables intended for the broader conservation community, (10) peer reviewed publications, (11) timelines, tasks, deliverables and responsible party, and (12) core research methodology.

As the workplans indicate, conducting science was only one of the objectives of MMAS. The other two main objectives were to build scientific capacity (at node sites, globally, within CI) and to translate this science into conservation action. Capacity building was seen not just as providing funds – rather, it involved short and long term training of individuals and organizations and developing enduring capacity through mentoring, network building, management training, workshops, and contributing to online tools and data sharing. There would be long term partnerships developed between scientists and decision makers within each node and across nodes.

Capacity building was focused on at all four node sites and globally, but was particularly emphasized in Belize and Fiji due to existing low capacity in these node locations. Capacity building also included capacity building within CI. Funding from MMAS allowed the building and professional development of the MMAS core team, as well as other changes within CI which will be discussed later in this dissertation.

Science to action was the final objective of MMAS. Each of the scientific studies was designed to not only produce scientific publications and illuminate new scientific realities, but to make a difference in the world of MMAs at node sites and globally. The scientific workplans required that each PI – before the scientific work began – worked with the node coordinator and the core MMAS team, as well and others within their country, to think about how their science would feed into existing conservation efforts, list out how in-country stakeholders would be involved, and clarify how results would be delivered so as to add to these existing conservation efforts. The success of actually feeding science into conservation efforts depended on the study and the node-specific approach - a major focus later in the dissertation – but overall was an effort to incorporate science to action thinking at the earliest possible stage.

MMAS had a budget of approximately $12.5 million USD. Of this $12.5 million, *approximately* 12.5% went to CI overhead, 42.5% went to studies at the four main nodes, 25% to staffing costs of the core MMAS team in Arlington VA, and the remaining 20% was spent on global studies, global capacity building, and other efforts. 15% of the budget for each study was set aside for S2A.

4.5 Fiji[2]

4.5.1 Socio-economic, institutional, environmental context

Fiji is a mountainous country in the south Pacific of more than 300 islands, of which approximately 100 are inhabited. Its largest islands are Viti Levu, Kadavu, Vanua Levu, and Taveuni. According to the CIA Factbook, in 2010 its population was around 876,000 (www.cia.gov). Being relatively isolated and subjected to favorable southeast trade winds has made Fiji home to significant terrestrial and marine biodiversity. According to the 2007 Fiji National Biodiversity Strategy and Action Plan (NBSAP), the country is home to at least 2600 vascular plants, 120 bird species, and 18 mammal species. In the water, Fijian coral reefs are renowned for their high biological diversity and productivity, with the NBSAP indicating 298 species of coral and 1198 species of fish, many endemic (http://www.sprep.org/att/IRC/eCOPIES/Countries/Fiji/11.pdf).

Many indigenous Fijians live in coastal villages with tight knit communal structures headed by village chiefs. Fijian coral reefs are a source of food and income for

[2] Some material in Section 4.5 was abstracted from an unpublished S2A Assessment completed in mid 2010, in which the author was heavily involved. Only assessment material where the author was the sole writing author was abstracted.

hundreds of thousands of these indigenous inhabitants. Traditional resource management practices for in-shore fisheries are the rule rather than the exception, with marine areas being viewed as common-property as opposed to open access. Customary sea tenure (called *qoliqoli*) regulates who can and where people legally and culturally can fish. There are 385 marine *qoliqoli* in Fiji's waters, with management decisions generally made by chiefs at the village or tikina (municipality) level (Govan et al. 2008). Besides qoliqoli, traditional resource management practices include restrictions on certain gear types and fishing methods, time limited fishing bans, and t*abu*, temporary or permanent spatial closures of marine areas.

Given that the country has historically been home to these traditional marine resource management practices, there are now efforts by academic, governmental, and non-governmental organizations to work with coastal communities to create locally managed marine areas (LMMAs) utilizing these practices. LMMAs are a concept created in 2000 by Pacific conservationists to refer to "an area of nearshore waters and coastal resources that is largely or wholly managed at a local level by the coastal communities, land-owning groups, partner organizations, and/or collaborative government representatives who reside or are based in the immediate area" (Govan et al. 2009). LMMAs generally include a community creating a *tabu* where some or all marine extraction is prohibited. The hope is that the *tabu* will lead to regeneration of the fishery and spillover into adjacent harvest areas. The community decides whether the *tabu* is temporary or permanent, and it is within a larger managed area where extraction is managed and regulated.

LMMAs in Fiji are joined together by FLMMA (Fiji Locally Managed Marine Area Network), an information-sharing umbrella organization consisting of partners across various sectors. Table 4-5 describes FLMMA's activities and members.

Table 4-5: FLMMA Activities and Members as of 2010

In communities, activities that FLMMA performs include:

1. Helping to assess community interest in having an LMMA,
2. Holding community workshops to develop and implement LMMA management plans,
3. Conducting community training in LMMA socio-economic and biological monitoring,
4. Assisting communities in analyzing, and adapting to socio-economic and biological evidence.

FLMMA Members as of March 2010:

Government	*NGO*
Ministry of Fisheries	World Wide Fund for Nature
Ministry of Indigenous Affairs	Wildlife Conservation Society
Ministry of Tourism and the Environment	Conservation International
	SeaWeb
Academic/Other	National Trust
University of the South Pacific – Institute of Applied Science	FSPI
Fiji National University	Resort Support
United States Peace Corp	Coral Reef Alliance
	RARE
Communities	South Pacific Projects
387 villages, 217 LMMAs	Mamanuca Environmental Society

FLMMA is the main marine conservation network in Fiji, with all major decisions and projects coming into the country being funneled through this entity. As with many other small countries, Fiji's stakeholders are weary of fly-in fly-out scientists, and insist that foreign researchers work in close collaboration with FLMMA so to ensure lasting value for Fijian organizations. The network is intended to encourage the use of a common community-based conservation strategy and facilitate inter-organization cooperation and data sharing. Since the network began, FLMMA's partners have worked with coastal communities to establish and manage LMMAs across the country. As of 2010, there were 217 LMMA sites with 12 out of 14 provinces part of the network. LMMAs have spread due to both word of mouth – Fiji's clan-based systems ensures extensive personal social networks – and also a concerted effort by FLMMA members to spread the LMMA approach. Assisting with its spread is the fact that LMMAs have the goals of sustainable use and marine conservation but also draw on Pacific traditional resource management practices, ensuring that communities are familiar with the ideas inherent in LMMAs before they ever hear the term "LMMA".

FLMMA was established in 2000 and operates with funding from the wider LMMA member countries network (Indonesia, Phillipines, Pohnpei, Solomon Islands, Vanuatu, Papua New Guinea, and Fiji) as well as from the Packard and MacArthur Foundations, GEF Small Grants Scheme and the British High Commissioner.

FLMMA members work with communities to create and manage LMMAs (Veitayaki et al. 2004). A representative from a FLMMA member first holds meetings with the entire community about whether to establish an LMMA. This meeting includes a presentation where examples of other LMMA sites, and their biophysical, cultural, and economic benefits for communities, are discussed. Subsequently, if the community decides to establish an LMMA, the representative then works with interested individuals to harness TEK for LMMA placement and create a management plan. For example, a representative might lead discussions among fishers about where LMMA placement is appropriate given fishing patterns or species distribution, or among village leaders about ability to enforce fishing prohibitions in particular areas. Chiefly pronouncements might completely close fishing in the *tabu* section of an LMMA, or restrict it to customary fishing methods such as hook and line fishing. Management then proceeds from a strong-community based perspective, with all decisions approved by stakeholders inside the community and based in traditional practices (Govan 2009).

Of FLMMA's members, the most prominent is the University of South Pacific – Institute of Applied Sciences (USP - IAS) and the Ministry of Fisheries. The idea for FLMMA originally came from Dr. Bill Aalbersberg within USP and USP-IAS is still the driving intellectual force behind FLMMA. USP is heavily involved with most of FLMMA's LMMA sites and individuals within USP form the backbone of FLMMA's strategic direction and work. The Ministry of Fisheries is the most relevant governmental organization and works closely with FLMMA; the FLMMA chairman is a Fisheries employee with over a decade of management and research experience.

FLMMA gains input into scientific projects and conservation action through its working groups. As of 2010, FLMMA had an executive committee, a biological working group, a socio-economic working group, and a communications working group. Representatives from various members of FLMMA sit on their working groups. The node coordinator for Fiji, Mrs. Loraini Sivo, had a large role in establishing the biological and socio-economic working group.

As with any area where humans are present, Fiji's coastal zone faces threats. New fishing technologies and population pressures are contributing to overfishing (Teh et al. 2009). Runoff from agriculture and pollution from urban centers is creating eutrophication and algae growth on reefs (Sykes and Morris 2009). Poachers, driven by income needs and access to new markets, come to fish in LMMAs from both urban centers and neighboring villages. Enforcement of fishing regulation against urban fishers is difficult; there is often limited funding for patrol boats and fuel. Additionally, there is currently no legislative framework for dealing with poachers from neighboring villages in the same *qoliqoli*. As of 2009, in the Fisheries Act all villages within a given qoliqoli have a legal right to fish in the entire *qoliqoli*, making it difficult to enforce a *tabu* area set up by one particular village. Called "internal poaching", this is an issue being dealt with throughout Fiji.

Following is a map of Fiji MMAS study sites (Figure 4-1), a list of the MMAS study locations and PIs (Table 4-6), and a rough timeline of MMAS action in Fiji (Figure 4-2).

4.5.2 Translation from International to Local

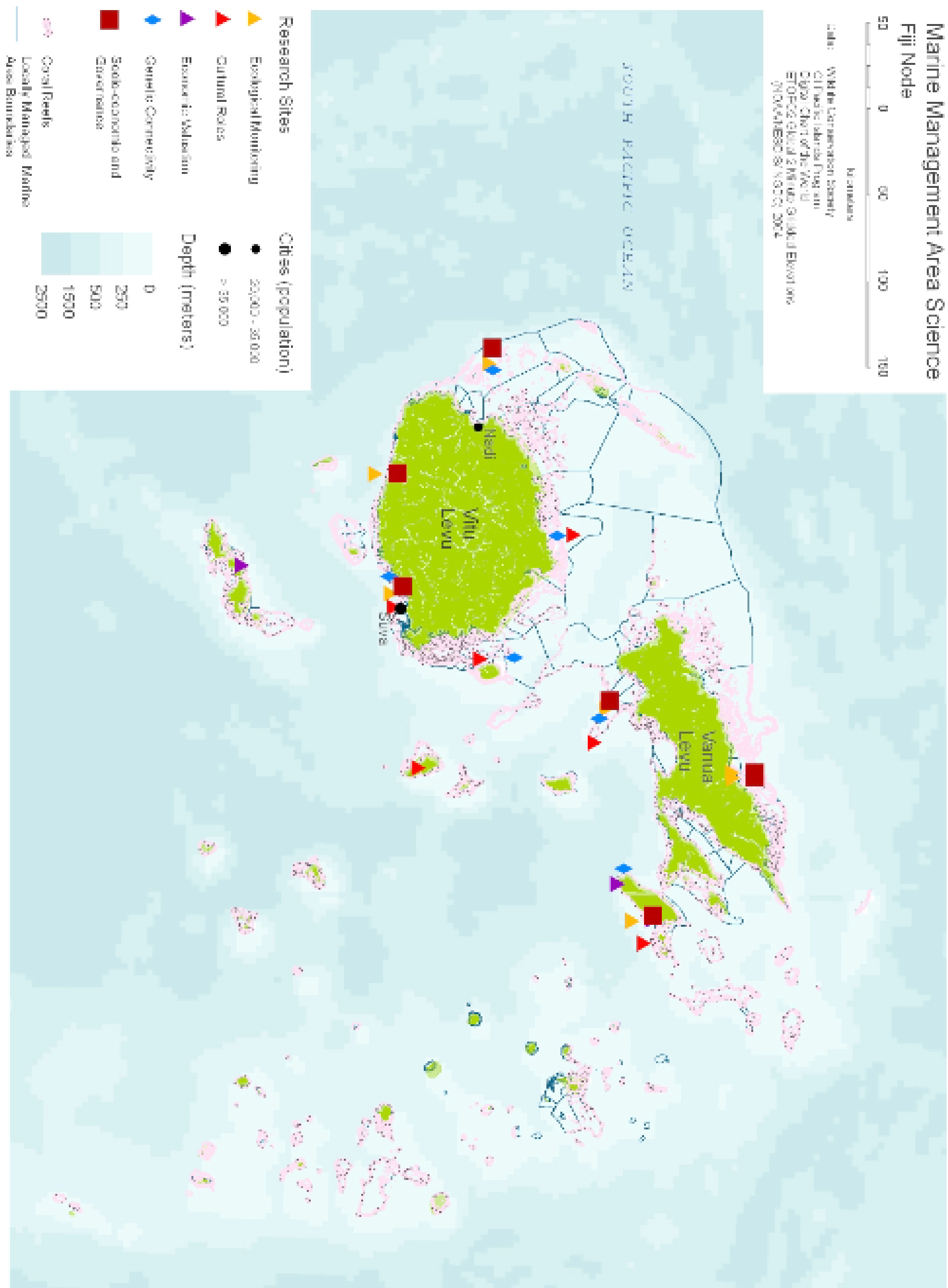


Figure 4-1: Map of Fiji MMAS Study Locations, published by MMAS

Table 4-6: Listing of Fiji MMAS Study Locations

Topics of Research (PI)	Study Locations: Village or District (Province)
Core Ecological Monitoring (Bertrand).	1. Waitabu (Cakaudrove) 2. Malolo (Nadroga) 3. Navakavu (Rewa) 4. Kalokolevu (Rewa)
Core Socioeconomic and Governance Monitoring (Fong)	1. Waitabu (Cakaudrove) 2. Kubulau (Cakaudrove) 3. Navakavu (Rewa) 4. Malolo (Nadroga)
Core Cultural Roles Monitoring (Veitayaki)	1. Waitabu (Cakaudrove) 2. Navatu (Bua) 3. Gau (Lomaiviti) 4. Waiqanake (Rewa) 5. Verata (Tailevu)
Core Economic Valuation (Korovulavula)	1. Waitabu (Cakaudrove) 2. Matasawalevu (Kadavu) 3. Navaukailagi (Lomaiviti)
Genetic Connectivity (Barber/Drew)	1. Malolo (Nadroga) 2. Yasawas (Ba) 3. Nananu-I-ra (Ra) 4. Verata (Tailevu) 5. Kubulau (Bua) 6. Naigigi (Cakaudrove) 7. Naselesele (Cakaudrove) 8. Koro (Lomaiviti)

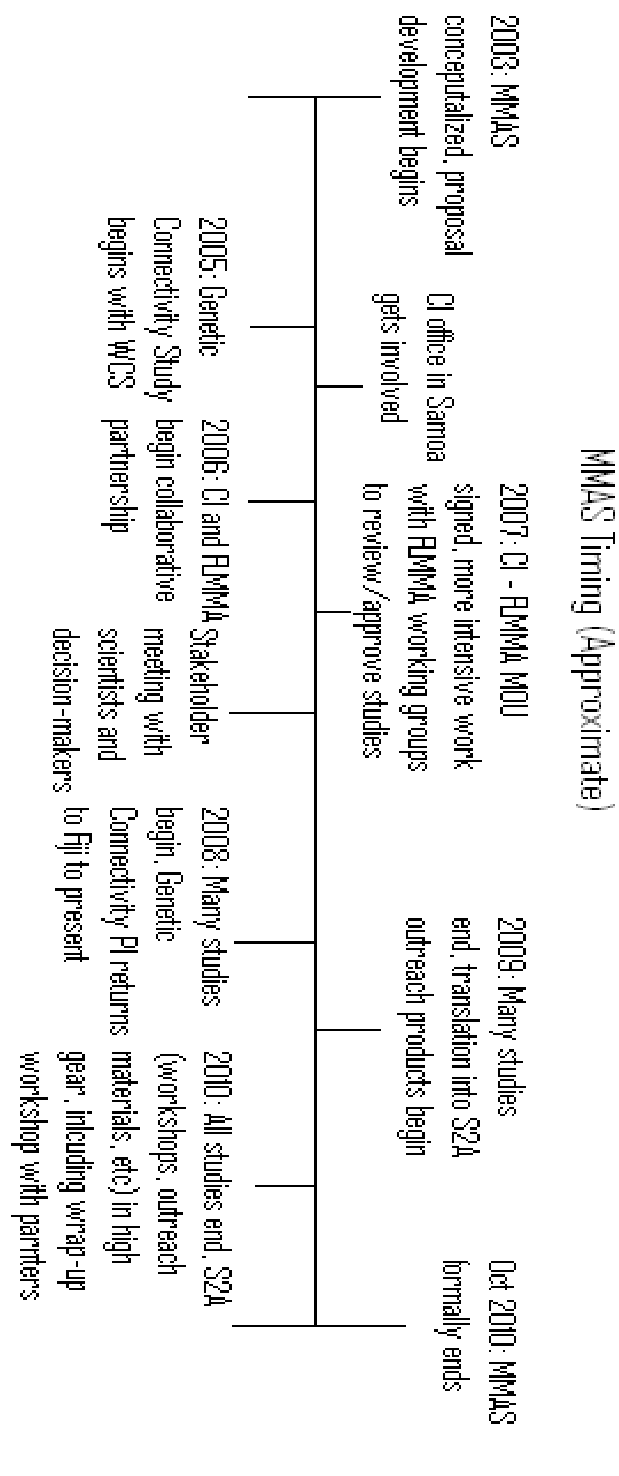


Figure 4-2: MMAS Timeline in Fiji

As early as 2005 and 2006, Fiji was the site of one of MMAS' studies. Shortly after Fiji was selected as a node, Dr. Kaufman recruited Dr. Paul Barber, ecologist and evolutionary biologist, and Mr. Joshua Drew, Dr. Barber's graduate student, to lead a Genetic Connectivity study looking at the genetic structure of populations of fish and invertebrates of Fiji and parts of Melanesia. Dr. Barber had already been studying genetics in the region, and had data for fish in Melanesia. The goal of the MMAS study was to determine if Fiji's fish and invertebrates were genetically distinct from Melanesia. If true, this finding would indicate that Fiji depends on its own fish and invertebrate populations for recruitment. Dr. Kaufman had worked in Fiji before with the Wildlife Conservation Society, and he parlayed these connections into working with WCS to arrange field visits and perform data collection.

Unbeknownst to the core MMAS team, WCS was not viewed favorably by Fiji's marine conservation community at the time. Informants mentioned that WCS was taking samples out of Fiji without permits and that the Director was having personality clashes with others in the Fijian conservation community. MMAS' association with WCS started to cause problems, and MMAS began to be viewed as 'captured' by WCS.

Generally speaking, due in part to this experience of the Genetic Connectivity study, the initial view of Fijian stakeholders was that MMAS was coming into the country without taking the time to connect with relevant institutions and gain input of those with a long involvement in the marine conservation community. Stakeholders in

Fiji were weary of fly-in, fly-out scientists and the initial actions of the Genetic Connectivity study led to a suspicion that this was MMAS' plan.

An NGO employee summarizes the dominant feeling of the Fijian conservation community when he states:

> First contact with MMAS was when MMAS approached [us] to be one of the nodes. To be quite frank I wasn't very impressed, basically because a lot of the research directions had been mapped out without much consultation with local partners, almost none really. That was a big issue for us. I understood because it was a global program we had to find common areas within the different nodes, but at the same time project such as this to be useful for the countries it needs to take into consideration country needs and research priorities.

After these initial perceptions had taken hold, Mrs. Sue Taei at the CI office in Samoa got involved. Her involvement focused initially on damage control but quickly shifted into coordinating a relationship between MMAS in the United States, CI-Fiji, and FLMMA. Involvement of Mrs. Taei brought regional and local knowledge of marine conservation issues, governance mechanisms, and participatory processes. Learning from their mistakes, the core MMAS team shifted to a more collaborative approach with subsequent studies requiring FLMMA approval and Fijian PI involvement.

MMAS began trying to coordinate other incoming MMAS projects with CI-Fiji and FLMMA. When MMAS started, CI had little experience doing marine programs in Fiji; CI-Fiji only had only one employee for a terrestrial program and no marine capacity. Unfortunately, this employee unexpectedly died, making entry into Fiji more difficult as

MMAS then had to search for another on-the-ground node coordinator. Health issues of key individuals also delayed discussions.

Eventually, the core MMAS team and FLMMA's executive board began to engage in 2006. The general objectives of the MMAS projects were first presented to FLMMA's executive board. After this presentation, the goal was to draft a memorandum of understanding (MOU) so as to define a close partnership between CI and FLMMA. The drafting of this MOU took many rounds of discussion and back and forth negotiations, with the MOU aimed at ensuring that the MMAS studies achieving both the goals of MMAS and assisting FLMMA in building its scientific capacity. Key players involved in drafting the MOU included Mrs. Kesa Tabunakawai from WWF, Mr. Sefa Nawandra from CI-Fiji, Mrs. Sue Taei from CI's Pacific regional program, and Dr. Leah Karrer from CI in the United States. As part of this effort towards capacity building, the MOU included an agreement that CI in the United States would commit $30,000 to FLMMA's trust fund. FLMMA had just established this trust fund and was asking external projects to commit 10% of their budget towards it; the idea was that donations would be a show of good faith and assist with long-term local capacity building, a core goal of MMAS.

While MMAS studies were not necessarily what Fiji conservationists would have selected if given free rein to design their own projects – several informants mentioned that studies on mitigating poaching, dealing with land-based pollution, and tracking demographic connectivity of fish larvae, juveniles, and adults would have been more useful – they did promise to address a gap in FLMMA's scientific monitoring. FLMMA had long been involved with community-based conservation techniques and community-based monitoring, and MMAS studies offered an opportunity to back up the results of this community-based monitoring with rigorous scientific monitoring data. A MMAS researcher involved in FLMMA states:

> It promised an awful lot, had huge potential, it was exciting and new. FLMMA and LMMA have got a few ongoing issues with monitoring. There is a bit of a divergence in our identity. On one hand, we are a community based management organization. I don't speak Fijian very well, couldn't do resource management at a village level. The reason I was brought in was because FLMMA and the LMMA recognized the need to have scientific evidence and understanding underpinning the work that the communities were doing.

After the MOU was drafted and signed in 2007, Ms. Loraini Sivo was recruited by FLMMA and CI as the node coordinator. Ms. Sivo worked to set up FLMMA's biological and socio-economic working groups. Following this, the job of selecting PIs for the MMAS projects was fed to the working groups. These working groups, in consultation with CI and the node coordinator, helped to select local PIs for the Socioeconomic Monitoring, Cultural Roles Monitoring, and the Economic Valuation studies. The Ecological Monitoring project had been determined in 2005 by Dr. Kaufman to be led by his student, Mr. J.F. Bertrand, but FLMMA's ecological working group adapted the project based on knowledge of FLMMA sites and the biophysical context. The group also selected Mr. James Comley and Mr. Semisi Meo as local co-PIs for the project, with all concerned feeling that there needed to be local co-PIs involved with the ecological monitoring for it to be fully successful. Both of these individuals had knowledge of FLMMA's operations and extensive experience with coral reef ecology.

FLMMA's socioeconomic working group engaged in a similar process, selecting up-and-coming USP researcher Mr. Sakiusa Fong to lead the Socioeconomic Monitoring study. Mr. Sakiusa Fong had just finished a Master's degree looking at socioeconomic issues in Macuata province, and thus was well placed to act as PI. Cultural Roles Monitoring and Economic Valuation were approached similarly, with Mr. Isoa Korovulavula and Dr. Joeli Veitayaki - a respected researcher with decades of experience examining Fijian traditional marine resource management practices – taking the lead. Going through the working groups helped to ensure diverse representation from marine conservation groups throughout Fiji.

> Basically FLMMA has these subcommittees, so it just went to these subcommittees. There was an ecological subcommittee, etc. which have representatives of most of the NGOs and government departments who are interested. Going through that had a much broader representation than just going to one single institution within Fiji. (CI-Fiji employee)

In close coordination with the node coordinator, the cross-node disciplinary coordinators, the core MMAS team, and the FLMMA working groups, the PIs developed the studies' workplans and ensured that MMAS sites and methodologies were relevant to the Fiji context. Ms. Loraini Sivo represented the interests of MMAS during informal and formal interactions. The PIs focused on the scientific components, while Ms. Sivo focused on the conservation aspects (e.g. anticipated conservation impacts, target audiences).

Selection of MMAS study sites was meant to be representative of the country's LMMAs with an eye to ecological, socioeconomic, and cultural factors, but also an ability to compare LMMA and nearby non-LMMA sites, a willingness of FLMMA partner at site to allow and assist with research, the need to allocate scarce resources (i.e. if a well funded-partner was already working at a site, MMAS didn't go there), and a geographical overlap between MMAS study sites, with the Ecological Monitoring study as driving site selector. Having all of the workplans constructed in this collaborative fashion took at least a year. The design of the Ecological Monitoring study was more constrained and less locally adapted versus the others due to coordination with BU researchers.

> Each PI was to develop a workplan. This workplan was to go through FLMMA endorsement, because we have that MOU, and any workplan that was developed for the project needed to be endorsed by the FLMMA partners. We were able to get the endorsement… but before the endorsement, you basically needed to do the budget, the sites you wanted to work on, and the other logistics in the workplan, which then gets approved by the FLMMA executive members, and then you can start to implement the process. (CI-Fiji employee)

While the specifics of the projects were locally designed, the overall objective of the studies remained governed by the framework developed earlier between CI and the GBMF. However, because FLMMA was the primary governance mechanism that MMAS worked through, all sectors were able provide input into the design of the projects.

MMAS' willingness to work directly with FLMMA was very much appreciated by stakeholders in Fiji as there was a country-wide emphasis on making sure all research coming from abroad coordinates with Fijian entities. By the end of the process, stakeholders generally were satisfied that their voices had been heard and reflected in MMAS projects to the extent possible in the context of a global initiative. As mentioned before, Fijian stakeholders were weary of scientists that didn't add value to Fiji, and MMAS – once it established a strong collaboration with FLMMA - represented a change from this model. Having local PIs in the lead for the majority of the studies also helped to gain local support.

> I think the bonus thing about it, three of the key projects, they had involved in country PIs. These in-country PIs were local people who had expertise in their areas and knew what was the need of what they were looking into. Like I had mentioned earlier, developing the workplan not only involved one PI but also involved the consultations and feedbacks of the other partners. We had inputs by WCS, WWF, Fisheries, and other FLMMA partners as to how the project should be. (CI-Fiji employee)

4.5.3 Translation from Science to Policy

Data collection for all Fiji studies except the Genetic Connectivity Study proceeded in 2008 and early 2009. The Genetic Connectivity study, due to its early start, had already been completed and had engaged in policy translation efforts (to be discussed later). PIs for the Economic Valuation, Cultural Roles Monitoring, and Socio-

Economic and Governance Monitoring studies worked independently, with data collection proceeding based on the PI's personal and professional schedules.

For the Ecological Monitoring study, local PIs Mr. Meo and Mr. Comley worked with Mr. Bertrand from Boston University in the United States to collect data. Very quickly, the local PIs found it to be disadvantaging to have Boston University control the research funds. Data collection progressed slowly due to a need to coordinate data collection trips with the visits of Mr. Bertrand to Fiji, and a need to adhere to foreign diving protocols. Since diving was to be done with a U.S. organization, the Fijian divers needed to get American Association of Underwater Scientist (AAUS) certifications. Both of these factors added frustration and paperwork to Ecological Monitoring efforts and led data collection to be low compared to initial workplans. A MMAS researcher explains:

> JF was only able to come to Fiji four times to do survey work, and for personal reasons, was only able to stay for 2-3 weeks at a time. So essentially we just haven't had the time, and freedom to be able to do surveys when we could… So it was increasingly harder and harder to organize a team of Fijian divers when JF was in country… We all work for NGOs, have 180% of our time for other projects. This project was an added bonus, and something really good for FLMMA. But … because you can only do work for that two week period when JF is in country, people just went back to their normal work.

Generally, before beginning data collection in local communities, PIs liaised with both the district or provincial offices and the associated FLMMA partner to gain research permission. Upon entry to the communities and before beginning data collection, PIs gave a community presentation and held lots of discussion with community stakeholders. These presentations involved a question and answer session where community members could explore how the study met local data and livelihood needs. A local community stakeholder at Waitabu Marine Park, one of the sites selected for research, describes her experiences with the Ecological Monitoring study and the Socioeconomic and Governance Monitoring study:

> Both Meo and Saki presented their work and what they were doing at a village presentation. Besides this formal presentation, they talked to people about what they were finding around the kava bowl. Word about the projects spread by word of mouth to the entire community… I think that the results will be useful for the village. When the marine park first started, people weren't aware of how it would affect their lives. The projects help to teach the village about the effects of the MPA, if it is improving their lives and if it is working.

Following is Table 4-7, listing MMAS's final study results for Fiji.

Table 4-7: Fiji Study Final Results

Topics of Research (PI)	Main Results (Abstracted From Final Study Reports)
Core Ecological Monitoring (Bertrand)	LMMAs have a positive effect on the biomass of fishes within the boundaries of the management area. No-take zones increased the biomass of fishes within their boundaries by 40% or more in Navakavu and Waitabu. Little evidence of spillover. Few differences in hard coral and benthic coverage between sites, habitats, and protection status. Lack of effects and spillover may be due to small no-take zones within LMMAs.
Core Socioeconomic and Governance Monitoring (Fong)	LMMA users have higher marine related income, more diversified livelihoods than non-LMMA users. There is no evidence to conclude that LMMA users take advantage of marine resources in a more sustainable way. However, LMMA users have stronger perceptions of non-monetary benefits of MMAs than non-LMMA users. LMMA users have stronger environmental awareness and knowledge and local values than non-LMMA users. LMMA users perceive management in LMMAs are more effective than non-

	LMMA users for non-LMMA sites. LMMA users are more likely to know the rules and regulations, be involved in meetings and management plans. LMMA users are more likely get information and training from FLMMA bodies than non-LMMA users. Information dissemination is more efficient among LMMA users. Conflicts, illegal fishing has not been reduced among LMMA users compared to Non-FLMMA users.
Core Cultural Roles Monitoring (Veitayaki)	Cultural roles and traditions are crucial to the declaration of LMMAs, but are not working effectively in contemporary context of government regulations and policies. Government support to sustain customary practices in managing resources was poor. Poaching is a huge issue in LMMAs, but enforcement of poaching is difficult due to legislation and lack of resources for enforcement. Traditional ties and relations were increasingly abused in an effort to benefit unfairly from LMMAs. People who were involved in managing their resources were under continuous pressure to relax their management arrangements because they considered their LMMAs their premier fishing areas The community engagement approach through LMMAs enhanced the management of marine resources and boosted rural development activities. Community members of LMMAs were getting more resources and were spending less time working to obtain what they wanted. LMMAs have helped to generate income. Communities perceived the MMAs as belonging to their NGO partners. This feeling made it easier for the people to trade their MMAs for much needed material goods.
Core Economic Valuation (Korovulavula)	Preliminary findings from Waitabu LMMA show that the area provides many benefits to the village such as fish, shellfish, and seaweed; coral reefs and mangroves protect village from storms.
Genetic Connectivity (Barber/Drew)	Five species of Fijian fish are genetically distinct from those in Melanesia. There is a general pattern of low genetic variation within Fiji. The Fijian archipelago represents a largely cohesive functional unit in terms of genetic connectivity, but at greater spatial scales, the islands of Fiji are unlikely to be connected to other reefs in the Indo-Pacific for several species investigated. Fiji should be treated as a unique conservation entity separate from other management plans in the Indo-Pacific region.

Table 4-7: Fiji Study Final Results (cont'd)

As results of the studies emerged, they were shared with Fijian stakeholders through several mechanisms. First, as local PIs were all connected to USP, departmental meetings provided a regular opportunity to share emerging results with university colleagues. Additionally, USP's marine campus is small, and there were many opportunities for impromptu interactions and discussions. Second, regular meetings with the FLMMA working groups enabled PIs to talk with managers and policymakers, share results between sites, and brainstorm how the results could be used in the context of FLMMA's ongoing work. Third, Ms. Sivo – in her capacity as the node coordinator position at CI-Fiji and the biological working group lead, while liaising with the core MMAS team in the US - disseminated results and organized them in the "S2A Matrix", where she planned out policy outcomes and S2A efforts. For local stakeholders, the PIs returned to the communities to discuss the results. As of interviews in fall of 2009 and spring of 2010, efforts to return results to communities were still ongoing. Results emerged from the Ecological Monitoring study more slowly, due to problems with international coordination. The Economic Valuation study also fell behind schedule as the PI moved to Australia to begin a Ph.D. program.

Responsibility for capacity building through the studies generally fell to the studies' PIs, and differed based on the inclination of that PI and the disciplinary focus. Stakeholders in communities were generally engaged through direct employment and assistance with data collection. The Cultural Roles study engaged multiple graduate students from USP for cultural data collection and analysis, and the Socio-economic and Governance study gave a presentation to FLMMA partners about how to conduct socio-economic surveys and maintain a database.

> Both at the community level and the partner organizations here… in doing these socioeconomic studies, we had a session for those that were interested on how to conduct the basic… designing your database, questionnaire, and things like that. (MMAS Researcher)

The most extensive capacity building was done through the Ecological Monitoring study. The local and foreign PIs trained individuals from FLMMA partners – including the Ministry of Fisheries and USP – in ecological monitoring techniques. Skills such as performing transects, doing fish and invertebrate identification, estimating coral type and percentage cover, and estimating fish size and biomass were taught. The opportunity to train was open to the entire FLMMA biological working group as well as those selected to be directly involved in Ecological Monitoring surveys. Training was slowed somewhat due to the infrequent opportunities for monitoring, which in turn was driven by the infrequency of Mr. Bertrand's Fiji visits.

> Capacity building is slightly different. From the ecological perspective it has been a fair amount, as much as could be given. We have got into the swimming pool, counted and measured fish, trained as a team. The problem is that that team has dispersed. Sure, we all see each other around the university, but that team has not been able to stay together because we have done 4 surveys over two years. We disperse when the work is over and then come back together when JF lands. (MMAS Researcher)

The studies also contributed to capacity building of the FLMMA network. Besides the long term capacity building through the grant of $30,000, the implementation of the studies encouraged FLMMA's members to collaborate with each other, share data, and plan future monitoring efforts. As mentioned, the working groups – a tool for cross-sector collaboration and feedback – emanated from Ms. Sivo's efforts. There was also a GIS training workshop held in October of 2009.

Mrs. Sivo was in charge of the S2A efforts for all the studies**.** Using a the S2A matrix as a framework, Mr. Sivo collected emerging results from the PIs, simplified the results into understandable key messages, and organized workshops, meetings, and seminars to disseminate key messages. FLMMA remained a crucial mechanism for doing so, with Mrs. Sivo talking about results in the biological working group and executive committee meetings. Beyond these meetings, Mrs. Sivo used MMAS S2A funding to organize community workshops in which MMAS results were discussed and used. Because there was instability at the national scale (there had been a military coup recently), Mrs. Sivo determined that S2A funding would be better focused on workshops at the community scale and not on extensive efforts to influence national policymakers.

For the Genetic Connectivity study, finished first of all MMAS studies in Fiji, there was a trip by the US-based PI back to Fiji to present final results in 2008. Oral discussions with stakeholders in communities, posters, and media articles returned the findings to a wide range of groups. Stakeholders from a wide range of sectors were happy with this dissemination. In particular, community stakeholders were practically overjoyed that a researcher had returned to the village to present the results. Interviews revealed that it is not common for foreign researchers, even Fijian researchers, to return to villages to present results. Despite the fact that this study started off with a non-collaborative approach, it ended up being highly praised.

As of June 2010, there had been community workshops in Yandua, Ovalau, Beqa, and Vanuabalavu. These workshops, intended to share knowledge from the MMAS studies, lasted 2-3 days and included representatives from numerous nearby communities. At the Yandua workshop, there were 70 community members. The Ovalau workshop involved representatives from 27 communities on two islands, with 80 participants. Beqa and Vanuabalavu had representatives from nine and ten communities, respectively. Workshops began with presentations about LMMAs and how they work – using examples from MMAS studies and a large cache of previous FLMMA experience - but quickly turned to small group work where community members worked to identify threats, identify environmental solutions, and create management plans. Interactive activities such as drawing problem-root trees (with the problems being the fruit, the roots being the root causes) assisted. In these workshops, community members found the results of MMAS studies helped affirm their commitment to resource management and protection. Workshops also included talk about the utility of Yaubula Management Support Teams (YMST)[3]. At several of the workshops, MMAS PIs attended and discussed their results.

Mrs. Sivo also organized a partnership with SeaWeb, where results from primarily Socio-economic Monitoring and the Cultural Roles Monitoring studies were shared with a larger audience. SeaWeb is an organization focused on communicating science to communities and on "bridging the gap between journalists and scientists". SeaWeb published papers about the Cultural Roles Monitoring findings to present to communities, engaged the Ecological Monitoring and Socio-economic Monitoring PIs in a "SeaSeries" program where PIs present and explain scientific findings to local journalists, and recorded a radio program where MMAS key messages were shared.

Finally, Mrs. Sivo coordinated the production of outreach materials. These outreach materials were disseminated throughout 2010, and consisted of colorful posters, booklets, T-Shirts, DVDs, and fact sheets. Again using the S2A matrix as a framework, each of these outreach materials were oriented around conveying scientific information to a targeted audience, and influencing that audience to support some sort of policy of management impact.

The following section discusses some of the policy, management, and capacity building outcomes of MMAS in Fiji.

---

[3] YMST stands for Yaubula (Yau meaning asset, bula meaning alive, together meaning life asset or living resource) management support team. These YMSTs are based in communities and act as liaisons for scientific information between Suva and communities.

4.5.4 Policy, Management, Capacity Building Outcomes

The MMAS studies in Fiji operated in an environment where there was already FLMMA organizing and running substantial community outreach and science work. Not operating in a vacuum, scientific messages coming out of MMAS studies served to reinforce FLMMA community monitoring results that had been known for years. Thus, it is thought that S2A impacts of MMAS have been due primarily to the learning process of conducting the work, the rigorous scientific confirmation of previously performed FLMMA work, and the presence of a large amount of funding for S2A rather than an uncovering of surprising management or policy messages. The process of conducting MMAS studies in Fiji was at least as helpful as the results. Policy, management, and capacity building impacts of MMAS studies include the following, below.

1. **Increased international credibility of the LMMA approach.** While FLMMA had been doing LMMA work since 2000, much of the effort had focused on community engagement and small scale community based monitoring. This focus has been driven by local needs but more critically a general lack of funding for FLMMA to conduct rigorous ecological, socio-economic, and cultural monitoring of LMMAs. There has been scientific monitoring at some FLMMA sites – WCS in the province of Kubulau and Resort Support at Waitabu being the most visible – but this has been the exception rather than the rule.

While community based monitoring of LMMAs was recognized as legitimate by local actors, the international scientific community required more rigorous scientific protocols to be used to give LMMAs credence. MMAS, by enabling this scientific monitoring of LMMAs, began to confirm community based monitoring results and show that LMMAs are biophysically, socially, and culturally beneficial in a way that the international community respects. Due to the timing of the completion of the studies, Socio-Economic and Governance study and Cultural Roles study findings were the most useful. Findings from both of these projects were presented at international conferences, increasing respect for the LMMA approach. FLMMA stakeholders expect that this visibility and credibility will help fundraising, empowering future efforts. A government employee said of the MMAS studies:

> As I said, it only adds to the science based information that we really wanted. I am speaking now from Fisheries point of view. Many times we talk at the Fisheries office and only talk on heresay and observations, and this data is science based and proven through trials… It was a big learning experience, people have been coming to Fisheries and asking, "where do you get all this knowledge?"… Personally, this has given me a big boost in my knowledge base.

2. **Strengthened cooperation among FLMMA partners.** The process of revising and discussing the MMAS projects in FLMMA's working groups, conducting MMAS projects at FLMMA sites, and engaging in MMAS-funded FLMMA community workshops helped to strengthen communicative ties between FLMMA partners. FLMMA partners say that this process made it more likely that similar large scale cross-

cutting projects would be conducted in the future if funding was available. The MMAS process also exposed communicative fault lines in FLMMA – particularly between WCS and the rest of the partners – that have subsequently been worked on and improved.

> The enabling multi-organizational team workshops also have strengthened FLMMA by bringing its partners closer together. It has brought all of us together and the communities benefit because there is different skill sets and knowledge. On top of this, because each of these partner organizations works in different areas around Fiji, we are able to share experiences from all over the country and also bring in people that are from the area. (FLMMA Partner)

3. **Strengthened capacity of individuals within FLMMA.** Local PIs, especially those of the Socio-economic and Governance study and the Economic Valuation study where researchers were in the beginning stages of their careers, gained capacity and knowledge by working on MMAS projects. These researchers brought increased knowledge into future research endeavors and thus will strengthen Fiji's overall scientific capacity. The Ecological Monitoring project trained a team of individuals from NGOs, the Ministry of Fisheries, and USP in coral reef and fish survey techniques, likewise giving them skills endured past MMAS' departure. MMAS results were presented by PIs at FLMMA's annual meetings, sharing scientific knowledge.

4. **Creation of several new *tabu* areas.** MMAS S2A funding allowed a greater number of FLMMA community workshops, workshops where results from MMAS studies and past FLMMA work were presented. This funding also enabled, for the first

time, representatives from a large majority of FLMMA partners to be able to travel to community sites. Multiple examples from across Fiji were shared with participating community representatives. The Cultural Roles study was the most influential study due to Fijian's deep connection to cultural issues.

> For the studies, the cultural roles had the greatest impact. This was because of the fact that communities related to a lot, in terms of why things are not working in terms of cultural approaches… The Genetic Connectivity helped the communities think about how to set up their MPAs, and for the SocMon and EcoMon, communities began to realize the importance of their LMMAs and the benefits that they were getting out of it, and this was good. (CI-Fiji employee)

These workshops led to a number of S2A impacts. As a result of the Yadua workshop, the community decided to set up a permanent *tabu* area near an iguana national trust heritage site. A temporary *tabu* area near the village was also established for five years. Communities on Ovalau, hearing the ecosystem based management messages inherent in many of the studies, are discussing setting up a forest reserve in addition to their existing marine *tabu*. Dissemination of Genetic Connectivity study results in 2008 within the context of FLMMA helped create interest in the village of Naigigi in creating a *tabu*. The MMAS final report to the GBMF indicates that 80 communities took part in some sort of workshop discussion, with over 60% of communities showing a stronger commitment to, or creating a new, *tabu.*

5. **Creation of YMST teams, spreading of enthusiasm about LMMA approach.**

Community workshops contributed to the creation of several YMSTs. In Ovalau and Beqa, the workshops directly led to the creation of these teams. While FLMMA has been creating YMST teams before MMAS, MMAS encouraged YMST teams to proliferate. See Table 4-8 for more information on the Ovalau Moturiki YMST.

Table 4-8: Ovalau Moturiki Yaubula Management Support Team

While in Fiji, the author had the opportunity to travel to Ovalau and learn about the Ovalau Motoruki Yaubula Management Support Team (OMYMST), newly established as a result of a MMAS. Mesake Drainatu, who has five years experience working with FLMMA and with his village's (Natokalau) tabu, is the OMYMST coordinator and acts as a liaison between FLMMA and the local communities. According to Mesake and other YMST representatives in Natokalau, YMST teams are tasked with: 1) Monitoring and implement what is in the village's LMMA management plan, 2) Helping in disseminating information on how to manage environmental resources, 3) Collecting biological and socioeconomic information 4) Linking NGOs and researchers that are interested in working in area to provincial office, 5) Sharing lessons learned from one site to another, village to village and province to province, 6) Taking a leading role in disseminating information within the village and district, 7) Choosing a rep from a site within a province to FLMMA annual meeting, 8) Being the voice of the community to the government and NGOs. Villages select members of their YMST teams. Each of these teams selects a representative for a district YMST team, which is run by a coordinator. The coordinator works through the provincial office to liaise with NGOs, government, and researchers from USP and the Fijian Institute of Technology. Since the OMYMST team started several months ago, they have already worked on the management plan, secured scholarships for 10 students from the province to study at any Fijian university, wrote letters to NGOs and government about local environmental issues, spoken with government entities about reforestation, and worked on composting toilets and smokeless stove projects. They are also currently looking to get GEF funding for small community development efforts. OMYMST represents 34 villages on Ovalau and Moturiki.

Presentation of MMAS results in workshops helped communities feel commitment and ownerships of their *tabus*; communities could see that *tabus* worked in other areas and efforts to manage resources and take pride in the natural environment could make a difference. Several community members and FLMMA partners mentioned how these workshops have empowered communities, giving them a realization that with the help of partners, they *can* conserve their cultural and biological heritage. A coordinator of an YMST says:

> The workshop funded by Conservation International help the communities have better ownership of their work… Lo presented the science part, presented the genetic part, said that the fish from Fiji have to replenish themselves. Now, as a result, the community realizes that they have to conserve their own fish, they can't depend on fish from somewhere else. This is the first time communities have heard this, it encourages them to take conservation very seriously...

6. **Contributed to review of Fisheries legislation.** A review of three pieces of fisheries legislation – offshore fisheries, inshore fisheries, and aquaculture, all part of the Fisheries Act – was ongoing in Fiji during MMAS' S2A efforts. FLMMA was invited to present and contribute to the review of the inshore fisheries piece, with members of the Ministry of Fisheries and one of the local Ecological Monitoring PIs presenting. Findings from the other MMAS studies complemented and improved FLMMA's submissions. The Cultural Roles study results were particularly helpful as it highlighted the need for a legal framework for community established tabu areas.

> FLMMA was invited to the inshore fisheries legislation discussion. I presented, James, and Maggie, and submitted FLMMA's submissions on some of the key issues that had been highlighted previously… MMAS studies complemented and improved FLMMA submissions. (Government Employee)

7. **Encouraged increased poaching enforcement by the Ministry of Fisheries.** The node coordinator gave a presentation to the Permanent Secretary of Fisheries in which results from MMAS studies were discussed. The problem of poaching was discussed, and following this discussion the Fijian Navy began to increase efforts to monitor and stop poaching in Fiji's waters.

8. **Contributed to FLMMA's move towards three tiered monitoring approach.** There had been discussions in FLMMA since 2004 about how to best learn from LMMA sites and move towards a tiered monitoring approach. FLMMA decided to devote the majority of their effort to monitoring the experiences of present sites rather than in creating new sites (although they will help communities create new sites upon request). This approach was finalized in 2009 and has an aim of maximizing learning, minimizing data-collection burdens on communities, and using limited funds.

According to the 2009 LMMA report (www.lmmanetwork.org), the first level of monitoring is done by the majority of LMMA sites. No monitoring takes place, but the community completes a checklist requesting simple anecdotal information about the effectiveness of the LMMA as perceived by community stakeholders. The second level consists of community-based monitoring. Underwater visual censuses (UVC) for simple key indicators, and catch per unit effort (CPUE) and compliance and enforcement surveys are done to collect ecological and socio-economic data annually or bi-annually. The third level is the most rigorous, and consists of scientific data collection methods confirming level two data. The objective is not just to calculate livelihood-related measures but assess the impacts of LMMAs on coral and fish biodiversity. This level is intended to be scientifically precise, and uses techniques such as extensive UVCs with SCUBA gear, surveys analyzed with statistical methods, and semi-structured interviews.

As part of MMAS and chair of the FLMMA biological working group, Mrs. Loraini Sivo was expertly placed to take a role in these discussions and bring in MMAS findings. Mrs. Sivo and the Socio-economic and Governance and Cultural Roles PIs worked to develop streamlined "success indicators" for LMMA sites based on MMAS methods, success indicators that were incorporated into the new monitoring approach.

4.5.5 Emergent Themes across Case

Themes from the literature emerge through the examination of MMAS in Fiji.

1. **Program Initiation.** The basic programmatic framework of MMAS was decided in the United States. Individuals from CI, Boston University, the SAC, and the GBMF developed MMAS' overall structure; individuals at node sites were not generally included in discussions. Thus, when MMAS first approached Fiji, it had to overcome a

perception of foreign ownership and little local input. Contributing to this perception was the ill-advised linking with WCS for the Genetic Connectivity study, and the failure to approach FLMMA before research had begun on that study.

2. **Networks, partnerships, and coalitions.** The assistance of a CI office in Samoa, and subsequently Ms. Sivo at the CI-Fiji office, allowed a strong partnership to be built with FLMMA. FLMMA served as an umbrella organization; it brought government, academic, NGO, and community stakeholders together to hold discussions and orient the MMAS studies towards relevant Fijian science needs. MMAS research could strengthen FLMMA's ability to do future work, make use of FLMMA's history to leverage impacts, use FLMMA's connection to community level stakeholders, build on FLMMA's scientific expertise and communication capacity, and utilize FLMMA's information sharing mechanisms (annual meetings, working groups).

3. **Participation across scales and the science/policy boundary.** In Fiji, there was a concerted effort to recruit local scientists as PIs so to gain local knowledge and provide an understanding of the policy context. Scientists took time to hold discussions across scales (up to the core MMAS team in the United States) and with academics, managers and policymakers while drafting the study workplans.

The ability to hold effective, participatory discussions was assisted by personal and professional networks, creation of an MOU, involvement in FLMMA's working groups, and the efforts of Mrs. Sivo. Personal and professional networks allowed scientists to engage with experts when needed. The MOU set out terms of collaboration between CI and FLMMA. The working groups operated as a regular forum for a diverse array of stakeholders to engage, learn, and give input. Mrs. Sivo, in her capacity as the node coordinator, was invaluable in engaging a wide range of stakeholders, leading working group discussions, creating communication opportunities, and organizing community workshops.

While designing and implementing the studies in this participatory fashion took time and possibly delayed scientific progress, the process built trust between CI and FLMMA, which in turn enhanced the ability of the studies to lead to policy and management impacts.. FLMMA partners felt like CI was treating them with respect. These feelings of mutual respect enabled the partners to see the studies as more theirs and more willing to accept the findings as valid and useful.

4. **Accountability and the Ability to Learn.** The experiences of MMAS in Fiji show a strong propensity of CI to learn. When MMAS realized that their initial approach to doing research in Fiji was unsuccessful, they quickly pivoted to engaging with FLMMA and creating a more participatory process. This ability to learn was assisted by the CI

office in Samoa, which understood what stakeholders in Fiji were thinking and saying, and let the core MMAS team know that its initial research approach was unsuccessful.

5. **Translation of Scientific Knowledge.** Mrs. Sivo took the lead role in active knowledge translation. While S2A outreach materials such as t-shirts, posters, and booklets were useful and contributed to scientific messages being heard and understood, the most effective translation was done through in-person community workshops. The workshops worked because they disseminated understandable messages, included MMAS PIs who could speak directly about their research, and engaged community members in participatory activities that linked MMAS study results directly to local livelihoods and traditional management practices.

6. **Assessment Context.** Experiences in Fiji show that it is important to know if umbrella organizations or other governance mechanisms are operating in a country. Existence of these organizations creates greater opportunities for participation and adaptation of studies to local context. Choosing to work outside of these organizations can cause severe disruptions.

MMAS results in Fiji contributed almost exclusively to decision making processes at the local scale. Contributing to the national level discussion was more difficult; the government of Fiji had recently undergone a military coup and was seen as quite unstable; thus, FLMMA and MMAS focused mainly on community level engagement. Being aware of the political reality enabled Mrs. Sivo to avoid unproductive efforts and focus on a scale where change could realistically happen.

4.6 Belize

4.6.1 Socio-economic, institutional, environmental context

Belize is a small country in Central America bounded by Mexico, Guatemala, and the Caribbean Sea. According to the CIA Factbook, its population was 314,000 in 2010 (www.cia.gov). Despite being roughly the size of the US state of Massachusetts, Belize possesses significant terrestrial and marine biodiversity. Along with Mexico, Guatemala and Honduras, Belize's waters are home to the MesoAmerican Barrier Reef System (MBRS). The MBRS, parts of which are World Heritage Sites, is the second largest barrier reef in the world and the largest in the Western Hemisphere. The Belizean section of the MBRS is 280 km long and covers 1400 km^2 (McField and Bood 2007). Belize's reefs are critical to the country's development, providing food, income, and tourism business opportunities for the country's population.

Belize is recognized internationally as a leader in establishing both terrestrial and marine managed areas. There are 18 MMAs in Belize's coastal zone, covering 22% of its atolls and continental shelf (McField and Bood 2007). The MMAs are generally zoned into schemes including both marine reserves and areas which allow fishing and tourism.

Currently the zoning of Belize's MMAs leans heavily towards large areas being open for fishing, meaning few areas are completely protected from extractive activities. This issue, in addition to issues with MMA enforcement and financing, unrestrained tourism development, illegal fishing, land based pollution sources, climate change, hurricanes, urchin die-off, and cruise ship impacts means that Belize's coral reefs are severely degraded compared to 25 years ago (McField and Bood 2007). Sedimentation, algal growth, fish depletion, and bleaching of the reefs are increasing at an alarming rate.

The political situation in Belize makes for an interesting context for conservation. While legislation for marine protection and fisheries management is present, enforcement of said legislation is lacking. Lack of funding for MMA enforcement has made it difficult to control illegal fishers from Belize, Guatemala and Honduras. Government agencies are strapped for funds and personnel; therefore, Belize relies heavily on the NGO sector and donors external to the country such as the World Bank, the Global Environmental Facility, and the Oak Foundation to provide marine and fisheries management capacity.

Within government, the most important stakeholder is the Department of Fisheries. This department regulates and implements closed seasons and catch limits on export fisheries such as finfish, lobster, and conch. It also directly manages MMAs, including Glover's Reef Marine Reserve and South Water Caye Marine Reserve. There are government advisory boards for tourism and fisheries.

Several NGOs co-manage MMAs with the Department of Fisheries. Most relevant to MMAS are the Belize Audubon Society (BAS), the Southern Environmental Association (SEA) and the Toledo Institute for Development and Environment (TIDE). SEA is an amalgamation of the former NGOs Friends of Nature and Toledo Association for Sustainable Tourism and Empowerment (TASTE). BAS co-manages the Half Moon Caye Natural Monument, SEA co-manages Gladden Spit and Silk Cayes Marine Reserve, Sapdilla Cayes Marine Reserve, and Laughingbird Caye National Park, and TIDE co-manages Port Honduras Marine Reserve. These co-management arrangements are not standardized across MMAs; however, they reduce financial and personnel pressure on the Department of Fisheries while allowing civil society stakeholders to take a larger role in marine resource management. Local communities are connected to the MMAs through involvement with NGO's education, outreach, and advocacy efforts.

Other NGOs, academic institutions, and quasi-governmental agencies are also present in Belize. The Wildlife Conservation Society is a strong presence in marine research and works closely with the government to turn research into policy outcomes. It runs a research station at Glover's Reef Marine Reserve, and has coordinated a working group on fish spawning aggregations for over seven years. The University of Belize (UB) is home to several of the country's most preeminent marine scientists, but overall lacks in financial, institutional, and human capacity. The Department of Forestry manages the country's forest resources and works with the Department of Fisheries to manage some protected areas. The Protected Area Conservation Trust (PACT) is a conservation trust, funded out of an airport tax and dedicated to management and preservation of Belize's protected areas. The Meso-American Barrier Reef System (MBRS) project looks to create a framework for the reef's sustainable use, and houses data on the state of the reef's ecosystem. The Coastal Zone Management Authority and Institute (CZMA/I) is a coastal quasi-government management policymaking and research institution in Belize City. The CZMA/I was active from 2000 until 2003, then offline until re-opening in 2008.

Despite the fact that the marine management sector in Belize is small, and many of the stakeholders know each other personally and professionally, there is little cross-institutional data sharing and communication. The Association of Protected Area Management Organizations (APAMO) is attempting to fix this issue by linking Belizean protected area management organizations' personnel together into a web of communication. APAMO also aims to advocate for improved environmental policies. Established in 2007, APAMO has two permanent staff in an office in Belize City.

Following is a map of Belize MMAS study sites (Figure 4-3), a list of the MMAS study locations and PIs (Table 4-9), and a rough timeline of MMAS action in Belize (Figure 4-4).

4.6.2 Translation from International to Local

Figure 4-3: Map of Belize MMAS Study Locations, published by MMAS

Table 4-9: Main Belize MMAS Studies and Locations

Topics of Research (PI)	Study Locations:: Village, marine area
Core Ecological Monitoring (Shank)	1. Half Moon Caye National Monument 2. Southwater Caye Marine Reserve 3. Sapodilla Cayes Marine Reserve 4. Laughingbird Caye National Park 5. Port Honduras Marine Reserve
Core Socioeconomic and Governance Monitoring (Haylock/Catzim)	1. Sarteneja 2. Chunox 3. Copper Bank 4. Dangriga 5. Hopkins 6. Sittee River 7. Indedepence 8. Placencia 9. Monkey River 10. Punta Negra 11. Punta Gorda
Core Cultural Roles Monitoring (Palacio)	1. Sarteneja 2. Hopkins 3. Seine Blight 4. Placencia
Core Economic Valuation (Hargreaves-Allen)	1. Gladden Spit and Silk Cayes Marine Reserve
Visualization and Spatial Analysis (Gopal)	N/A
Cross-Shelf Habitat Linkages (Romero/Ricketts)	Transect running from Placenica Lagoon to Glover's Reef Atoll; Southwater Caye MR.
Inter-Reefal Habitats (Lobel)	Lagoon between the coast and the first ridge of mangrove cays in the Southwater Caye MR.
Enforcement Chain Analysis (Neal)	N/A
Cruise Ship Ecological Impacts (McField)	Note that all of the below are sites on the MBRS. 1. Canalito 2. Hol Chan 3. Coral Garden 4. Caye Caulker 5. S Gallows 6. Lee Reef 7. Coral Grove 8. Rendezvous 9. N. Silk 10. Laughing Bird 11. Ranguana 12. Goffs
DNA Conch Genetic Connectivity (Cigliano/Kilman)	Sapodilla Cayes Marine Reserve
Larval Dispersal Modeling (Paris-Limouzy)	Glover's Reef Marine Reserve
Ecotourism Effects on Spawning Fish (Heyman)	Gladden Spit and Silk Cayes Marine Reserve

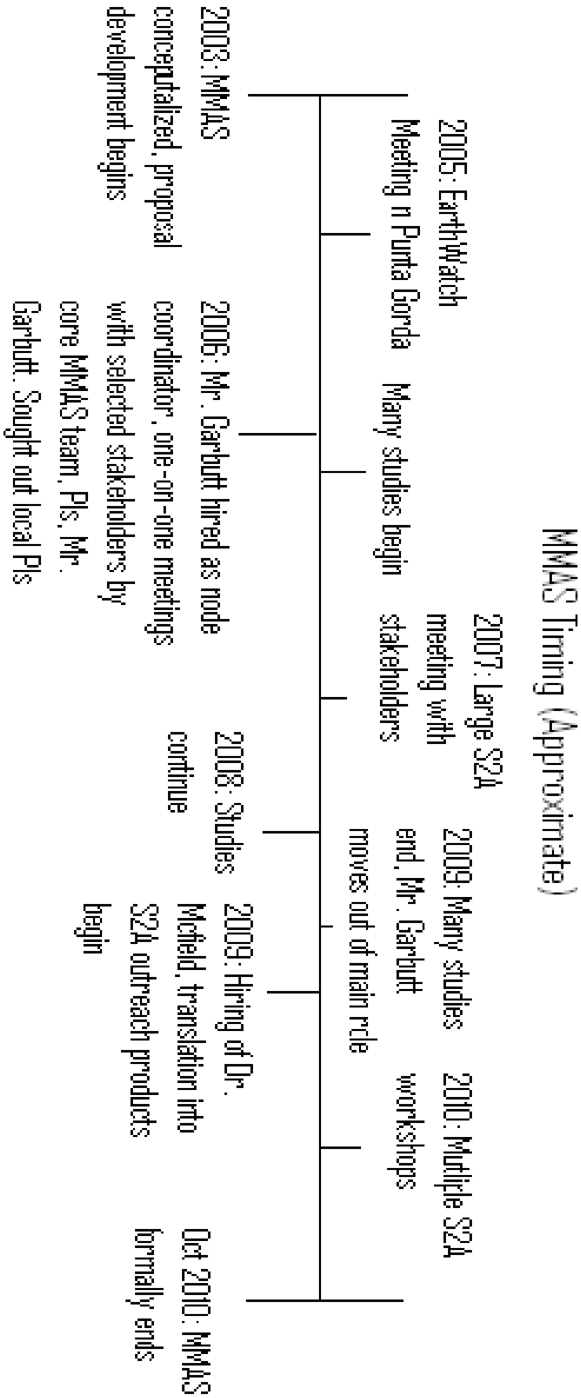


Figure 4-4: MMAS Timeline in Belize

In May 2005, the Belizean NGOs TASTE and Earthwatch organized a meeting in Punta Gorda to determine how to focus a research program for the Sapadilla Cayes Marine Reserve. Over thirty individuals from NGOs, government, universities and local user groups attended and engaged in three days of marine research discussions. Due to a long professional association with Earthwatch, Dr. Kaufman participated. For Dr. Kaufman, the meeting acted as a catalyst for his thinking about how the core monitoring studies in Belize would be structured. Dr. Kaufman also used it to gather ideas about what sort of studies beyond core monitoring would be useful for the country. For example, discussions with both Belizean and non-Belizean professionals with knowledge of Belizean science needs resulted in plans to do the DNA Conch Genetic Connectivity study, led by Drs. Cigliano and Kilman. A MMAS researcher explains:

> Idea of the EarthWatch meeting was for researchers to ask the stakeholders about what the stakeholders needed to know to manage their fisheries and the reef. During that meeting, Les and John, during a side conversation, were talking about the need to look at the population genetics of conch to try to figure out gene flow among conch populations, genetic connectivity of conch populations. John told Les than he and myself were thinking about doing that work, Les asked us to write a proposal to MMAS, and this is how we got into the MMAS program… people were discussing fish, conch, lobster, and idea to focus on conch came generally out of EarthWatch meeting.

Dr. Kaufman had previously determined that the PI role for the Ecological Monitoring study would be held by one of his graduate students, Mr. Burton Shank. Mr. Shank, a reef biologist with a background in ecological monitoring and surveying subtropical fish assemblages, was looking to do advanced coral monitoring research to complete his PhD. Involvement in MMAS brought a comprehensive research opportunity as well as PhD funding. In 2005 and 2006, Dr. Kaufman and Mr. Shank developed the Ecological Monitoring study workplan, working with the core MMAS team and consulting with the Department of Fisheries in Belize to determine the sites, refine the methodology, and get necessary permissions and permits.

Meanwhile, various individuals inside and outside of CI looked to recruit PIs for the other MMAS studies and gain a deeper understanding of the country's science and management needs. Belizean stakeholders were tired of foreign scientists doing science in the country without an understanding of the context and without contributing value to Belizean organizations, and the core MMAS team wanted to avoid falling into this trap. The core MMAS team, Dr. Karrer in particular, was very adamant that the science was to have applications to management and that local stakeholder groups, particularly senior scientists, should be involved to the extent possible. Dr. Karrer and others in the core MMAS team travelled to Belize periodically and held early discussions with individuals at the Wildlife Conservation Society, the Nature Conservancy, the Department of Fisheries, the Southern Environmental Alliance (then Friends of Nature), and the Oak Foundation. These conversations helped contextualize MMAS' Belize projects and make selected stakeholders aware of what CI was planning. Mrs. Imani Fairweather-Morrison at the Oak Foundation was particularly helpful in giving recommendations for PIs and feedback on MMAS' general direction.

Mrs. Morrison recommended Mr. Lindsay Garbutt as node coordinator. Dr. Kaufman and Dr. Lobel met with him while in Belize in 2006, and Mr. Garbutt was hired shortly thereafter. Mr. Garbutt had been working in protected area management for over a decade and seemed well placed to coordinate the scientific studies and subsequent S2A activities. Active on various consultative boards and NGOs, he was currently working as the head of Friends of Nature, an NGO based in Placencia. MMAS responsibilities for Mr. Garbutt were in addition to his ongoing work, so he agreed to work in a part-time role. Mr. Garbutt was excited about being involved in MMAS as he saw MMAS as a way to finally start turning Belizean science into policy, a traditional area of weakness for the country.

When looking for Belizean PIs, the core MMAS team found that Belize did not have an extensive cadre of trained scientists, and those that were trained were not available. A core MMAS team member explains:

> There is one small University… You just don't have a lot of people to choose from. There are excellent scientists at the University of Belize, and at the nongovernmental organizations. But most of them have full-time jobs, so they are not just hanging out, waiting to do a part-time project.

The relative lack of scientific capacity in Belize led to an emphasis on foreign PIs. Out of the final total, foreign PIs represented approximately 60% of all PIs in Belize. Foreign PIs that became involved were generally connected through personal and professional networks with core MMAS team members, but also were selected based on their potential to create S2A-relevant science and perform rigorous, high quality scientific work. Dr. Kaufman connected with colleagues at Boston University to recruit Dr. Phil Lobel (Inter-Reefal Habitats) and Dr. Suchi Gopal (MIDAS), an experienced biologist and geographer, respectively. The head of the Economic Valuation study, Mrs. Venetia Hargreaves-Allen, was a PhD student looking to do economic work in Belize, and was recruited based on direct contact with the core MMAS team.

Those recruited from within Belize were likewise experienced and well-qualified. Recruitment of PIs was done based on recommendations from stakeholders in Belize, as well as through knowledge of those PIs in networks that could fill the roles. For example, after a recommendation from Mrs. Morrison, Dr. Karrer recruited Mrs. Adele Catzim and Mrs. Diane Haylock to be the PIs for the Socio-economic and Governance Monitoring study. Hired as consultants, they both possessed extensive knowledge and skills gained from conducting social science research and working with Belizean communities for over 15 years. Dr. Kaufman approached Dr. Leandra Cho Ricketts, an experienced marine ecologist at the University of Belize, to lead the Cross-Shelf Habitat Linkages study. Dr. Kaufman had met Dr. Ricketts at the earlier EarthWatch workshop. For the Cultural Roles study, Dr. Orbach recruited Dr. Palacio, a native Garifuna anthropologist based in the south of Belize. Due to Dr. Palacio's time commitments, although he was intimately involved in the study design and write-up the majority of the fieldwork on this study was done by three graduate students, Mr. Greg Moretti, Mrs. Noella Gray and Mrs. Chantelle Clarke (also a native Belizean).

Other studies were either initiated based on perceptions of stakeholders needs or as opportunities arose. The Cruise Ship Ecological Impacts study arose somewhat opportunistically as another CI division had been working with Dr. Melanie McField on the cruise ship industry, and it made sense to incorporate her project into MMAS. The Ecotourism Effects of Spawning Fish study was proposed and designed by Dr. Will Heyman and Dr. Phil Lobel, in consultation with the core MMAS team. Dr. Heyman had had a lot of experience working in Placencia and with the whale sharks and spawning aggregations there, and had wondered about the effect of the noise of tourism on the both spawning aggregations of finfish and whale sharks. The Enforcement study for Belize came on relatively later, in 2009. Mr. Garbutt, after seeing the enforcement study take place in the Eastern Tropical Pacific Seascape, got the idea that an enforcement study in Belize would well complement the ETPS study and could provide information that could be useful for the country's policymakers. Mr. Garbutt then recruited Mr. Dwight Neal, an independent consultant, to do the study.

Once the PIs for the studies had been recruited, the process of developing the individual study workplans began. Workplan construction involved discussions and sharing between the PIs, the core MMAS team, and Mr. Garbutt. The PIs provided scientific expertise and methods planning while Mr. Garbutt focused on policy and management implications. Each of the workplans had to work to balance the scientific, management, and governance needs of Belize with the overall MMAS model.

In addition to the work of the core MMAS team, PIs attempted independently to gain input from Belizean stakeholders. For example, Mrs. Catzim held discussions about her study with heads of marine NGOs in Belize City and Punta Gorda while Mr. Shank talked with science officers in SEA, BAS, and TIDE. Stakeholders were generally excited about MMAS' early and declared notion of specifically doing science that was targeted towards management applications and that some of the science was filling in information gaps that had long existed in Belize. For example, a government employee, reflecting on the MMAS studies, said:

> The connectivity study is very important, many researchers have shown correlation between mangrove and reef environment…Research that shows connectivity will allow them to protect areas holistically instead of isolating the protection of different areas… This will identify gaps for Fisheries and then we will be able to address them.

However, some Belizean PIs and other stakeholders found workplan development to be difficult and frustrating, believing that that consultation with a wider range of Belizean stakeholders on the design of the studies had been insufficient, and it would have been better to have left more room for local adaptation in the studies.

> When the project was first suggested, my gut reaction was that it was impossible. I had concerns… it took 6-9 months to get local ownership and buy-in… [We] put in questions that CI wanted but also use it as an opportunity to get buy-in by

> getting questions that the managers wanted… It worked out great, but when there is NOT that preliminary stage of getting buy-in it creates problems and makes people have to backtrack. (MMAS Researcher)

4.6.3 Translation from Science to Policy

Data collection for the MMAS studies began when their individual workplans were fully completed. For some studies, it took almost a year to recruit the PIs and design the workplans. Most of the studies, such as the Ecological Monitoring study, Socio-Economic Monitoring Study, Economic Valuation Study, Cultural Roles Study, MIDAS, Ecotourism Effects of Spawning Fish, and the Inter-Reefal Habitats Study started data collection in 2006 or 2007.

In 2007, Mr. Gabutt and the core MMAS team in the United States arranged a S2A Workshop in Belize City. This workshop had two objectives: (1) to bring the Belizean conservation community up-to-date on the development of the MMAS studies and complement the earlier one-on-one discussions, and (2) engage this community in planning MMAS S2A impacts. The workshop was well attended by NGO representatives. Few representatives of user groups (i.e. fishers) attended.

The workshop engendered two responses. Firstly, many were happy that CI was making a serious effect to link science to policy, a recognized area of weakness for Belize research. Secondly, many were surprised by the extent of MMAS' work in the country and disturbed that they had not been consulted earlier. Stakeholders felt that MMAS was attempting to post-facto devise S2A applications for studies that had been designed without sufficient coordination with and input from Belizean NGOs. Most strongly, representatives from BAS and TIDE felt that their organizations only learned the full range of MMAS' work – in MMAs that they managed - at the workshop, and that earlier consultation could have allowed synthesis of MMAS' and their NGO's ecological monitoring efforts. It appeared that the outreach at the 2005 Earthwatch workshop, as well as one-on-one discussions with the core MMAS team, Mr. Garbutt, and the PIs had not been effective in creating an extensive feeling of buy-in. A NGO employee explains:

> [Their NGO] didn't feel like they were involved sufficiently when projects were initiated, this is one reason why we were not on board for the length of the project. I feel strongly that for [NGO] to be fully involved, we need to involved in the development and the design of the projects. This allows them to decide what they can and want to do.

Each PI worked independently on data collection as their personal and professional schedules allowed. Mr. Shank coordinated work on the Ecological Monitoring study with the science officers at both SEA and TIDE. Capacity building efforts varied greatly depending on the study and the personal initiative of the associated PI. Mr. Shank, through the Ecological Monitoring study, did the most capacity building. During his visits to Belize, he trained individuals in ecological monitoring and survey techniques, taught two resource management and statistical training courses, and mentored a particularly promising student, Mr. Eli Romero. Mr. Romero later used these skills to join Dr. Cho-Ricketts as the co-PI for the Cross-Shelf

Habitat Linkages study, and Dr. Kaufman eventually secured a scholarship for him to attend Boston University for a Master's degree. The capacity building led by Mr. Shank had multiplier effects, as those that received training were able to go back to their own organizations and share insights with others. A MMAS researcher explains:

> Often, we've enabled biologists to leave their usual work sites and dive on other reef systems, giving them insights into the way their own system works or resetting their baselines for the condition their system could be in… I also taught two intensive courses for resource managers in cooperation with the University of Belize and the Protected Areas Conservation Trust; one on relational database design and one on introductory statistics, 20 and 15 participants respectively… it certainly helped them better understand the need for standardized data collection techniques, consistency in data collection, and proper archiving.

See following for Table 4-10, listing Belize study final results.

Table 4-10: Belize Study Final Results

Topics of Research (PI)	Main Results (Abstracted from Final Study Reports)
Core Ecological Monitoring (Shank).	The MMAs had a minimal effect on the enhancement of fish assemblages and little or no effect on the state of reef bethos. More enforcement, increases in size and representativeness of fully protected zones needed.
Core Socioeconomic and Governance Monitoring (Haylock/Catzim)	Majority of respondents across communities did not link a change in economic or health status to MMAs. Commercial fishers linked negative economic outcomes to establishment of MMAs, only communities with opportunities for tourism linked positive economic outcomes to establishment of MMAs. Establishment of MMAs is linked to a change in marine resource patterns, but positive impact from the rules is nullified due to an increase in fishers, small no-take zones, and largely inadequate patrolling. Marine management bodies lead to greater environmental awareness and knowledge. Acceptance of marine resource management is related to the level of economic reliance of communities on marine resources. Economic livelihood needs drive resource users to employ unsustainable practices.
Core Cultural Roles Monitoring (Palacio)	None of the four communities report significant impacts from the establishment of the Laughing Bird or Gladden Spit MMAs.

	All four communities have been affected significantly by the development of the leisure-tourism industry; by the development (or lack) of infrastructure such as roads; by the trends in labor, alternatives such as timber and fruit; and by in-migration from neighboring countries.
Core Economic Valuation (Hargreaves-Allen)	As of 2007, Gladden Spit and Silk Cayes Marine Reserve was worth $1.3 million per year and have a net present value of US$13-29 million over 25 years.
Visualization and Spatial Analysis (Gopal)	Modeling software developed.
Cross-Shelf Habitat Linkages (Romero/Ricketts)	All species examined that concentrate as adults in coral reef habitats depended upon sea grass and mangrove at least until reaching a standard length of ca. 15cm. Furthermore, there is a net shift toward offshore habitat with increased size in all species but *L. synagris*, which appears to be a lagoon specialist.
Inter-Reefal Habitats (Lobel)	There is a patchwork of scattered hard bottom oasis habitat that fish use to cross the open sand/silt planes. If these oasis habitats are clustered, they may form an important "stepping stone" corridor for migration and thus, would be important sites for environmental protection.
Enforcement Chain Analysis (Neal)	While functioning mechanisms and agencies that are responsible for patrols and surveillance, detection, arrest/interception, prosecution, and sentencing exist, efficiency and effectiveness can be significantly improved through effective communication, greater collaboration and more efficient coordination. Enforcement is an expensive process that that has very few immediately tangible results. There is much more illegal activity in MPAs than is being reflected by the number of cases. There needs to be documentation of the enforcement process and proper handling of the documents. There are several pieces of legislation that govern maritime spaces in the country of Belize. There are jurisdictional overlap and gaps that need to be addressed. Every agency has its own approach to the enforcement problem.
Cruise Ship Ecological Impacts (McField)	Variations in coral cover not consistent with visitor use levels. More highly visited sites have more mortality than controls. More impacts, such as disease, fin marks, etc. seen at highly visited sites. Visitor impacts decreases after snorkeler education programs.
DNA Conch Genetic Connectivity (Cigliano/Kilman)	Within queen conch, there is no more genetic variation among locations than would be expected. Conclusion that could be drawn from these findings is that queen conch have a history of gene flow that obscures any demographic discontinuity that might exist today.
Larval Dispersal Modeling (Paris-Limouzy)	Fish larvae from Glover's Reef spawning aggregation are less dispersed than previously thought. The grouper population that aggregates at the northern cape of Glover's Reef may also be local and needs to be managed accordingly.
Ecotourism Effects (Heyman)	Impacts of dive ecoutourism on spawning aggregations and whale shark behavior is limited.

Table 4-10: Belize Study Final Results (cont'd)

As results started to come out, they were shared with managers and policymakers through a variety of mechanisms. First, the core MMAS team attempted to use the MBRS program as a mechanism to combine MMAS data with other existing datasets, and in the process build more comprehensive datasets[4]. Second, the core MMAS team, the PIs, and the node coordinator, Mr. Garbutt attempted to personally discuss results with stakeholders. Core MMAS team members organized several visits down to Belize and used these opportunities to hold meetings with managers in NGOs and the Department of Fisheries. PIs attempted to discuss the results during fieldwork and post-fieldwork Belize visits (in the case of foreign PIs). A MMAS researcher discusses some of the challenges with this approach:

> Well, you know, again, it is sort of the thing that you have to trade off your time allocation. In my case, if I am in country for so many days I have the choice of being in the field collecting data and on land talking about the data that was collected. It is the sort of thing that in an ideal world I would have had more time on land. I did have enough time in the water to get done what I needed, but it would have been better if I had had time to, every time I was down there doing fieldwork to do the rounds and expect to spend one day working with any manager or co-partner down there, to at least give them an opportunity to ask what is going on.

In 2007 and 2008, Mr. Garbutt was deeply involved in Belizean marine governance, sitting on the National Protected Areas Commission, acting as an advisor to the Belize Fishermen Cooperative Association, and professionally connected to high-

[4] Unfortunately, this attempt was not successful due to financial reasons.

level Belizean policymakers. During participation in these meetings, he was occasionally able to discuss MMAS' studies results. Further, Mr. Garbutt was also involved in working on the creation of APAMO, and used this opportunity to try to build a partnership with this organization. Mr. Garbutt also oversaw the production of MMAS newsletters which showcased MMAS emerging results in an understandable, colorful format.

In 2009, Mr. Garbutt became occupied with running a private business and moved out of his roles on councils and management boards, leading to a drop in MMAS result dissemination. An NGO employee states:

> [Mr. Garbutt] was a member of APAMO board. Heard about MMAS from Lindsay, heard lead investigators were coming to Belize and that the lead investigators wanted participation. Lindsay would indicate at board meetings that the project was ongoing and provide some feedback. But he is no longer on APAMO board as of 2009… I really doesn't recall as to what the whole project is about at this point. There is a lack of information generally.

Interviews in 2009 and 2010 indicated that awareness of MMAS studies in Belize was low. Many community members interviewed knew little about the MMAS studies; some were unaware that they were even taking place. The Ecological Monitoring study was visible due to its capacity building efforts; other studies were slightly visible either because community members were surveyed or because the PI had a history in the community. Stakeholders generally viewed the studies as being timely and relevant to the Belizean management and policy context. The Ministry of Fisheries, which had required yearly permit applications from the PIs in order to continue the research, was able to stay informed as to study progress. Other managers and policymakers in Belize, however, were generally unsatisfied with the level of information sharing about, and input into, the studies during the design, implementation, and dissemination process. Another NGO employee in Belize offers insight:

> Not everybody. For example, Belize Audubon, one of the key people at BAS did not know about the project. BAS is the oldest, largest conservation NGO in Belize – of all people they should know. Again, reason for them not knowing I couldn't say… CI has had discussions with BAS. Maybe information was not filtered down to field people, managers? Most people that I talk to are aware of it, but there is more outreach and consultations, dissemination that needs to be done.

Beginning in 2009, responsibility for S2A was transferred to Dr. Melanie McField of the Healthy Reefs for Healthy People Initiative. Dr. McField took charge of S2A efforts in 2010 identifying relevant policy and management issues, distilling key scientific messages from the studies, promoting MMAS key messages through booklets, posters, an educational video, newspaper articles, radio blurbs, and television programs, organizing workshops with MMA managers to discuss S2A applications, and holding one on one meetings with policymakers to insert results into policy and management. As in Fiji, a S2A matrix was used as a framework to plan, and repeated discussions were held with PIs and the core MMAS team to refine efforts.

In February of 2010, Dr. McField organized a large stakeholder meeting in Belize City where the final results of MMAS studies were disseminated to a large audience of governmental, NGO, and local community representatives. There were also several smaller, more targeted S2A workshops. In April of 2010, Dr. Mcfield organized an S2A workshop where stakeholders worked through key messages coming out of studies and discussed how these messages could be disseminated. It was attended by the coordinator of APAMO, several fisheries officers, WCS, several independent consultants, and some PIs. In July 2010, Mrs. Mcfield organized a workshop with the Ministry of Fisheries. Using the results of the Ecological Monitoring study and the Enforcement Chain Analysis, she emphasized the need for a greater emphasis on enforcement and enforcement training. This workshop helped to narrow the information gaps that had existed about the MMAS studies' results.

4.6.3 Policy, Management, Capacity Building Outcomes

Many of the MMAS projects were just finished when the second round of interviews were conducted with stakeholders in 2010, making it relatively early to try to analyze all of the S2A impacts. Most S2A impacts were generally modest. Below are the policy, management, and capacity building outcomes in Belize.

1. **Contributed to zoning plans, no-take areas for the South Water Caye Marine Reserve and Sapodilla Cayes Marine Reserve.** When down in Belize, several PIs took the initiative to feed their data into ongoing MMA zoning efforts. The baseline data from

the Ecological Monitoring study was incorporated into the zoning plan for the Sapadilla Cayes. Mr. Dennis Garbutt, Fisheries Manager for the Sapodilla Cayes marine reserve, indicated that Mr. Shank's work discovered healthy coral areas, leading to the establishment of a no-take area of approximately 5% of the marine reserve.

> Because of work that Burton's team was doing, they could identify pristine habitats for the preservation zone – Burtons work identified good habitats for no-take zone in concert with work of other scientists. Now it is 5% preservation zone and located in the north. Just a couple of days ago, the demarcation and enforcement of this preservation zone went into effect. (Government Employee)

The Interreefal Habitats study, in concert with data from the Smithsonian on sponges and tunicates, helped to show that Pelican Caye was an area of endemism and worthy of protection. These results contributed to a new no-take zone around Pelican Caye in the South Water Caye Marine Reserve.

2. **Contributed to several Codes of Conduct.** Data on diving and sound impacts from the Ecotourism Effects on Spawning Fish study was incorporated into a Code of Conduct called "How to Dive on Spawning Aggregations", developed by SEA. The Cruise Ship Impacts study results also were used to develop a code of conduct for snorkeling on reefs. As of 2010, Mrs. McField was working with the Belize Tourism Board to turn these Codes of Conduct into regulations and training plans.

3. **Training of Belizeans in coral reef monitoring and statistical analysis.** The Ecological Monitoring study provided substantial capacity building. 15 Belizeans were trained in coral reef monitoring and statistical analysis techniques, developing skills for themselves and their organizations. While the University of Belize had a marine biology component, the number of individuals trained in actual field survey techniques and statistical analysis in Belize has historically been low. Thus, the training through Ecological Monitoring study had the potential to create large multiplier effects.

> People working alongside with Burton have been strengthened, Eli Romero for instance. Other people at various levels have been trained in certain monitoring techniques. Capacity has been built. Burton has also organized a statistics course for people in fisheries, NGO community. Major problem in Belize has been doing data collection but then no data analysis; there has never been training in proper data analysis… Burton has tried to address many of the gaps in Belize. (MMAS Researcher)

4. **Built international collaboration between Boston University and University of Belize.** Due to his extensive travel to Belize, Dr. Kaufman was able to develop a closer partnership with Dr. Leandra Cho Ricketts at UB. As of 2010, the two universities were currently in discussion to sign an MOU for enhancing information exchange and personnel and student transfers. Dr. Kaufman also assisted UB in establishing the new Environmental Research Institute (ERI). Arrangements have been made through Boston University to use this institute as a data bank; MMAS results will be housed here and new research studies in Belize will be coordinated through this entity. ERI, if supported

by Belizean and non-Belizean organizations, has the potential to be a central clearinghouse for marine managed area research and lead the way in identifying research questions.

5. **Drafting of a Cabinet Paper.** As of 2010, Mrs. Mcfield and Mr. Garbutt were drafting a Cabinet paper with key messages from the studies. When accepted by policymakers, it had the potential to elevate the issues of coastal management and solutions into an arena of greater importance.

> Talks about cabinet paper are in process; they will fold into Reefs for Life initiative. Cabinet paper may cause them (government) to agree to a timeline for the Coastal Zone Plan. It could pass the mangrove regulations, gets their brain started thinking about the protected area bit, increase amounts for targets for no-take zones… (NGO employee)

6. **Contributed 2010 Reef Summit *Someday is Now*.** In November 2010, the Belize Reef Summit entitled *Someday is Now! Save our Reef, Demand a Plan* took place. Well attended by conservationists, high level Belize policymakers, members of the media, and others, this summit was intended to draw attention to the state of Belize's natural environment and motivate stakeholders across Belize to work to protect their marine resources. Dr. McField and Dr. Leandra Cho-Ricketts attended, and discussed results from MMAS to motivate action. Results from MMAS were also presented through a short video produced by CAVU (Clear Altitude Vision Unlimited) in collaboration with

MMAS. Results from various MMAS studied were further used to produce a MesoAmerican Reef Report Card, which was also presented at the summit.

4.6.4 Emergent Themes across Case

Themes from the literature emerge through the examination of MMAS in Belize.

1. **Program Initiation.** Entry of MMAS into Belize suffered due to the same reasons as the Fiji node - the basic structure of MMAS was decided in the United States by a small group; there was a perception of little local input into MMAS' design. There was the early 2005 EarthWatch workshop, and there were early one-on-one discussions with selected Belizean organizations after the initial MMAS model had been designed by CI and the GBMF. However, these discussions – while well intentioned – could not provide full information to the very broad swath of NGOs and other stakeholder groups in Belize. Furthermore, they were often viewed as coming late in the study development process. This lack of feelings of engagement at the earliest possible stage may have handicapped S2A efforts as it meant that the MMAS studies were not as visible or as relevant to organizations that felt excluded from design input.

2. **Networks, partnerships, and coalitions.** MMAS did not succeed in establishing a strong, early partnership with any organization in Belize. While Mr. Garbutt was

employed as node coordinator and the intention was to leverage his involvement in SEA to a strong partnership, in the end his involvement – due partially to it being part-time and his other commitments - did not seem to bring the institutional capacity of a partner. MMAS tried to partner with MBRS and APAMO; however both organizations were young and weak during much of MMAS' implementation. Lacking a strong on-the-ground partner meant that MMAS needed to rely on individual efforts of PIs, the core MMAS team, and Mr. Garbutt to gain input into the studies and leverage MMAS results. As many of these individuals were foreign to Belize, this meant that efforts were (unavoidably) iterant and sporadic.

3. **Participation across scales and the science/policy boundary.** There was a dedicated effort to recruit local scientists as PIs so to enable studies to be accessible speak to Belizean management and science needs. This recruitment suffered somewhat due to the low scientific capacity at UB. PIs engaged in an extended process of discussing the workplans with the core MMAS team in the United States. Discussions across the science/policy boundary in Belize during workplan design were less extensive. PIs did work with Mr. Garbutt to craft their studies to speak to management and policy needs; however the inability of foreign PIs to have regular, in-person contact with Belizean stakeholders meant that they needed to rely exclusively on his input.

Several factors hampered engaged participation during the data collection phase of the studies. First, unlike other nodes, there was no obvious iterative, participatory process for all of the studies into which to feed their results. There was no CI office. APAMO had just been established in 2007 and lacked institutional capacity. The partnership with MBRS failed. The University of Belize was weak and under-resourced. Thus, for extended periods of time between 2007 and 2010 workshops, feedback on progress was relayed solely through newsletters and one-on-one communications. Second, focusing the studies on multiple MMAs instead of one meant that a larger set of MMA managers needed to be updated and consulted. Third, foreign PI's time in Belize was limited; when they were in Belize, they were focused on collecting and analyzing data as opposed to holding extensive stakeholder discussions. Fourth, Mr. Garbutt had many obligations, and his involvement through a part-time contract was not sufficient. A person that had been paid full time from the beginning of the scientific projects to coordinate S2A efforts in Belize could have been helpful. This person could have devoted their time to getting out information, keeping people updated, and trying to tie the science into management decisions, etc.

4. **Accountability and the Ability to Learn.** The experiences of MMAS in Belize show a propensity of CI to learn. In the last phases of MMAS in Belize, upon receiving a progress report from this author, CI retooled and hired Mrs. McField as the S2A

coordinator. This was a positive step as she had both scientific acumen and time to commit to S2A dissemination. The lack of a CI office in Belize meant that there was one less accountability mechanism to give feedback to the core MMAS team in the United States; it was difficult for CI to know that stakeholders were unsatisfied with their input into the design of the studies until the large 2007 workshop.

5. **Translation of Scientific Knowledge.** Mrs. Mcfield took the lead in knowledge translation. S2A outreach ramped up in 2010 and closed some of the earlier information gaps with Belizean stakeholders. Colorful posters, videos, booklets and t-shirts, in addition to methods that reached a large audience – such as newspapers, radio, and television – significantly extended the reach of MMAS study messages. Each of these products was planned through the S2A matrix, and intended to persuade a particular audience and achieve a specific management or policy impact.

6. **Assessment Context.** Belize is a case study in why it is important to understand the institutional context of a country before program initiation. Overall, despite the personal efforts of the core MMAS team, Mr. Garbutt, and others, dissemination of scientific results was not as successful as hoped due somewhat to country specific factors. With hindsight, it is clear that the lack of country-wide participatory processes (combined with no CI office), low scientific capacity at UB, and low cohesiveness of the

Belizean NGO sector hindered S2A efforts. If these factors had been considered at the node selection phase, Belize may not have been selected or selected only with much greater on the ground support (a full time node coordinator, for example).

4.7 Panama and Galapagos[5]

4.7.1 Socio-economic, institutional, environmental context

MMAS focused upon both Panama and the Galapagos within the Eastern Tropical Pacific Seascape. The CI ETPS office, based in the Galapagos Islands, and the CI Meso Sur office, based in Costa Rica, were the two CI entities most involved in coordinating these efforts. Panama was the main MMAS ETPS site with the bulk of the effort and funding and thus will be the main focus of the following text.

Panama

Panama is known as the 'crossroads of the world', linking disparate groups, cultures, and continents together. Sitting in the southern part of Central America, Panama connects both the North and South American continents and the Atlantic and Pacific Oceans. The country is home to a wide variety of ethnic groups and draws its cultural influences from the Caribbean, Central America, North America, and Europe.

---

[5] Some material in the following sub-chapter was abstracted from an unpublished S2A Assessment completed in mid 2010, in which the author was heavily involved. Only assessment material where the author was the sole writing author was abstracted.

According to the CIA Factbook, as of 2010, the population was ~3.4 million with a plurality (~1 million) in Panama City (www.cia.gov). Being in the position to link continents and oceans has long made Panama a center of commerce and trade. The Panama Canal, one of the most important waterways for trade in the world, divides the country at a narrow point and connects the city of Colon on the Atlantic with Panama City on the Pacific.

Besides being culturally and strategically important, Panama is home to significant terrestrial and marine biodiversity. On land, Panama possesses lush tropical rainforests that are home to both indigenous groups and a wide variety of endangered plant and animal species. In the water, both the Gulf of Panama and the Gulf of Chiriqui are areas of significant marine importance, home to a habitat mosaic of islands, mangroves, rocky bottoms, sandy bottoms, seagrass beds, and coral reefs. Islas Las Perlas in the Gulf of Panama and Coiba Island in the Gulf of Chiriqui are priority conservation areas for the marine conservation community and recognized for their role in a functioning marine ecosystem.

As with terrestrial and marine areas around the globe, Panama faces a wide variety of threats. Deforestation in the rainforest is a problem that has yet to be fully addressed. The forests in the Darien region are being affected by increased agriculture and expansion of a growing population, and as of 2010, there was talk of a road finally completing the Pan-American Highway through Darien. The ecologically sensitive waters of Panama fall prey to illegal fishing as well as unregulated coastal development.

Coiba National Park is located in the Gulf of Chiriqui. While the island of Coiba is the largest island in the park, the park also includes multiple other islands such as Brincaco, Uva, and Afuera. There are 38 islands total in the park. From 1919 until 1994, Coiba served as a penal colony for the Panamanian government, paradoxically protecting its biodiversity from human impacts. Coiba's terrestrial biodiversity is extensive. In the marine realm, Coiba National Park sits in a fortuitous area in the Pacific characterized by strongly contrasting warm and cold ocean currents. These contrasting currents bring nutrient richness to the area and create a hotspot for marine life. Sharks, particularly hammerheads and tigers, frequent the area. The water has a high concentration of rays, turtles, and numerous species of finfish, lobsters, oysters, and other invertebrates.

In 1991 Resolution 21 by the National Authority of the Environment laid the groundwork for Coiba National Park. By 2004, Law 44 established Coiba as a national park, created its adjacent 'special zone of marine protection' of 160,700 hectares, and mandated the creation of a management plan and many of the governance structures now associated with the park, including the Directive Council (Consejo Directivo). The Directive Council is invested with decision making powers and made up of representatives from government, civil society, and users, and. Normally meeting every three months, it operates as a governance mechanism enabling discussion, communication, and feedback among a diverse range of groups.

There are multiple institutions and stakeholder groups involved in the science and governance of Coiba National Park. The Smithsonian Tropical Research Institute (STRI), connected with the Smithsonian Museum in Washington D.C., and the University of Panama, a respected Panamanian research institution, have been conducting research both in the park and the park's adjacent buffer zone. STRI coordinated the development of the Coiba National Park management plan. The government entities ANAM (Panama's National Authority for the Environment) and ARAP, Panama's recently created Aquatic Resources Authority, are the most involved government players. ANAM is in charge of protected areas in Panama and is focused on "ensuring compliance and implementation of [environmental] laws, regulations, and policies" (www.anam.go.pa). ANAM chairs the Directive Council and has the final say in Coiba management decisions, while ARAP is in charge of the 160,000 hectare special zone of protection abutting the park.

Several NGOs are also involved heavily in Coiba's governance. MarViva is a regional marine organization with offices in Costa Rica, Panama, and Colombia. It is focused on (from www.marviva.net) (1) the promotion of new marine protected areas and extension of existing ones, (2) encouragement of sustainable use of resources by coastal communities and creation of economic alternatives, and (3) working with governments for control and surveillance of MPAs and creation or modification of supporting laws or regulations. MarViva was involved in the initial political process of Coiba's declaration, sits on the Directive Council, and supplies the boats for fisheries enforcement in the park. The National Association for the Conservation of Nature (ANCON) is a Panamanian environmental organization that focuses on both terrestrial and marine issues, including climate change, deforestation, creation of protected area management plans, and work with local communities (www.ancon.org). ANCON is particularly active in communities in the so called 'buffer zone' of Coiba NP. Like MarViva, it sits on Coiba's Directive Council.

Galapagos

The Galapagos Islands are a volcanic chain of islands about 500 nautical miles west of Ecuador. There are over a dozen main islands. Under Ecuador's jurisdiction, the Galapagos are known worldwide as a place for thriving coral reefs, exotic and abundant wildlife, and natural outdoor splendor. Galapagos is considered the birthplace of evolutionary theory, having hosted a visit by Charles Darwin and his ship the HMS Beagle in the 1830s.

The Galapagos is a UNESCO World Heritage Site. The marine areas of the Galapagos are part of CI's Eastern Tropical Pacific Seascape, a two million square kilometers priority marine conservation area for CI that includes waters of Costa Rica, Panama, Columbia, and Ecuador. The Seascape, due to its contrasting currents and biophysical oceanographic phenomenon, is home to significant marine biodiversity – whales, sea lions, turtles, sharks, seabirds all rely on these waters. These four ETPS countries signed the San Jose Declaration, an agreement to "seek the support of international and regional organizations, including Conservation International (CI), to improve stewardship of their shared marine life and environment" (www.conservation.org). Besides areas of the countries' EEZs, ETPS includes sites such as the Galapagos Marine Reserve, Costa Rica's Cocos Island Marine National Park, Panama's Coiba National Park, and Colombia's Malpelo Fauna and Flora Sanctuary.

The Galapagos has both a national park and a marine reserve. The national park was established in 1959 while the marine reserve was established in 1998. The human population of the islands has been growing rapidly. With no indigenous population, inhabitants from mainland Ecuador have been migrating to the Galapagos to take advantage of the relatively higher standard of living and income from tourism opportunities. Therefore, despite the fact that the national park and the marine reserve provide legislative protection, the ecosystem of the Galapagos is under threat. Tourism impacts and impacts from land-based sources put the marine and terrestrial ecosystems at risk.

The Charles Darwin Research Station on Santa Cruz Island, run by the Charles Darwin Foundation, is the preeminent ecological research entity on Galapagos. More than 50 years old, the station conducts research and ecological monitoring, builds scientific capacity, advises Ecuadorian authorities, and translates scientific findings into understandable products for public consumption. It works closely with the main governmental stakeholder on the island, the Galapagos National Park Service (GNPS). To manage the national park and the marine reserve, the GNPS and the Charles Darwin Foundation work with other stakeholders through various councils.

Following is a map of Panama MMAS study sites (Figure 4-5), a list of the Panama and Galapagos MMAS study locations and PIs (Table 4-11) and a rough timeline of MMAS action in Panama and Galapagos (Figure 4-6, Figure 4-7)

4.7.2 Translation from International to Local

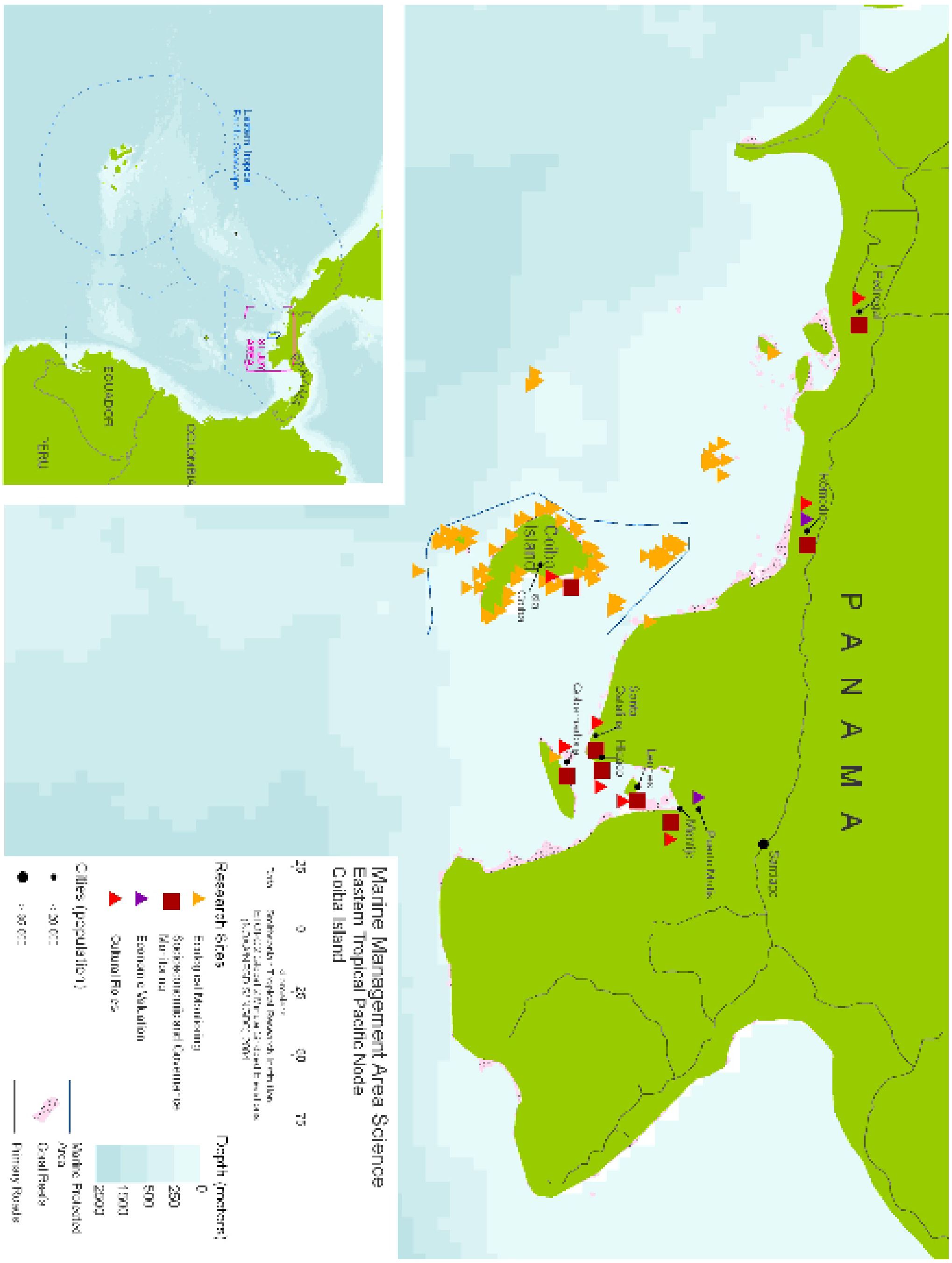


Figure 4-5: Map of Panama MMAS Study Locations, published by MMAS

Table 4-11: Main Panama and Galapagos MMAS Studies and Locations

Topics of Research (PI)	Study Locations: Villages, Sites (Abstracted from Study Final Reports)
Core Ecological Monitoring – Panama (Guzman)	9 marine sites inside the Coiba MMA and 9 unprotected marine sites in the surrounding region of the Gulf of Chiriqui.
Core Socioeconomic and Governance Monitoring – Panama (Mate/Suman)	1. Pedregal 2. Remedios 3. Hicaco 4. Santa Catalina 5. Pixvae 6. Los Díaz 7. Bahía Honda 8. Malena 9. Puerto Mutis 10. Gobernadora Governance study relied mainly on literature reviews, semi-structured interviews in Panama City and Santiago.
Core Cultural Roles Monitoring - Panama (Cordero)	1. Las Palmas 2. Mariato 3. Montijo 4. Rio de Jesús 5. Soná 6. Santiago 7. Remedios
Core Economic Valuation – Panama (Montenegro)	Numerous communities in the provinces of Chiriqui and Veraguas. Specifics unavailable.
Visualization and Spatial Analysis (Gopal)	N/A
Fisheries Assessment – Panama (Vega)	Several communities in the provinces of Chiriqui and Veraguas. Additional data from marine sites.
Enforcement Chain Analysis (Rosero)	Literature review and interviews in Panama, Costa Riva, Ecuador, and Columbia.
Core Ecological Monitoring – Galapagos (Banks)	Numerous marine sites in and out of Galapagos Marine Reserve.
Core Socioeconomic and Governance Monitoring – Galapagos (Quiroga)	Communities on islands of San Cristobal, Isabela, Santa Cruz.
Extinction Resistance (Edgar/Brooks)	Compiled and synthesized existing data from across ETPS.

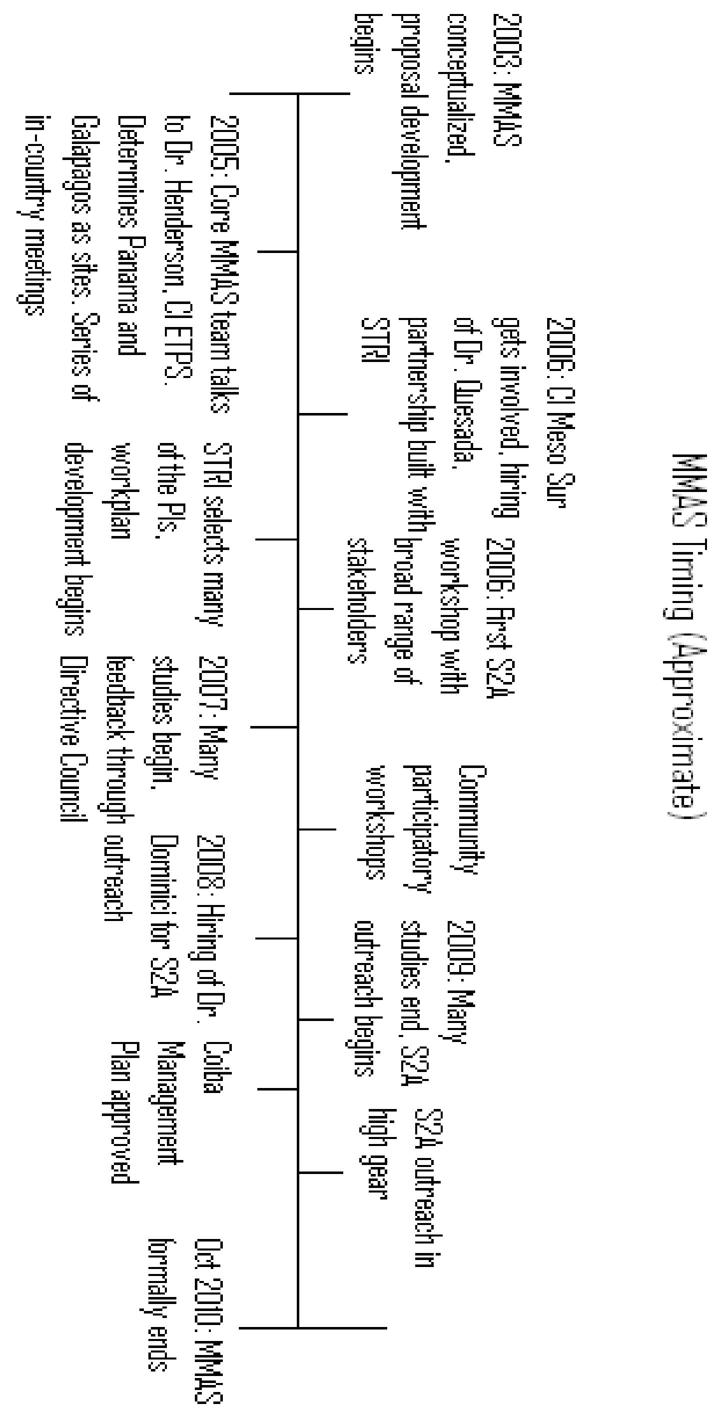


Figure 4-6: MMAS Timeline in Panama

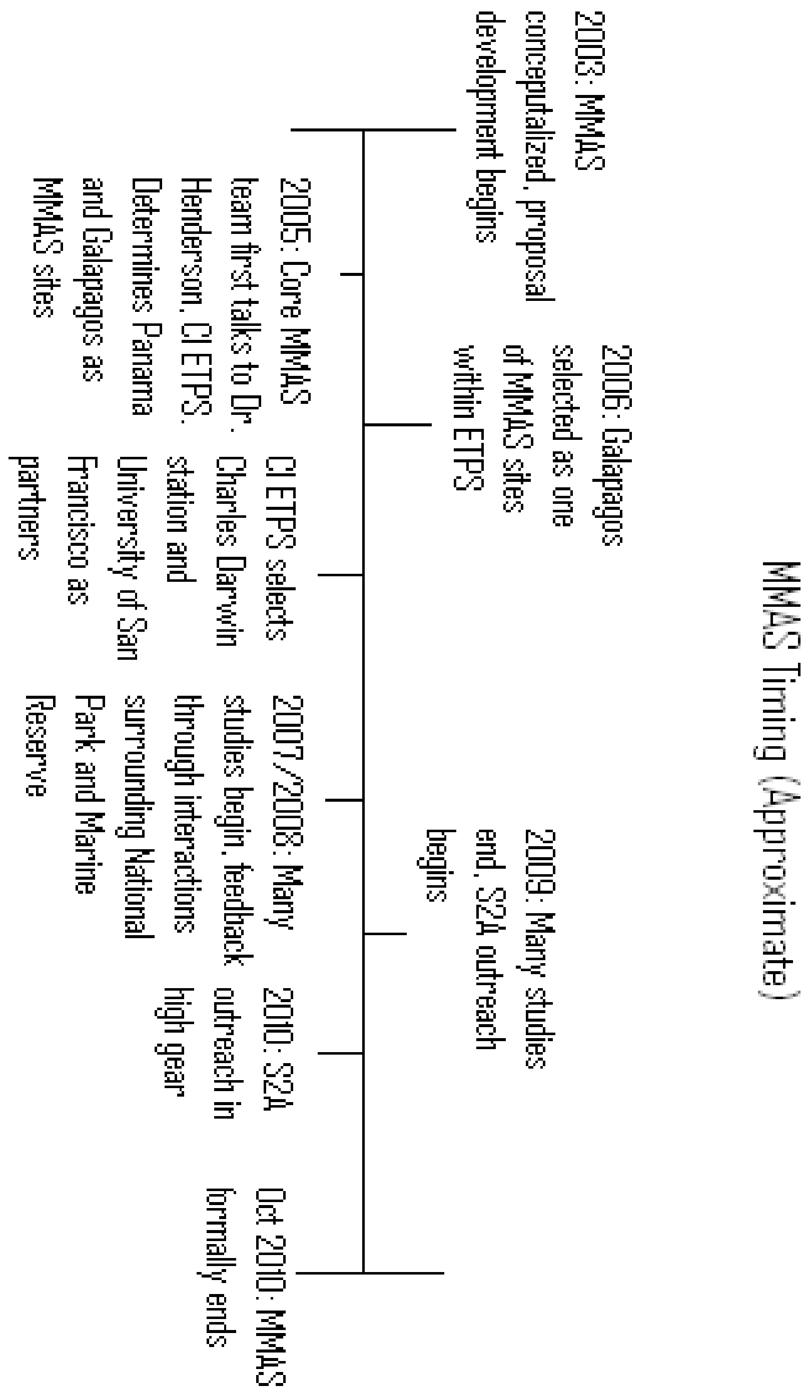


Figure 4-7: MMAS Timeline in Galapagos

The process of selecting Panama as focal site in ETPS began informally in November 2005. Dr. Scott Henderson, head of the CI ETPS program and based in the Galapagos Islands, met Dr. Karrer at an Australian MMA conference, and subsequently – together with other staff in the ETPS, including Ecuador and Panama - began to talk about how MMAS could dovetail with CI's increased focus on Seascapes. At the time, CI ETPS had received significant funding from the Walton Foundation for work in Galapagos and was looking at ways to build the ETPS science program in concert with other donors. In the words of a CI-ETPS employee, "Walton was giving so much funding for processes, co-management, and capacity building – I thought there should be an effort to merge MMAS focus sites as much as possible".

Dr. Henderson was involved in discussions with Dr. Kaufman and Dr. Karrer as node selection continued. CI ETPS staff, in consultation with the core MMAS team, decided that Coiba National Park in Panama would be an ideal site for MMAS within ETPS. Two main factors encouraged its selection. First, Coiba was in the midst of a process of drafting a management plan. The MMAS studies, with their focus on creating core MMA monitoring data, were seen as ideal for baseline studies for the plan. Second, funding from UNESCO and Walton Foundation was already set aside for contributing to the Coiba management plan creation process, and MMAS funding could help by funding science and complement these activities. The idea was to ensure action of MMAS studies through fitting the studies into an ongoing, co-funded process.

One of the individuals involved in early discussions with Dr. Henderson, Dr. Kaufman, Dr. Karrer and other people with CI ETPS was Mr. Manuel Ramirez, head of the regional CI Meso Sur program. Mr. Ramirez liked the idea of MMAS and that of feeding the studies into the Coiba Management Plan. As a requirement for Panama's participation, Mr. Ramirez insisted that the CI-ETPS office would directly oversee the studies and have final decision making power.

> In the case of Panama, was very clear from the beginning to MMAS in Washington, saying that this is a project that we [ETPS office] will manage. They will oversee every activity, and this will be the responsibility of their team, and CI Washington should interact with them… CI country or regional programs are the ones that are accountable and liable to the governments and the agencies. (CI-ETPS Employee)

Since the Smithsonian Tropical Research Institute (STRI) was in charge of the drafting of the Coiba management plan, it was quickly decided that this institution would coordinate many of the studies. Mr. Ramirez liaised with the head of STRI and then selected Dr. Juan Mate, one of the consultants working on the management plan, to be the main in-country MMAS contact. Dr. Marco Quesada in the CI Meso Sur office in Costa Rica was to be Panama node coordinator, and was to work with Dr. Mate.

Dr. Mate, in concert with CI ETPS, Dr. Quesada, and the core MMAS team in the United States, took the lead in selecting PIs and co-PIs for several of the studies. The conservation community in Panama is small with much professional and personal overlap, and Dr. Mate was well situated to select qualified scientists. The Socioeconomic and Governance study was divided into two parts. For the first part, focusing on macro governance issues and how main institutions interact as related to the park, Dr. Mate recruited Dr. Daniel Suman, of the University of Miami, to be the PI. Dr. Mate then worked with Mr. Osvaldo Jordan of ACD (Alianza para la Conservacion y el Desarrollo) and Dr. Ricardo Montenegro of CSF (Conservation Strategy Fund) to draft the work on the second part, local community socioeconomic and "micro" governance issues. This work involved developing criteria for selection of communities, drafting questionnaires for surveys, and working through a specified methodology. After the drafting of the workplans, Dr. Montenegro, an economist, transitioned to taking the lead in the Economic Valuation study.

Dr. Mate also contracted Dr. Angel Vega for the Fisheries Assessment and Dr. Dolores Cordero for the Cultural Roles Study. Dr. Vega was a fisheries biologist at the University of Panama with roots and years of experience in the communities near Coiba National Park, thus making him well suited for the role. Dr. Cordero, also a professor at the University of Panama, had been deeply involved for years in researching cultural issues in communities in the Coiba buffer zone. Dr. Kaufman, due to his lead role in coordinating Ecological Monitoring studies in all nodes, worked directly with Dr. Hector Guzman from STRI on the Ecological Monitoring workplan.

The objectives of the studies were, to a degree, pre-decided due to the already determined CI-GBMF framework and the need to ensure measuring MMA management effectiveness and enabling cross-site synthesis between nodes. However, specifics of the communities studied, methodology, questionnaires, and other elements were devised by in-country PIs. Locally adapting the studies took many rounds of revisions and back and forth discussions between the core MMAS team in the United States, the node coordinator, STRI, and the PIs. As a MMAS researcher put it:

> MMAS has a general goal, and what we did was just try to fit those goals into Panama, into the Coiba area. We tried to generate the necessary information so that we could achieve those goals for MMAS but also so we could use that information to build the Coiba plan.

For input, there were one-on-one meetings with various stakeholders, including with ANCON and Marviva, in early 2006. In June of 2006, to ensure the input of a wide range of Panama stakeholders into the design of the studies, STRI and CI hosted a large workshop in Santiago. Forty people from organizations including ANAM, MarViva, ANCON, and the University of Panama, as well as from user groups such as fishing and tourism, attended the workshop. Over three days, these groups gave their input into the design of the MMAS projects to ensure their application to Coiba. The reception of stakeholders to this workshop was excellent; there was a general level of excitement that their input was being sought early in the MMAS study design process. A MMAS researcher that was heavily involved in the entire MMAS process said:

> We had already identified key personnel, key people in the area. So we started with those. We already were carrying out a process in the Coiba plan, so we identified these key people and invited them to participate. There were around

> 40 or so people there from all sectors, so there were key people from diverse areas, all involved in Coiba in one or another way. (MMAS Researcher)

Dr. Mate, Dr. Guzman, and other PIs were also involved in both the Coiba Scientific Board - set up to evaluate and oversee scientific projects relating to the park - and the Coiba Directive Council. The Directive Council was made up of representatives of national and local institutions from government, civil society, and user groups, and is invested with decision making powers. Involvement in the council meetings created opportunities to share project information with government, NGO, and local stakeholders as the design process moved forward.

Galapagos

Early discussions between the core MMAS team and CI ETPS in 2005 and 2006 led to CI ETPS selecting Galapagos as the second focal site. As with Panama, Dr. Henderson of CI ETPS was heavily involved in site selection. By the time Galapagos was selected, it had already been decided that Panama would be the main MMAS ETPS focal site, with the majority of funding and effort. Galapagos was added for three reasons. First, it was seen by Dr. Henderson as easy to manage, as he was based there. Second, CI ETPS saw Galapagos as a good opportunity to harness existing monitoring data. Due to the worldwide prominence of the national park and the presence of the Charles Darwin Research Station, the Galapagos possessed a huge amount of ecological data that could complement MMAS data from other nodes. Third, CI ETPS had received in 2004 a $2 million USD Walton Foundation with a small focus on science, and MMAS money was seen as complementing this funding.

Individuals at CI, Dr. Kaufman, and Dr. Henderson identified partners with whom to work. Due to its prominent role, partnerships with the Ecuadorian government, and its large cache of ecological data, the Charles Darwin Research Station was seen as the natural partner for Ecological Monitoring study. Dr. Stuart Banks, senior marine scientist at the station, was identified to be the lead PI. The University of San Francisco at Quito was doing socio-economic research in the Galapagos and had almost a decade of experience, and thus this university was chosen for the Socioeconomic and Governance study. Dr. Diego Quiroga from the University was recruited as PI.

The amount of money allocated from MMAS for Galapagos was very small compared to other MMAS nodes. CI ETPS was already involved in ongoing participatory management processes for the Galapagos National Park. This lack of extensive funding and pre-existing knowledge of stakeholder needs meant that workplan development was not particularly participatory. PIs worked directly with CI ETPS and core MMAS team members in the United States to draft workplans. A regional workshop had designed a particular ecological monitoring protocol; this was used in both the Panama and Galapagos Ecological Monitoring studies so that the data could be analyzed and compared more easily. After the workplans were developed, Dr. Fernando

Ortiz took over Dr. Henderson's responsibilities in coordinating partnerships and designing eventual S2A efforts.

One final study to be organized in Galapagos was one looking at the effects of climate change on biodiversity and human well being. This study was not funded by the Moore Foundation, and thus was not officially an MMAS study. However, it involved collaboration of CI ETPS and the core MMAS team with colleagues and scientists in other divisions of CI and in Galapagos, and built off of MMAS' work.

4.7.3 Translation from Science to Policy

Panama

Most of the Panama MMAS studies started in 2007 and 2008 after workplans were fully constructed and there had been sufficient time to adapt them based on consultation between the local, national, and international scales. The Cultural Roles study lagged behind other studies due to delays in workplan adaptation and discussions with the cross-node Cultural PI, Dr. Orbach. The studies proceeded with the PIs working relatively independently. While the Ecological Monitoring Study collected data from marine sites both within and outside the NP, many of the social science studies – such as the Socio-economic and Governance Study, the Economic Valuation Study, and the Cultural Roles Study - centered their data collection around selected communities in the provinces of Chiriqui and Veraguas. The goal was to select communities engaged in different economic activities so to allow comparison and deeper analysis. A MMAS researcher explains:

> Yes, we preselected 10 communities, there are like 35 or 36 communities in the area, so we selected 10 key communities. Some involved in fisheries, one of the main activities carried out in Coiba. We selected others for agricultural. We selected others for cattle raising, and some others that did not carry or present any activities in the park… but they have the potential the way the country is going to have some impact in the park.

Due to the existing high scientific capacity in Panama, capacity building through the studies was not emphasized to the level of Belize or Fiji. However, selected PIs used students or interns to assist in data collection, and there were workshops at STRI where the data was used in teaching workshops.

See following for Table 4-12 for Panama study final results.

Table 4-12: Panama Study Final Results

Topics of Research (PI)	**Main Results (Abstracted from Study Final Reports)**
Core Ecological Monitoring – Panama (Guzman)	Commercial, non-commercial and total fish biomass increased between 2007 and 2009, with the largest increases recorded in protected areas. For shellfish species, conch and oyster densities rose significantly in protected areas. Conversely, sea cucumber density decreased to near the point of local extinction in protected sites. Live coral cover decreased non-significantly (ca. 15%) between 2002 and 2009 in both protected and unprotected areas.
Core Socioeconomic and Governance Monitoring – Panama (Mate)	46% of all families have reaped benefits derived from the creation of Coiba NP, regarding basic services, access roads and increase in tourism. However, 72% perceive their income to have decreased after the park's creation and the fishing to be worse than the previous year. Most residents (>90%) exhibit concern for environmental conservation as a resource for their subsistence, but also a 37.3% of all families considers that the organizations that manage these resources are taking supplies from the

	people. On average, most families do not have information about Coiba NP (52%). 31% of residents have been invited to Coiba NP meetings, but consider that their opinions are not taken into account when making decisions. Most families consider that the authorities of Coiba NP have not shared information about the park (68%). There is a lack of coordination between agencies associated with the park. There is low participation of some members on the Directive Council, in particular mayors and fisheries groups.
Core Cultural Roles Monitoring - Panama (Cordero)	The community buffer zone is characterized by important cultural traditions - artisan traditional work, sea stories, music, poems, traditional food, and religious celebrations.
Core Economic Valuation – Panama (Montenegro)	The area of Coiba provides 275 fishing jobs;, while it provides 50 tourism jobs. The Management Plan will cost $13 Million USD over 5 years; The net present value of fishing and tourism from Coiba is $35 million over 20 years, approximately $20 million from fishing and $15 million from tourism. There is the potential to charge more for Coiba user fees if park service and infrastructure are improved. There are 46 boats that use Coiba approximately 30% of their time.
Visualization and Spatial Analysis (Gopal)	N/A
Fisheries Assessment – Panama (Vega)	Fish size is related to sexual maturity. There is a correlation between the size of hook used and the sexual maturity of fish caught. There is regional and depth variation among size classes and the maturity of commercial fishes as Lutjanis and Serranids. The variation in maturity between areas gives a good tool to determine nursery areas, which then can be used to regulate fisheries and restrict fishing based on reproductive cycles.
Enforcement Chain Analysis (Rosero)	Levels of both detection and surveillance are sufficient for ETPS MMAs; however prosecution is not.
Extinction Resistance (Edgar/Brooks)	MMAs provide an effective framework for the conservation of species of global biodiversity significance. Marine management areas represent: populations of 83% of the 93 threatened species; 67% of Alliance for Zero Extinction sites (holding the entire global population of one or more highly threatened species); and more than half of site occurrences for 60% of threatened species. Increase of just 2% of protected areas would create significantly greater protection for species and habitats.

Table 4-12: Panama Study Final Results (cont'd)

As results started to come out, they were communicated with government and institutional partners – such as ANAM, ARAP, ANCON, MarViva – through two primary mechanisms. First, the conservation community in Panama is small and personal and professional networks reach to all parts of it. MMAS PIs attended the same workshops, meetings, and luncheons, enabling frequent informal exchanges and interactions about emerging results.

Second, many MMAS PIs were active on both the Coiba Scientific board and the Coiba Directive Council, enabling formal, iterative interaction about the studies during meetings. The Directive Council met (on average) every two to three months and included representatives of many different stakeholder groups in Panama, including ANAM, ARAP, MarViva, ANCON, fishermen, tourism representatives, and mayors from the municipalities of Santiago. There were a total of 30 meetings of the Directive Council between 2005 and 2009. The Coiba scientific board had 5 representatives – one from ANAM, ARAP, SENDACYT (National Secretariat of Science, Technology, and Innovation), University of Panama, and STRI. As 2009, the representatives from University of Panama and STRI were both also MMAS scientists. MMAS PIs were also engaged in direct conversations with STRI, CI Meso Sur, and core MMAS team members in the United States.

Overall, these exchanges were very effective in keeping stakeholders informed as to the progress of the studies. The Directive Council, by bringing together representatives from all the relevant stakeholder groups of Coiba, provided a forum for information exchange and dissemination. Stakeholders on the council, especially government and NGO stakeholders, mentioned how they were satisfied with the dissemination of MMAS study results. A government employee explains (translated from Spanish):

> The Directive Council was charged with validating these studies. We participated with the technical aspects of the organizing of the workshops… But we worked with the consultants. When the consultants came back with the results of the studies, we saw them, validated them, and brought the information into the process. These projects were all presented during workshops, meetings of the Directive Council.

For local communities, interim results were communicated through participatory workshops during the creation of the Coiba management plan. There were at least 27 workshops with over 1,000 total participants. The workshops centered on subjects including preliminary zoning of the park, identification of information needs and priority sites, and rules for artisanal and commercial fishing, while providing an opportunity to gather and discuss MMAS study data.

There was a mixed reception by local stakeholders at the participatory workshops. Stakeholders were initially hostile to the idea of a management plan and the associated MMAS studies as they didn't see how they would benefit them; indeed, they feared (perhaps rightly) that Coiba National Park would limit their fishing and reduce their development opportunities. MMAS PIs and STRI consultants felt that as the workshops continued, while there wasn't complete agreement on the decisions around the management plan, stakeholders started to feel like they had an adequate opportunity to participate and gave legitimacy to the process. A MMAS researcher:

> First it was really aggressive, because they had been in many previous workshops and meetings with little or any benefits or been depressed by people. It took us a while to gain their trust and their confidence. Once they saw the process was clean, straightforward, and would really take into account the… they started to work with us. For example, with fishermen, we started with five or six fishermen per meeting. We ended with 100 or more fishermen per meeting, voting and taking decisions on this is going to be the regulations for the area. Not everybody is happy, but at least the majority is happy.

Fishermen interviewed admit some improvement in community stakeholder hostility through the workshops. A local community representative of the Fishermen's Association in Remedios voices the dominant feelings of the fishermen about participating in the workshops when he says (translated from Spanish):

> Initially, there was a very bad reaction [to the workshops]. Fishermen are not accustomed to regulations. There was much frustration… MarViva had workshops, ANAM had workshops, and the fishermen contributed their opinions about what should happen… It was more difficult at the beginning, and as the plan was explained it became a little bit better, not 75%, not 100%, or something like that, but maybe 25% better.

An increased willingness to participate in the workshops didn't mean that fishermen didn't stay concerned about access to development opportunities. Hostility and fear were not directed specifically at the MMAS studies; rather, interviews revealed a widespread concern about access to fishing areas and funds for development projects after the Coiba management plan was completed and enforced. The local community representative continues, summarized the dominate feeling of fishermen (translated from Spanish):

> I am one of the people that believes in conservation, but… It is important to not just think about the natural resources, but also about the fishermen. How can you help them? They need resources, they don't have resources, and they are being asked to give sacrifices…

In 2008 MMAS recruited Dr. Arturo Dominici as node coordinator in Panama through FUNDESPA (La Fundacion para el Desarrollo Sostenible de Panamá) to replace Dr. Quesada in Costa Rica. Dr. Dominici, thus, did not have an initial role in the design and coordination of the projects, but in later stages was in charge of preparing S2A outreach material after extracting the key scientific messages. As in the other nodes, a S2A matrix was used to plan out S2A efforts. S2A outreach materials were the *main* way MMAS final results were presented to local stakeholders, the media, and the general public. These materials spanned a range, from posters to pamphlets and t-shirts, and were intended to explain MMAS results in an easy to understand fashion and increase awareness of Coiba NP and the management plan. Production of the materials finished in mid 2010. A meeting to inform the Coiba Directive Council about S2A outreach efforts was held on April 8th 2010.

After the production of the materials was completed, Dr. Dominici organized an extensive outreach campaign to local communities to educate them and try to increase their support of the management plan. According to the MMAS Final Report, 700 stakeholders from communities and NGO and government authorities attended 9 workshops; during the workshops, over 1500 booklets, posters, and calendars were disseminated and MMAS results were discussed. Complementing this outreach campaign was a national media campaign, engaging MMAS PIs in radio interviews and contributing to newspaper articles.

Galapagos

Data collection for the two MMAS studies started in 2007 and 2008 and went relatively smoothly. Dr. Ortiz stayed involved with the PIs through periodic discussions and feedback, and relayed this information up to the core MMAS team in the United States. The Climate Change study, as it was researching many of the same indicators as the two MMAS studies, served as a mechanism for confirmation of MMAS findings.

Several minor challenges arose in data collection. The Charles Darwin Research Station quickly found that expenses associated with ecological data collection were higher than they anticipated. The station usually partnered with the Galapagos National Park for marine logistical assistance; when the National Park was unable to provide this assistance for MMAS research trips, the station turned to MMAS for more funds. MMAS was unable to provide these funds, resulting in minor consternation. Second, the Socio-economic and Governance study data was initially viewed by MMAS as needing further analysis, and was returned to the University of San Fransico – Quito for additional work.

As research progressed, results were shared with stakeholders across the islands primarily through existing relationships. The Charles Darwin Research Station had been involved in a partnership with the Galapagos National Park; these interactions continued and allowed emerging MMAS data to be shared. Similarly, the University of San Fransico – Quito interacted with various Ecuadorian ministries and government departments through its research and shared results as they emerged.

See Table 4-13 for Galapagos study final results, below.

Table 4-13: Galapagos Study Final Results

Topics of Research (PI)	**Main Results (Abstracted from Study Final Reports)**
Core Ecological Monitoring – Galapagos (Banks)	There is a positive correlation between enforcement levels and predatory fish biomass. Corals that survived El Nino events became more resistant to subsequent events, suggesting subset selection.
Core Socioeconomic and Governance Monitoring – Galapagos (Quiroga)	The creation of the GMR has benefited the people living in the Galapagos. GMR has meant the establishment of a sizeable area that is relatively free of an industrial fleet. The only people legally permitted to fish in the Galapagos are the local fishermen, who number a bit more than 1000 though only one third of them are truly active. However, overexploitation of fisheries continues to be an issue in the GMR, owing in part to weak adaptive management and law enforcement. The Participatory Management System (PM) in the Galapagos has been effective in lowering the level of tensions and disputes amongst the various sectors, mistrust and inequalities still persist.

The main efforts for result dissemination and policy translation took place in late 2009 and early 2010. Using a S2A Matrix, Dr. Ortiz synthesized the data, made it into key messages, targeted audiences, identified desired management and policy changes, and shared results with groups at the local and national scales.

> We have already identified a series of messages that need to be transmitted to the decision makers and hope they will become conservation actions…We have a particular historical moment in Galapagos. When MMAS started three years ago, we could not forsee what is happening right now. There is a new government, a new constitution… So the stakeholders can really make direct use of the information, and the stakeholders can speak their minds in the various venues that have been developed. (CI-Ecuador employee)

Dissemination of messages was adapted based on the audience to which it was delivered; messages were simpler when delivered to fishermen and more politically oriented with delivered to ministries. CI ETPS was involved with a participatory management board for the Galapagos National Park and the Marine Reserve; it was used as one of the main mechanisms of dissemination to a wide variety of stakeholders after results had been finalized.

4.7.4 Policy, Management, Capacity Building Outcomes

Management, policy, and capacity outcomes of MMAS studies are below.

Panama

1. **Feeding of studies in the Coiba Management Plan, approval of management plan in September 2009.** The main goal of the MMAS studies in Panama was to

strengthen the management plan of Coiba. Interviews revealed that MMAS studies provided data for a rigorous scientific baseline for the management plan. The management plan guides how local, national, and even international groups interact with the park, and the fact that the MMAS studies were critical in the management plan creation meant that MMAS studies will have an enduring impact on management and policy. Because of the timing of the completion of the MMAS studies, the Socioeconomic and Governance, Economic Valuation and the Fisheries Assessment studies were most influential in the plan. A government employee explains (translated from Spanish):

> Conservation International financed the studies to feed into the management plan… The studies were intended to create a baseline in the park and strengthen the management plan. The studies were a first diagnostic of the area of the park… The fisheries assessment was in my opinion the most important and relevant to the management plan and the process… The workshops run by Juan Mate were also very critical to the development of the plan; they enabled the working with fishermen.

In Panama, Coiba's management plan is not viewed as just a standard Panamanian protected area management plan. There is a significant amount of pride in the plan and how MMAS studies have contributed to it. A MMAS researcher explains their point of view (translated from Spanish):

> One of the big achievements of the process of MMAS was the energy and the integration of the initiative. Contributed much to the people of the management plan, always talked with them. Much of the results of the MMAS work will be integrated into future plans, future visions to conserve the area. This is a durable

product of the initiative, that it was integrated into the management plan, and can help to craft the future vision of Coiba.

2. **Establishment of a no-fishing zone within one-mile of Coiba island.** Results from the Fisheries Assessment, showing the importance of maintaining snapper reproductive stocks protected by no-take areas, and the Socioeconomic and Governance study, determining the areas and frequency of fishing activity as well as governance issues, helped to convince the Directive Council and local fishermen groups to agree to fishing no-take zone ringing Coiba one mile from the coast. This no-take area was established by legal degree and is 20% of the park.

The process in zoning the park in general was also assisted by MMAS study results. A workshop of 36 local experts on preliminary zoning inside the Coiba NP was held in August 2007. Besides the no-fishing zone, the studies contributed to discussions on resource management zones, absolute protection zones, primitive zones, cultural zones, natural recuperation zones, and special use zones.

3. **Fishermen agreement to change hook sizes to ensure reproduction of silk snapper.** Results from the Fisheries Assessment, which showed that fishermen were catching sexually immature snapper, helped to increase public support for use of medium hook sizes. Three fishermen workshops and two broader stakeholder workshops where these issues were discussed were held in 2008. Medium hooks, by

catching larger fish after they had time to spawn, will help to ensure reproductive success and continuation of the silk snapper fisheries. As snapper are a commercially important fishery in the area, using appropriately sized hooks will ensure economic as well as biological benefits. As of May 2010, agreement on hook size was an informal agreement; legislation codifying the agreement was in progress.

4. **Creation of four commissions of the Directive Council.** After Dr. Daniel Suman presented results from the Socio-economic and Governance study, showing that there needed to be increased coordination and information exchange between institutions responsible for Coiba National Park, there was an establishment of four sub-commissions of the Directive Council. These commissions were tasked to work on specific management issues and increase coordination and information exchange.

Galapagos

1. **Contributed to zoning discussions for Galapagos Marine Reserve.** According to the MMAS Final Report, findings from both the Ecological Monitoring and Socio-economic and Governance contributed to zoning discussions for the Galapagos Marine Reserve. MMAS results came together in an information packet distributed to "50 prominent government officials" (from MMAS Final Report) and held to enable discussion and feedback as to the best zoning decisions for the reserve.

4.7.5 4.7.5 Emergent Themes Across Case

Themes from the literature emerge through the examination of MMAS in Panama and Galapagos.

1. **Program Initiation.** Entry of MMAS into Panama was optimal. While, like the other nodes, the basic structure of MMAS was decided in the United States by a small group, there was very early engagement with CI ETPS and CI Meso Sur. Therefore, these offices were able to use their region-specific knowledge to advise how MMAS best could enter the region. For example, these offices had knowledge of the Coiba management plan process, enabling the MMAS studies to immediately make an impact with ongoing work. Likewise, early discussions with Dr. Scott Henderson in CI ETPS in Galapagos laid the groundwork for easy entry into Ecuador.

2. **Networks, partnerships, and coalitions.** MMAS succeeded in quickly linking up to several strong partners in Panama. CI ETPS and CI Meso Sur – being part of CI's worldwide organizational structure – were obvious early partners; however, STRI was the Panamanian partner that allowed the MMAS studies to have the greatest leverage over the course of the initiative. STRI is a respected research institution and had extensive networks throughout Panama. This partnership allowed quick recruitment of highly qualified MMAS PIs, knowledge of the Coiba management and science context,

and most importantly, knowledge of the country's governance processes and immediate access to Coiba's Directive Council and its Scientific Board.

Choices of NPCs in Galapagos were more limited than in Panama. CI ETPS made the obvious choice in choosing to quickly link up to the Charles Darwin Research Station. The station, because of its recognized expertise, existing data, and close linkages to the Galapagos National Park Service, could leverage the studies into management and policy impacts.

3. **Participation across scales and the science/policy boundary.** Several factors enabled engaged participation in Panama across scales and the science/ policy boundary. Most importantly, the Coiba Directive Council and the Scientific board functioned as an efficient MMAS information sharing and coordination mechanisms. Regular meetings solicited input and kept a wide range of Panamanian NGO and government stakeholders informed and updated, boosting the MMAS studies' local salience and legitimacy. Second, involvement of CI offices ensured that programmatic decisions were made by those with a better understanding of the science and management context. Decentralization allowed STRI, CI Meso Sur, and CI ETPS to complement MMAS funding with funding from the Walton Family Foundation and UNESCO. Combined funding enabled a greater number of participatory workshops

where community input into MMAS studies during the data collection and result dissemination phases was collected.

Local PIs possessed a strong knowledge of the socio-economic, ecological, and cultural realities of Coiba, as well as extensive personal and professional networks. Local PIs (at STRI) set up an early workshop in 2006 that allowed stakeholders to give input into the design of the MMAS studies. These factors eliminated a learning curve that would have resulted from foreign scientists coming into the country; it also allowed the PIs to better understand salient science and management needs. Local PIs used discussions across scales – up to the core MMAS team in the United States – and across the science-policy boundary to engender participation and solicit input from a wide range of groups.

Interviews revealed that these factors encouraged the vast majority of stakeholders from the government, academic, and NGO sectors to feel engagement and support for MMAS studies. Community members, while not as supportive of MMAS studies generally – instead focusing on their development needs – found that participatory workshops gave them opportunities to voice their opinions and have a (limited) say.

In Galapagos, the involvement of the Charles Darwin Research Station and the University of San Francisco in existing ongoing participatory processes meant that they could quickly harness knowledge of management needs and use these connections to disseminate results.

4. **Accountability and the Ability to Learn.** From the beginning, MMAS planned that the Panama studies would feed into Coiba's management plan. It was not a coincidence but rather a well-thought-out strategy. The implementation of this strategy progressed relatively smoothly and therefore produced few situations to learn from mistakes. Downwards accountability in Panama was greatly strengthened through meetings of the Directive Council, existence and use of the CI Meso Sur and CI ETPS offices, and participatory workshops in communities.

5. **Translation of Scientific Knowledge.** While S2A outreach efforts by Dr. Dominici were helpful in communicating results to communities and the general public at the end of the MMAS cycle, earlier ongoing engagement and clear management linkages was more critical to S2A impacts. Specifically, having scientific results translated into communicable, understandable language and inputted directly into ongoing processes such as Directive Council meetings ensured that the MMAS study results would be used. In Galapagos, the efforts of Dr. Ortiz complemented the ability of the Charles Darwin Research Station to spread key messages and motivate management and policy change.

6. **Assessment Context.** Panama represents the clearest example yet of why it is necessary to have a firm knowledge of political, socio-economic, and institutional realities of a country before studies begin. The existence of organizational offices helps to give a (foreign) initiative this information. For example, the knowledge of CI ETPS and CI Meso Sur that Coiba was constructing its management plan meant that MMAS could engage where its results would be immediately used. Likewise, a strong scientific capacity in Panama ensured that MMAS knew it could rely on local scientists and utilize their knowledge and networks; a strong civil society ensured that MMAS results would be pushed used as leverage by NGOs beyond CI.

4.8 Brazil[6]

4.8.1 Socio-economic, institutional, environmental context

The Abrolhos Bank in coastal Bahia, Brazil is a region known worldwide for its marine biodiversity. While Abrolhos contains only 5% of the reefs in the West Atlantic, it possesses high endemism levels, 20% in coral reef fishes and 50% in coral reef corals

[6] Some material in the following sub-chapter was abstracted from an unpublished S2A Assessment completed in mid 2010, in which the author was heavily involved. Only assessment material where the author was the sole writing author was abstracted. Additionally, adapted material in this chapter was previously published, with a citation of Hastings, J. G. (2011). International Environmental NGOs and Conservation Science and Policy: A Case from Brazil. *Coastal Management*, *39*(3), 317-335.

(Francini-Filho and Moura 2008). The bank is made up of not only reefs but an interconnected ecological system of reefs, mangroves, and seagrass beds.

The complex biological system in the Abrolhos region is complemented by a complex socioeconomic situation, with numerous coastal communities depending upon the resources that the Abrolhos bank offers. Artisanal fishing in the region is extensive. A smaller subset of the population depends on tourism. Over 4,000 humpback whales come to Abrolhos Bank every year during their nursing season, and some communities have tourism infrastructure set up to take advantage of this phenomenon.

Several different types of marine managed areas make their home in the Abrolhos bank. The oldest one is the Abrolhos National Park, created in 1983 by IBAMA (the Brazilian Institute of Environment and Renewable Natural Resources) (Werner et al. 2000). Now managed by the relatively newly created ICMBio (known as the Chico Mendes Institute), the park has an 88,000 hectare area used for tourism as well as for fisheries production and marine preservation. It is divided into two parts – an 11,000 hectare area covering the Timebas Reefs and a ~77,000 hectare area covering the Abrolhos archipelago and the Abrolhos parcel (Francini-Filho and Moura 2008). The park is managed with the help of a consultative council made up of local users, NGO partners, the Brazilian Navy, and the Chico Mendes Institute, with Chico Mendes having the final say in decisions relating to the park's management.

There are several extractive reserves (called RESEX) in the area, including the Corumbau RESEX, Canavieiras RESEX, and the Cassuruba RESEX. As opposed to the Abrolhos NP, which is oriented more towards environmental preservation, biodiversity protection, and creation of tourism opportunities, these extractive reserves are oriented towards enabling sustainable use of marine resources for adjacent local communities. The Corumabu RESEX was established in 2000 with the assistance of IBAMA and CI-Brazil (Moura et al. 2009), and has a no-take zone covering 20% of its ~89,000 hectare area. This no-take zone promotes spillover and improvement of adjacent fisheries. Canavieiras RESEX was established in 2006 and Cassuruba was established in May 2009. Each of these extractive reserves has a deliberative council (to be distinguished from a consultative council) where over 50% of the members are representatives of local user groups, enabling strong local say in the reserve's management. These council decisions have the force of law and the RESEX' are co-managed with the help of the Chico Mendes Institute.

As with coastal zones around the world, Abrolhos faces threats from both land-based and marine-based sources. On the land, cellulose production in eucalyptus plantations is causing deforestation and increasing agricultural runoff. On the coast, shrimp farms both threaten and destroy mangroves and create large amounts of chemical and biological pollution. In the sea, parcels opened to oil exploration have the potential to enable spills and threaten the sensitive reefs of the Abrolhos region. Illegal fishing depletes protected areas and non-protected areas alike.

Several institutions are crucial in Abrolhos. The most important government institution is ICMBio – the Chico Mendes Institute. The Chico Mendes Institute was created out of IBAMA (the Brazilian Institute of Environmental and Renewable Natural Resources) in 2006, and is charged with management of all protected areas in Brazil. The Ministry of Fisheries is also important, now getting involved in fisheries monitoring of the protected areas of Abrolhos. The field CI-Brazil marine office is in the town of Caravelas, near the Abrolhos National Park. Originally, the work in Abrolhos started as a project belonging to the CI-Brazil Atlantic Forest program. Work in Abrolhos then separated and was given its own site office and staff. CI-Brazil marine has years of experience, and is deeply involved in political processes of the area.

Other NGO key institutions include the Instituto Baleia Jubarte, a science-based NGO founded in 1988 dedicated to protecting humpback whales that frequent the Caravelas region between July and November of each year, and Movimiento Cultural Arte Manha, founded in 1988 dedicated to preserving indigenous and cultural heritage in Bahia. SOS Abrolhos, a coalition of 21 organizations dedicated to protecting the natural environment of Abrolhos and working together towards common conservation goals, is also a key player. Besides these instituted groups, the area is also home to many fishermen, peasants, property, and dweller associations and guilds. Many inhabitants are members of these groups. For example, the fishermen association and fishermen guild in Caravelas combined to have almost 1700 members.

Following is a map of Brazil MMAS study sites (Figure 4-8) a list of the Brazil MMAS study locations and PIs (Table 4-14), and a rough timeline of MMAS action in Brazil (Figure 4-9).

4.8.2 Translation from International to Local

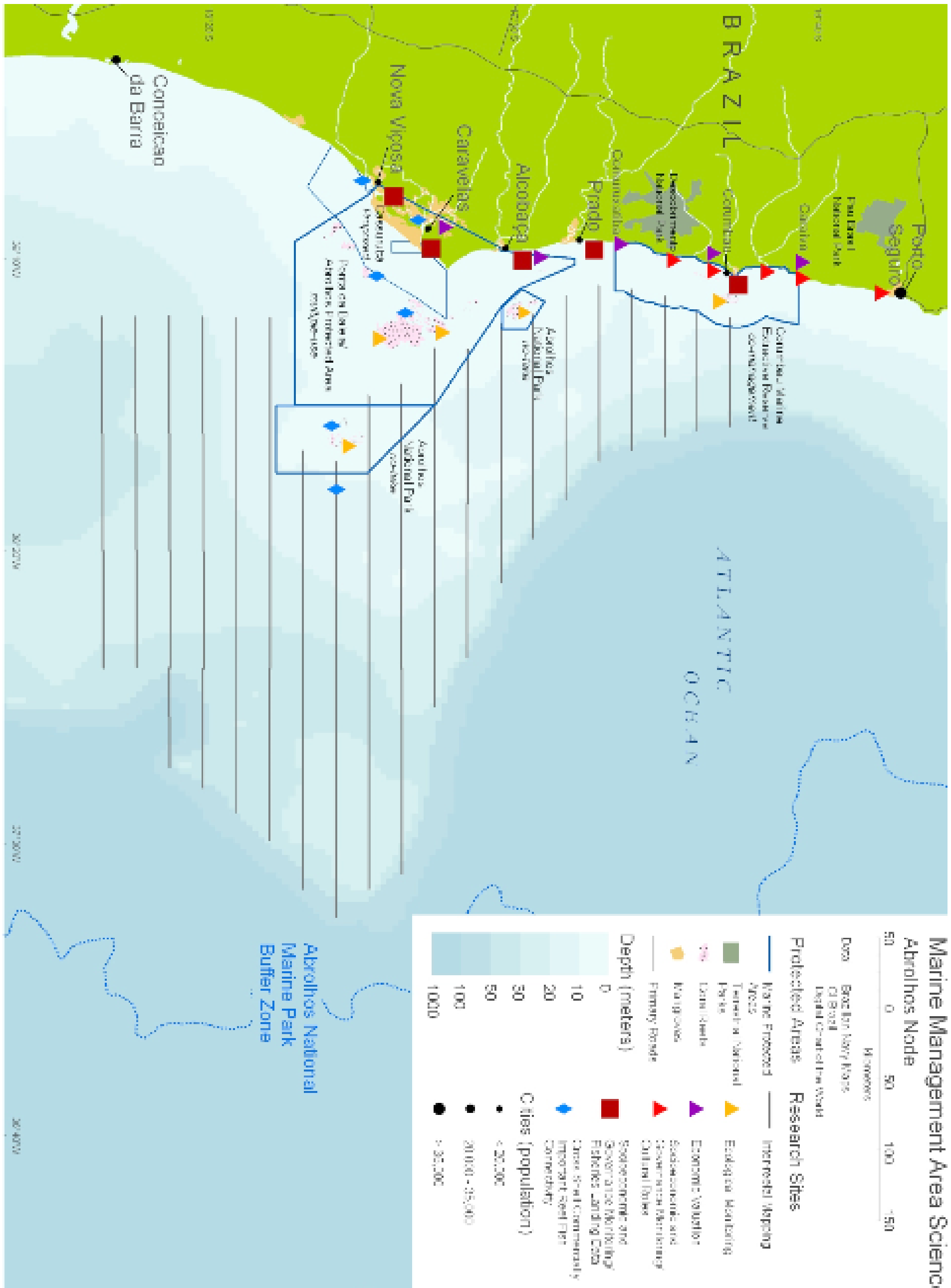


Figure 4-8: Map of Brazil MMAS Study Locations, published by MMAS

Table 4-14: Main Brazil MMAS Studies and Locations

Topics of Research (PI)	Study Locations (Villages, Sites. Abstracted from Study Final Reports)
Core Ecological Monitoring (Moura)	Marine sites in and out of Abrolhos National Park and Corumbau RESEX.
Core Socioeconomic and Governance Monitoring, Cultural Roles (Combined) (Curado)	Fishermen in/near: 1. Cassuruba RESEX 2. Corumbau RESEX 3. Caravelas 4. Prado 5. Alcobaca 6. Nova Vicosa
Core Economic Valuation (Amend)	Communities of: 1. Alcobaça 2. Caravelas 3. Corumbau 4. Prado 5. Budigão 6. Barra Velha 7. Vitória
Cross-Shelf Habitat Linkages (Moura)	Marine sites in and out of Abrolhos National Park and Cassuruba RESEX.
Inter-Reefal Habitats (Moura)	Across the Abrolhos Bank.
Multi-Species Aggregations (Moura)	Marine sites across the Abrolhos Bank, in and out of Abrolhos National Park.

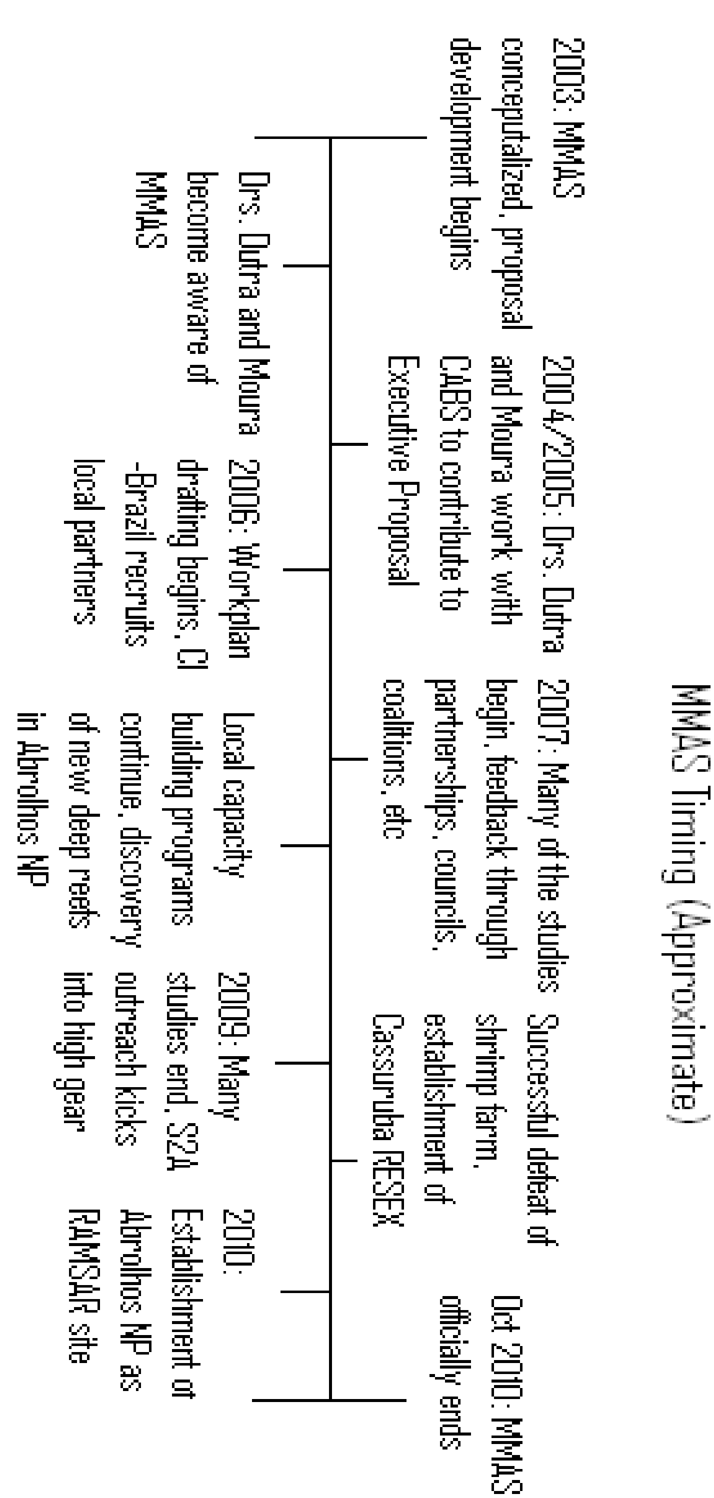


Figure 4-9: MMAS Timeline in Brazil

Individuals at CI-Brazil[7] were involved with MMAS since its conceptualization, having heard of the concept shortly after the DOE conference in Los Cabos, Mexico in 2003. After individuals at CI in the United States began to gauge interest with their field offices about participating in the initiative that would become MMAS, Dr. Guilherme Dutra and Dr. Rodrigo Moura at CI-Brazil let it be known that they were interested. Drs. Dutra and Moura were the two key individuals in CI-Brazil's marine program. In 2004 and 2005, Drs. Dutra and Moura worked with CABS to contribute to the executive proposal for MMAS to the Moore Foundation. By the time that the Moore Foundation decided to support MMAS in 2005, Brazil had been selected as one of the nodes. Brazil was chosen as a node because of the large amount of monitoring data that CI-Brazil had collected in the Abrolhos region, and because of the value of the Abrolhos Bank to south Atlantic biodiversity.

From 2005 until 2006 there was a gap in communication between Drs. Dutra and Moura and CI in the United States as the core MMAS team worked to design the MMAS structure and overall workplan. In 2006, after individuals at CI in the United States had constructed the general MMAS model, Drs. Dutra and Moura began to work to draft workplans for the individual Brazil studies. They quickly joined with scientists at Brazilian universities. Universities most heavily involved included Fundação Getúlio Vargas (FGV), University of Sao Paulo (USP), Universidade Estadual de Maringa

[7] 'CI-Brazil' will thus on refer to CI-Brazil marine program in Salavador and Carvelas, not the larger CI-Brazil presence in Brazil generally, unless otherwise noted.

(UEM), Universidade Estadual de Paraiba (UEPB), and the botanical gardens of Rio de Janeiro. University scientists were recruited based on their knowledge of the Abrolhos region, their professional and personal networks, and the scientist's ability to contribute to rigorous scientific exploration. Scientist's position's in universities, independent involvement in various partnerships and working groups, and past work in the region allowed them to understand local needs and incorporate this knowledge into workplans.

The workplans construction was centered on taking the skeletal framework of MMAS as decided by CI in the United States and altering it to the Abrolhos context. There were many rounds of revisions between Drs. Dutra and Moura, the Brazilian PIs, and the core MMAS team, with CI-Brazil trying to complement and expand monitoring that had been taking place since 2000. The MMAS initiative was also seen as an opportunity for CI-Brazil to accomplish work that they had long wanted but had not had the funds to accomplish, such as inter-reefal mapping.

While Dr. Moura is listed as the PI for many of the studies, in reality workplan construction and implementation was a collaborative effort. Mr. Ronaldo Francini-Filho and Dr. Carolina Minte-Vera (reef and fisheries ecologists) worked with Dr. Moura on constructing the workplan for the Ecological Monitoring study. In 2006, Mr. Francini-Filho was in the last year of his PhD doing ecological monitoring in the Abrolhos region and looking to continue ecological work there; Dr. Minte-Vera, based at UEM, had been working with CI on the extractive reserve of Corumbau and saw the MMAS project as a useful way to continue her involvement in the region.

For the Socioeconomic and Governance and the Cultural Roles Monitoring Studies, Dr. Moura recruited Dr. Isabela Curado, a professor of business at FGV. By the time that MMAS started, Dr. Curado had worked with communities relating to the Abrolhos National Park and the Corumbau extractive reserve, and thus had a good social understanding of the area. Dr. Marcos Amend, technical director of the Conservation Strategy Fund was selected to lead the Economic Valuation study based on his knowledge of economic valuation techniques and immersion in the Brazilian context. For the Inter-reefal Habitat study, Drs. Moura and Dutra connected with Dr. Paulo Sumida at USP, Dr. Gilberto Dias at the Botanical Garden of Rio de Janeiro, and Dr. Alex Bastos at the Federal Universiy of Espirito Santo (among others) to put together a plan for a technically challenging exploratory study.

While the workplans were being constructed, meetings were held with governmental partners – such as IBAMA - in Brasilia. The meetings focused on how MMAS studies could be oriented towards meeting the environmental information needs of the Brazilian government and served to build trust that would be crucial in the later stages of the research process. Drs. Dutra and Moura's professional and personal relationships enabled these meetings to take place while also ensuring that policymakers could feel comfortable expressing opinions and giving feedback.

CI-Brazil been working in the Abrolhos region since 2000 and was well integrated into the local governance context. As a member of both the Abrolhos National Park consultative council and the Corumbau Extractive Reserve deliberative council, they were able to use bi-monthly council meetings as opportunities to connect with policymakers, managers, NGO partners, and local users and understand knowledge needs. A physical presence in Caravelas allowed interactions with fishermen, peasants, property, and dweller associations and guilds.

> We were already engaged into assisting them. We were already supporting the national park on the board and doing the day by day management. So we got a sense, had a sense of what the national park's needs were. We were running projects with the Corumbau association, so we knew what the needs were in terms of knowledge. (CI-Brazil employee)

The MMAS workplans were written so as to add to ongoing scientific work. CI-Brazil had been running ecological monitoring at various locations in Abrolhos National Park and socio-economic monitoring at communities of the Corumbau and Canavieiras extractive reserves. MMAS allow continuation of this five years scientific dataset and expansion into equipment intensive inter-reefal mapping and cross-shelf connectivity research.

> From my perspective, we had a good opportunity to develop a lot of things we wanted to for a long time and didn't have a chance to. The information we had, at that moment, was really important to develop things we… we had tried before many alternatives for monitoring, we had tried before many alternatives for mapping, and that moment we really knew what we really needed to be done in the Abrolhos region. (CI-Brazil employee)

Heavy engagement with international scientists and with the core MMAS team in the USA occupied a large amount of time during research planning. Communications ensured that workplans fit into the MMAS model and were relevant to the global knowledge community. There were many rounds of information exchange between CI-Brazil, Brazilian PIs, the core MMAS team, and non-CI US scientists through in-person meetings, telephone calls, and e-mails.

Negotiations were not a costless exercise. At times this communication process was frustrating as it led to an initial sense among Brazilian scientists and Drs. Dutra and Moura of delay, bureaucracy, and micromanagement. However, the process effectively helped participants move beyond the traditional model of scientist-led research and transform into a more collaborative model involving multiple disciplines, stakeholder groups, and scales. Thus, while these negotiations took time and effort, they ended up being crucial in creating a suite of studies that stakeholders in Brazil felt would be most useful for the local context as well as globally relevant, and thus more likely to be taken up by managers and policymakers.

> … So I became the PI of the project. That was February 2007. But my workplan and the contract was approved at the end of 2007, it took forever. The first discussion about the workplan was May of 2006, like first semester of 2006, and the workplan was approved in May 2007. So it took a long time, and a long time because of his thing about let's make some patterns and make things follow the model. (MMAS Researcher)

Drs. Dutra and Moura were scientifically trained, charismatic, politically aware, and had extensive professional networks. These personal traits served to be critically important during this stage of the research process, making it easier to connect with high-level stakeholders in Brasilia, talk with scientists around the world, and gain input from local stakeholders during council meetings.

4.8.3 Translation from Science to Policy

Data collection for most of the MMAS studies started in 2007. As Drs. Moura and Dutra and Brazilian PIs gathered data for MMAS, the studies were linked to wider coalition efforts. One such coalition was a Brazilian research project called Pro-Abrolhos. Pro-Abrolhos came out of a proposal by the Oceanographic Institute at USP to do marine biodiversity research in the Abrolhos Bank. USP needed many partners to conduct the wide range of work, and thus built a research coalition of 14 universities and NGOs throughout Brazil. CI-Brazil was recruited to be part of the coalition due to its recognized scientific expertise and knowledge about the Abrolhos region. By linking with this coalition, CI-Brazil gained access to institutions possessing skills and technical equipment that improved both MMAS studies and the work of other partners. For example, a habitat mapping project run by USP and MMAS' Inter-reefal Mapping complemented each other by sharing ROV and side-scan sonar data. A faculty member at USP, who had partnered with MMAS and worked with CI-Brazil employees, states that:

> That's one thing I think is very nice about them [CI-Brazil] is that they are very willing to collaborate. That's a virtue for me. I think it is a very good virtue. Even though they have a very nice set of data they said let's do it together. I give you my data you give me yours, so… It was perfect. I am really impressed with their work.

Drs. Dutra and Moura and PIs also interacted with many national groups through SOS Abrolhos, an advocacy coalition of 21 NGOs, fishermen and community groups, cultural movements, and research institutions dedicated to the protection of Abrolhos Bank. SOS Abrolhos was originally created to combat the industrial shrimp farming industry and oil exploration near sensitive marine habitats, and CI-Brazil became engaged due to the importance of these issues to MMA health. As Drs. Dutra and Moura and the PIs lent their expertise to the coalition, it gained access to a network for exchange of emerging MMAS scientific data and creation of political mobilization strategies.

CI-Brazil used regular council meetings as a mechanism to keep local government and organized local user groups informed as to MMAS progress. Emerging MMAS results were also relayed through community meetings, workshops, and informal professional interactions. Nationally, Drs. Moura and Dutra consistently travelled to Brasilia to share emerging results with employees of the Chico Mendes Institute and the Ministry of Fisheries and Aquaculture.

> Not to do a boring 1.5 hour powerpoint presentations, but side conversations and ongoing discussions, knowledge and… but if you, there are the councils and then there are other ongoing processes, like the syndicate, the union of peasants. They are building a project so we are building capacity and inputing knowledge from MMAS. Just using the example today, but this is how it is happening. So it is not just in the bimonthly council meetings, it is everywhere, it is a continuous process. (CI-Brazil employee)

CI-Brazil involved community members in the production of scientific knowledge through local capacity building programs. One program that aimed to do this was the Open your Eyes to Science program, an interactive internship course started by Dr. Carolina Minte-Vera and subsequently run through a partnership between the CI-Brazil, UEM, Bahia state organizations, and the Brazilian Ministry of Science and Technology. The main elements of the program was to pair students with scientists working on MMAS studies and require them to both assist the scientist and develop an environmental research project of their own. In addition, Open your Eyes included a transdicisplinary course about the Abrolhos bank (including geography, ecology, anthropology, etc), teaching about the work of the local NGOs and about environmental experiences from other locations in Brazil. The students were fully engaged in every aspect of the research activities, from field data collection to analysis. This program assisted with community outreach as these students then discussed benefits of Abrolhos with their families and others, fueling a change in environmental attitudes among local stakeholders in communities. A Caravelas school teacher explains:

I believe there has been a change. The prejudice was very great against outsiders. And I see it has been getting better… these young people are becoming [information] multipliers, with their neighbors and with their friends in the school.

See following for Table 4-15, Brazil study final results.

Table 4-15: Brazil Study Final Results

Topics of Research (PI)	Main Results (Abstracted from Study Final Reports)
Core Ecological Monitoring (Moura)	Biomass of commercially important fish, particularly small carnivores, was consistently higher in the older no-take MMAs. Poaching and reopening of fisheries leads to decline in fish biomass. Evidences of spillover (i.e. higher biomass inside the reserve and in unprotected sites closer to its boundary) were obtained for black grouper, yellowtail snapper, and greenback parrotfish. Roving herbivores (RH) are unable to clear large tracts of reef surface of frondose algae once these have proliferated, and that territorial herbivores do not limit the access of RHs to particular resources. Some parrotfish species consume live corals, leading to detrimental effects that may offset the benefits of removing competitive seaweeds. Coral diseases intensified only recently (2005–2007). In Abrolhos, six types of coral diseases were already recorded, including syndromes that are similar to White Plague, Black-Band, Red-Band, Dark Spot, Aspergillosis and Octocoral Tissue Necrosis, reported elsewhere in the Caribbean and in the Indo-Pacific. We predict that eastern Brazilian reefs will suffer a massive coral cover decline in the next 50 years, and that *M. braziliensis* will be nearly extinct in less than a century if the current rate of mortality due to disease is not reversed. The MERC has well defined physical boundaries, but users are not clearly defined and there is a need to deepen the discussion about the extension of the MERC's limits to land areas; although the Management Plan has been extensively discussed, there are still many fishers unaware of the meaning of an MER and MERC's specific rules. The effective use of MMAs in Abrolhos and elsewhere is highly dependent on consistent management rules, adequate enforcement and

	the protection of critical habitats such as deep reefs and mangroves.
Core Socioeconomic and Governance Monitoring, Cultural Roles (Combined) (Curado)	Over 1000 families depend on the Cassuruba mangrove area, more than the 250 families as estimated in government data. Fisheries monitoring information linking with information from ecological monitoring to create comprehensive fisheries picture in region.
Core Economic Valuation (Amend)	The protected areas help protect resources that form the basis of economic activities of fishing and tourism in places like the Abrolhos Bank. In fact, these activities represent at least 8% of the GDP of a region with a very dynamic economy. Both fishing and tourism have a positive economic return to the region, finding that a group of about 420 working fishermen has a net income of R $ 1,778 per month. As for tourists, they would pay extra $ R10 (median) per entry or $ 40 extra (median) as a single payment to collaborate with the conservation of the park. Currently, tourism contributes about $ 50,000 / year in direct inflows to the park.
Cross-Shelf Habitat Linkages (Moura)	Stable isotope analysis still being conducted on Brazilian samples as they were delayed in shipping to Boston labs due to Brazilian customs. In-water observations and sampling, plus stable isotope analysis demonstrated close connections among each developmental stage of fishes to particular habitats. The Cassurubá mangroves are key nursery sites for important commercial fish species in Abrolhos.
Inter-Reefal Habitats (Moura)	Discovered a large previously unknown area of deep reefs on the Abrolhos bank. Subsequent explorations revealed "incredible diversity and fish abundance" of these reefs; revealed that reef area in Abrolhos was double that than previously thought.
Multi-Species Aggregations (Moura)	In alignment with prior predictions, the presence of multi-species reef fish spawning aggregation sites was documented along the Abrolhos bank. Characterization of as many of these sites as possible was conducted.

Table 4-15: Brazil Study Final Results (cont'd)

Before engaging in result dissemination, Drs. Dutra and Moura organized a three day "S2A Workshop". They invited, and had attend, over forty individuals from local and national NGOs, user groups, the Chico Mendes Institute, and universities.

Management and policy implications of MMAS' emerging results were discussed and science-to-policy translation activities were jointly planned.

Drs. Moura and Dutra recognized that the mechanisms of dissemination were crucially linked to how the results would be received. Like the other nodes, they used the S2A matrix as a planning tool, and worked to distilled the scientific results into easy to understand one or two line key messages. Policymakers and managers in Abrolhos and in Brasilia received information through meetings, dinners, and presentations. Continued involvement in councils enabled regular feedback to organized groups. The public was the focus of an intensive multi-faceted outreach effort, with CI-Brazil and PIs engaging with previously built partnerships (such as SOS Abrolhos) to herald MMAS findings and produce press releases, radio, video, and television spots.

Locally, the public received banners, posters, and leaflets with simplified scientific messages and colorful illustrations so to influence their behavior, and stayed involved through capacity building programs. S2A outreach efforts were assisted by consultant Mr. Pablo Faget. Mr. Faget had worked in environmental education surrounding Abrolhos for many years, and thus was well suited to understand how results could be best disseminated. A CI-Brazil employee describes S2A outreach:

> But we know the fishermen communities and the great majority has a low comprehension level of this type of material, we know that from research. So we translate this technical language to a more popular language… We know by research done by CI that around 70% of the people in the region have a very basic learning level. So the scientific level doesn't reach them. Not using text

> only, but games, posters to schools and also radio transmissions and video. We try to put it forward to the community, not just to listen but also take part in the research processes.

One of the most important S2A outreach material was new video developed by CI-Brazil called "Mocussuy". This professional quality video uses simple language to explain the benefits of the Abrolhos NP and the extractive reserves to community stakeholders. It was shown extensively during community presentations.

This dissemination of understandable results was crucial to fight misinformation. For example, while MMAS was ongoing in Brazil, there were plans for a large shrimp farm in Cassurubá. Simultaneously, the oil giant Petrobras and the Ministry of Mining and Energy were pushing for oil drilling near Abrolhos NP. Forces behind both of the projects began spreading misinformation and sued to overturn the Abrolhos buffer zone. In response, Drs. Moura and Dutra used results from MMAS studies to create a computer oceanographic current model which showed that the Abrolhos reefs would be affected by potential oil spills; they also created a video that used MMAS results from the Socio-economic and Governance monitoring study to argue that a large number of families would be impacted by the shrimp farm. An independent consultant who worked with MMAS stated that:

> We've been working so to use solid data to convince [stakeholders] of the importance of creating such areas. Most of the areas that have been created have suffered strong political reaction, resistance from economical interests, stakeholders. Solid data was essential; as much biological and also social…

> We've been confronted with organized disinformation… So you try to disarm such things by data.

Drs. Dutra and Moura also worked a political constituency that would support policy changes. Continued engagement with and presentation of results to allies in coalitions, government, and local councils helped to change minds and increase political pressure on decision makers.

Stakeholder openness to supporting policy changes depended on perceptions of the credibility of the information source as well as economic and political interest. Drs. Moura and Dutra's networks and CI-Brazil's reputation helped with the former; for the latter, MMAS results helped change the calculus of interest by making stakeholders more aware of the full costs of particular policy options. For example, communication with local stakeholders about the damaging effects of the shrimp and oil drilling projects got many in these communities talking to their government representatives and supporting more sustainable development approaches. A local community stakeholder associated with the fishermen's association, APESCA, explains:

> After three public hearings in the area they started to bring the fishermen into the meetings, so this is when they found me and started to tell me the facts about what was happening and the dangers that were threatening the fisheries… We started to realize that there were people against the fisheries people, and this is when we started to take part in it with the NGO people. We got united and spent our power.

4.8.4 Policy, Management, Capacity Building Outcomes

Management, policy, and capacity building outcomes of Brazil MMAS below:

1. **Preventing oil exploration near Abrolhos National Park, stopping a large shrimp farm, creation of Cassuruba Extractive Reserve.** The results from the Cross-Shelf Habitat Linkages study, showing that the Cassuruba mangroves were an important area for the life cycle of juvenile reef fish, combined with the preliminary results of the Socioeconomic and Governance study, showing that over 1000 families depend on the Cassuruba area, and the Inter-Reefal Mapping study, which created detailed habitat maps, helped create the conditions for the creation of Cassuruba RESEX. A CI-Brazil employee explains:

> When the widespread the information of the importance of that region for, of the mangrove region for the maintenance of the whole life in the Abrolhos Bank, or when we could use the information from the socioeconomic monitoring to show that the families living in that area were 1000 and not 250 as in the previous reports, we basically created the technical conditions for the creation of the Cassurba Extractive Reserve, and their [shrimp farmers] plans went out.

The Chico Mendes Institute also confirmed that data from MMAS was crucial in stopping a shrimp farm and oil exploration in the Abrolhos Bank in the area and in subsequently strengthening the political pressure to create this reserve (See Table 4-16). A government employee in Brasilia explains:

So CI in this oil issue participated quite actively before the creation of the Cassuruba, focused on the preservation of Abrolhos NP and creation of Cassuruba. They made several studies for the creation of the protected area.

Table 4-16: The Fight to Create Cassuruba RESEX

During the time period that MMAS projects being conducted in the Abrolhos Bank, there were plans for a large shrimp farm in the Cassuruba region. Powerful national and local groups supported the shrimp farm – including the ex-municipal secretary of fisheries for the Colonia guild, a national senator, and the local owners' union. At the same time, there was a push for oil exploration in the Abrolhos buffer zone. The powerful oil giant PetroBras had purchased a marine parcel only 50 km from Abrolhos NP and had plans to begin drilling. The forces behind the oil exploration and the shrimp farm joined together and sued to overturn the Abrolhos buffer zone. They were initially successful. Their push included spreading misinformation to local communities as to the benefits and costs of these projects. The shrimp farm was to be the biggest in Brazil. Both the shrimp farm and the oil exploration would have brought few benefits to the local communities, but had the potential to cause extensive environmental damage to a sensitive region. With the information from the cross-shelf and the SocMon studies, CI-Brazil was able to use rigorous, science-based evidence to show that Cassuruba had both ecological and socioeconomic benefits and needed to be protected. They also fed results from the inter-reefal study into a computer oceanographic current model which showed that the Abrolhos reefs would be affected by potential oil spills. Outreach with these messages included meetings with government ministers in Brasilia at the Chico Mendes Institute, engagement in the judicial system, and discussion of results during community meetings and consultative and deliberative council meetings. While the legality of buffer zones in Brazil was still to be decided as of 2010, the shrimp farm project was halted and oil exploration plans were eliminated for the closest parcels. In May of 2009, President Lula signed an order making Cassuruba an extractive reserve.

2. **Creation of Canavieiras Extractive Reserve Council:** While MMAS funding for CI-Brazil allowed studies and scientific results, it also served to give CI-Brazil economic flexibility to engage in extensive political and community outreach. One of the results of this flexibility has been CI-Brazil's continuing involvement in the Canavieiras region. Immediately preceding MMAS, CI-Brazil had been engaged in the creation of the

Canavieiras extractive reserve, helping the Chico Mendes Institute overcome organized resistance and disinformation in local media. The Canavieiras extractive reserve was established in 2006. Using assistance from MMAS, CI-Brazil has continued to be engaged in Canavieiras. This past year, CI-Brazil again collaborated with the Chico Mendes Institute and local community leaders to establish the Canavieiras deliberative council. These councils help the voices of local groups be heard and give the community a significant say in how the extractive reserve is managed.

3. **Declaration of Abrolhos National Park as a RAMSAR Site:** Drs. Dutra and Moura collaborated with the Abrolhos park managers to complete a RAMSAR application emphasizing that the Abrolhos region is high in biodiversity and worthy of protection In the application, they cited data from the majority of the MMAS studies. Officials from the Chico Mendes institute said that CI-Brazil's data and assistance in this application was extremely helpful. The application was submitted to the RAMSAR convention and subsequently Abrolhos National Park was declared a RAMSAR site on February 2nd, 2010. A government employee explains:

> [We had] guidelines from the RAMSAR conventions to make a RAMSAR site, need to complete a form, but CI filled it in for us. [We] have the park, and have the park management, but this is not enough… The people from the park would have had no way to fill in this form, and CI did it, so CI's help was crucial… There were maps, flora and fauna surveys, all of the ecological characteristics of the park in the form. Also included information from socioeconomic, cultural,

> governance studies…. CI's technical data made it possible to make it a RAMSAR site.

4. **Signed Workplan with Chico Mendes Institute for Expansion of Abrolhos National Park.** Results from the Inter-Reefal Habitat Mapping study, showing that Abrolhos had a more extensive reef system than previously thought, spurred discussions with the Chico Mendes Institute to expand the area of Abrolhos National Park. While, as of 2010, the park has not yet been expanded, CI-Brazil has developed and negotiated a workplan with Chico Mendes to work towards this goal. Data from the Ecological Monitoring, Socioeconomic and Governance Monitoring, and Inter-Reefal Habitat Mapping studies helped to define new park boundaries and zoning.

In April of 2010, the two organizations jointly held a workshop where, using MMAS data and in concert with local and national stakeholders, discussed priority geographical areas for conservation in the Abrolhos Bank. Chico Mendes expects the final definition of the protection zones to be completed in 2010, and the entire workplan implemented by the end of 2011. Formal legal declaration of the expanded park is expected within 3-5 years. Legal declaration is a political process and will require going to Congress and having consultations with other relevant Ministries, including the Ministry of Mining and Energy and the Ministry of Tourism. A government employee explains:

> MMAS projects have contributed the most for making the workplan… the level of knowledge is reasonable if you compare it with other protected areas in Brazil.

> It is better than most of them, for Abrolhos they have more information. By the end of 2011, hope to have the workplan implemented… The idea is by 2011 they will have some definition and will continue with the workplan.

5. **New project for Fisheries monitoring devised with EcoMar and Ministry of Fisheries.** While not directly connected to any study, the MMAS funds gave CI-Brazil economic flexibility to negotiate a new fisheries monitoring program with the Ministry of Fisheries and the NGO EcoMar. These three organizations will be collaborating to monitor all the fisheries in the Abrolhos bank, with each organization providing skills, technical expertise, and experience. Several government employees at the Ministry of Fisheries explain:

> The object is to find out how much the fisheries are producing by joining CI and EcoMar. By joining both organizations together we can enlarge the area of monitoring, are able to include the entire area of Abrolhos not only the protected area. When you do this, even though you have a sample of offloadings, we can have a view of the entire universe of fishermen that work there, and then use statistics to get knowledge.

6. **Advising Sao Paulo State on MMAs on coast.** As MMAS was in full swing in 2007 and 2008, Sao Paulo state decided to create a network of multiple use marine managed areas on its coast. Realizing they would benefit from outside consultations, the state government invited a range of universities and NGOs to participate in drafting MMA boundaries and devising management regimes. CI-Brazil was one of these NGOs and was able to use experiences from MMAS Abrolhos to work with other partners to

prepare a technical report. This report, combined with CI-Brazil and partners involvement in political processes, enabled the establishment of a 1.12 million hectare MMA network in late 2008.

7. **Creation and strengthening of collaborative linkages between CI-Brazil and research universities**. The money and opportunities presented by MMAS enabled CI-Brazil to strengthen its linkages with research universities, working independently with researchers from universities such as UEM and FGV, but also in established formal partnerships such as Pro Abrolhos. These partnerships are "not going to stop" (Phone Interview, Dr. Carolina Minte-Vera, November 4th 2009) and yielded improved data sharing, new scientific proposals, and media projects. For example, a March 2008 workshop in Caravelas with Pro Abrolhos partners has motivated the development of several S2A activities within this coalition.

8. **Capacity building and community outreach through "Open your Eyes to Science" initiative funded by CI-Brazil and the Ministry of Science and Technology, general opportunities created by MMAS research, MPA manager training course.** PIs, Drs. Dutra and Moura, government, and local community stakeholders spoke of how MMAS funds, in concert with funding from the Ministry of Science and Technology, enabled the training of large numbers of young Brazilians through the "Open Your Eyes

to Science" initiative. Several of the students involved in this program won a Bahia state science fair. A MMAS researcher involved with the program talks about it and how MMAS contributed:

> One project that benefit young people with matching funds was open your eyes to science, where we combined the components of biodiversity and culture. This opportunity for congregating people, both from the local community and from the academic community, it was something that was possible by MMAS. And also the MMAS PI's were people that had the strength to gather collaboration around an issue. I think that is a very important strength, the funds were very well used for people to connect.

One example of local high school students being involved in research through Open your Eyes to Science was with the Socioeconomic and Governance Monitoring study. In this case, Dr. Curado used children of local fishermen to assist as interviewers and collect data.

There has also been the opportunity for university students to do internships with MMAS researchers and get advanced degrees doing MMAS research. MMAS has also enabled an MPA training course which has brought MPA managers, oceanography students, marine professionals and other stakeholders together to learn from each other about MPA management and science. This course does not just focus on technical aspects but also on exchanging information between different groups of professionals. The first edition of the course was held in the Sao Paulo area in 2009 and the second edition was held in Caravelas in February of 2010.

4.8.5 Emergent Themes Across Case

1. **Program Initiation.** Entry of MMAS into Brazil was assisted by CI-Brazil and early discussions between this office and the core MMAS team in the United States. As with all the other nodes, the overall structure of MMAS was decided in the US. However, in the Brazil case, CI-Brazil was able to provide input in 2004 and 2005 into the initial proposal to the GBMF, thus giving them buy-in and enabling early thinking about how MMAS would dovetail with existing Brazil science and management efforts. In turn, this thinking enabled MMAS in Brazil to get an earlier start than the other nodes.

2. **Networks, partnerships, and coalitions.** The main MMAS partner in Brazil was CI-Brazil, a CI field office with years of science and management experience in the Abrolhos region. Partnering with CI-Brazil meant that CI-Brazil could continue and expand their previous work, enabling a long-term scientific dataset that would be more credible to stakeholders. Additionally, using CI-Brazil as the main conduct for the MMAS studies meant that the studies could benefit from CI-Brazil's extensive relationships with local, regional, and national partners. The involvement of CI-Brazil in Brazilian in NPCs was extensive, ranging from one-on-one partnerships with local NGOs, national universities, and governmental departments to involvement in large

national coalitions ProAbrolhos and SOS Abrolhos. NPCs improved up the design and utilization of MMAS science in three ways: (1) they enabled the recruitment of qualified PIs with a keen understanding of the Abrolhos context, (2) they provided a mechanism for gaining input into the design of the studies, and (3) they provided a mechanism for results to be quickly shared and inputted in political processes.

3. **Participation across scales and the science/policy boundary.** The most relevant factor enabling participation across scales and the science/policy boundary was the involvement of CI-Brazil. CI-Brazil had strong relationships with the core MMAS team in the United States as well as with local and national stakeholders through NPCs. NPCs allowed local PIs, which brought their own personal and professional networks by which to solicit participation. Workshops, one on one conversations, and informal interactions – including with policymakers from important agencies such as the Chico Mendes Institute – solicited input, helped to under knowledge needs, and ensured future S2A applicability. These participative interactions would have been difficult or impossible without CI-Brazil's involvement and its excellent reputation with local, national, and international stakeholders

At the local level, participation was assisted by two additional factors. First, CI-Brazil's involvement in Abrolhos National Park's Consultative Council and Corumbau RESEX deliberative council allowed government, NGO, private sector, and local community stakeholders to stay engaged in the studies' progress and feel that the results were salient to their needs. These councils, similar to Coiba's Directive Council, were a regular iterative mechanism for information sharing and feedback. Second, CI-Brazil's capacity building programs – involving both high school and college age students – created a local constituency that supported marine science and spread information to families and friends.

4. **Accountability and the Ability to Learn.** The meetings of the deliberative and consultative councils served as downwards accountability mechanisms, allowing local stakeholders an opportunity to provide their opinion and feedback on MMAS studies. The existence of a CI-Brazil office in Caravelas also allowed day to day interactions with locals, and enabled Dr. Moura to be constantly keyed in.

The fights over the oil drilling and shrimp farming in Abrolhos provide the clearest evidence of MMAS being able to learn. CI-Brazil used their political connections and coalitions, in addition to the MMAS study results, to fight an organized development campaign. Flexible adaptation proved key as CI-Brazil engaged through judicial, legislative, and direct action methods.

5. **Translation of Scientific Knowledge.** S2A outreach efforts by Drs Dutra and Moura, as well as Mr. Faget, were helpful in disseminating understandable messages

through videos, banners, posters, and presentations, so to influence management and policy changes. Local stakeholders, many of which were illiterate, needed these products to fully understand MMAS scientific results and incorporate them into their lives. S2A products were accepted by local stakeholders as credible because of the trust built by CI-Brazil's long term presence. As a CI-Brazil employee puts it, MMAS has been successful in part because:

> We are not a big NGO that comes with a big project, then packs and leaves. We have been there with a small office with the door open, been talking with all the stakeholders and giving support to fisheries associations, parks and the reserves, councils, etc. This is what brings trust. Program is incorporated into the governance structure of the entire region and the agenda has been affected by the local context.

6. **Assessment Context.** The experience of MMAS in Brazil emphasizes how large-scale threats ongoing in a country can increase the salience of scientific results. Immediate threats such as oil exploration and shrimp farming served to mobilize CI-Brazil, the Chico Mendes Institute, NGO partners, SOS Abrolhos, and some sectors of the local communities against a common enemy. Once mobilized, these groups needed rigorous scientific data to support their political positions. MMAS data was well suited to fill this gap. Without these threats, MMAS data would still have been useful but possibly less timely and used.

Brazil MMAS also illustrates the power of a cohesive and engaged civil society in pushing environmental and social change. More so than the other nodes, Brazil has a large amount of well funded NGOs, associations, and coalitions, and these civil society members had a perceptible influence on governmental decisions.

4.9 Translation from Local to International

4.9.1 Communication with the Gordon and Betty Moore Foundation

While MMAS had been crossing scales and implementing the program at the four node sites, the core MMAS team was also in regular communication with the GBMF. In particular, Dr. Karrer had monthly talks with Ms. Calcari to provide updates on MMAS' achievements and setbacks. This communication helped keep the GBMF informed, ensuring the GBMF that their money was being spent wisely. MMAS placed a large emphasis on communication with the GBMF both because it was a requirement and because the GBMF was a large and continuing donor for CI.

> Keeping the donors happy is extremely important. I guess that's just assumed, if they are giving money, you need to make sure the donors happy. I talk to Megan every month and give her an update on generally what is happening… Usually it is more than substantial stuff like for example, we discovered a new fish in Fiji, just to get her... it is her money, so I want her to be excited about it. And I think it is a good thing to keep the donor excited, otherwise in two years you'll go back to them and they'll say I have no idea what you've done and why am I giving you money. (Core MMAS team member)

Beyond personal communication, several written documents were used to ensure upwards accountability. First, the MMAS Overall Workplan (detailed earlier in this dissertation) kept the GBMF updated on the progress of MMAS towards its outcomes. This document was filled in piece by piece by CI and regularly passed back and forth between CI and the GBMF. Second, the core MMAS team composed annual reports and delivered these to the GBMF. These annual reports documented scientific, capacity building, and policy and management achievements at the four nodes and globally. Third, the S2A Assessment (of which this author was a part) gave the GBMF an independent evaluation of MMAS' management and policy impacts. Finally, the 2010 MMAS Final Report provided the GBMF a summary of all programmatic achievements over the life of the program, and included individual study reports, scientific publications, S2A outreach materials, and other documents.

4.9.2 Cross-node sharing and synthesis

Throughout most of MMAS, scientific results were transmitted up to the core MMAS team by the node coordinator or through direct conversations with MMAS PIs, and then re-transmitted downwards to PIs at other nodes if needed. Direct cross-node data sharing and collaboration between scientists in different nodes was rare. There were late opportunities for collaboration; meetings were held for PIs to share results in April 2009 (Socioeconomic and Governance), January 2010 (Ecological Monitoring), and April 2010 (Cultural Roles). These meetings were all organized by the cross-node disciplinary coordinators.

Despite these late meetings, and the efforts of cross-node disciplinary coordinators, in interviews MMAS PIs overwhelmingly spoke of few opportunities to engage in direct PI sharing. Few had any idea what was happening in other nodes. The general sense was that earlier cross-node sharing would have been very desirable. A core MMAS team member reflects:

> We had a two-day meeting just this April 2009. And what they were saying was… we should've had these meetings before. At least one here, when everybody started preparing their questionnaires… and I agree with them, because then we would have had a more standardized questionnaire for the cross node…

Interviews revealed that earlier sharing would have had benefits as well as challenges. PIs felt that it would have enabled them to learn from each other's approaches, develop different methodologies, and craft directly comparable results. By having more comparable results and similar methodologies, the eventual construction of cross-node disciplinary reports would have been simpler and more productive. Ideas for mechanisms of cross-node sharing included cross-node visits, online communication tools, e-mail groups, and early workshops. A selection of thoughts from MMAS researchers across the nodes is listed below.

> I always find very fascinating to hear the kind of cross site visits; we had someone from Madagascar are talking about how they set up an MMA, so the kind of more informal learning when people are doing similar things but in cultural contexts. You learn a lot from that…I haven't seen a lot of that happening among the four. (MMAS researcher, Fiji)

> None whatsoever. I know their names, because I see them on an email. Never met them, never seen them… The whole program should have had a database from day one that the data was feeding into, it should have been on a web server, there should have been analysis workflow done as soon as we collected the first dataset, all of this stuff should have been done before we got in the water. (MMAS researcher, Fiji)

> Would have liked to have a meeting like that earlier on. We could have benefitted from that, could have tried to standardized our methods across countries. Still don't know how CI will do the cross node analysis. Methods are very different… Synthesis of results of results in a qualitative way will be easy, quantitative comparisons across countries will be extremely difficult. If we had come together from the beginning, could have talked about what was possible and tried to standardize as much as possible. (MMAS researcher, Belize)

> So instead of having everybody together at the beginning, and saying okay lets discuss what we are gathering, what information, is this an international global comparison of MPAs and models? Okay, so what is a MPA for you? So how can I compare RESEX to something that is related or similar in Panama, to something that is related and similar in Fiji. We haven't started this FIRST discussion, so you cannot compare apples and oranges. (MMAS researcher, Brazil)

> You could not see what was going on in the other nodes on a permanent basis. It was not a newsletter. Sometimes people tend to overcomplicate information venues. A newsletter could have been something simple, an email group… we don't have an email group. (MMAS researcher, Brazil)

However, PIs were cognizant of some of the challenges inherent in cross-node sharing, such as language, node timing, availability of funds, and reluctance of scientists to share unpublished data. Interviews with the core MMAS team also revealed that they believed cross-node coordination before 2009 and 2010 was premature since no results were available, and that there was a fundamental balance between having standardized methodologies across nodes and being more locally useful and adapted.

> Some but less that I had anticipated, given the original concept for the MMAS project. I've received some data upon request, in early attempts at cross-site synthesis, but mostly fellow researchers are either a little leery of sharing unpublished data or, understandably, too busy with immediate-need projects to expand into larger collaborations. (MMAS researcher, Belize)

> None. Some work should be done about it. This would be extremely expensive, [but] would be good. I have not had any contact with other nodes, research teams in others countries…It would have been very productive. However, it may be dangerous because don't know how similar Panama project was to other projects, each country adapting the project to their own realities. May be difficult dialogue. For example, I speak English, but not everyone speaks English for good communication. (MMAS researcher, Panama)

> From a core MMAS team member:
>
> … Because there was nothing to share earlier. If there was something I would like to do, if this was going to have a phase 2, with four other nodes, same cross synthesis, I would definitely have one at the beginning. The important thing for that would be that it would help to standardize everything.

One goal of the MMAS initiative was to synthesize findings into overall MMA findings, and to use these findings to craft transdisciplinary messages, produce outreach materials, target audiences, and influence global management and policy. There was to be cross-node disciplinary synthesis reports (in which all the disciplinary results across the nodes would be synthesized), and node-specific synthesis reports (in which the findings of all disciplines within a node would be synthesized). These reports were produced in late 2009 and 2010.

For the cross-node disciplinary synthesis reports, cross-node PIs (identified earlier) collected disciplinary findings across nodes and identified core findings and common themes. For the node-specific synthesis reports, a PI or, in the case of Belize, the S2A Coordinator, worked with the node coordinator and the core MMAS team to synthesize the results from all disciplinary studies in his/her node into a report. The primary node specific synthesis report authors were Mr. James Comley in Fiji, Dr. Melanie McField in Belize, Dr. Juan Mate in ETPS, and Dr. Michael Orbach in Brazil. Synthesis for all reports took some time as there were significant methodological differences between the results from each node, and challenges in aggregating data and combining different disciplinary themes within nodes.

In particular, producing the cross-node disciplinary synthesis reports compelled an increase in cross-node coordination and data sharing. Besides the 2009 and 2010 meetings, there were multiple mass e-mail exchanges, releases of online MMAS newsletters, and visits by cross-node disciplinary PIs to Arlington Virginia to hold discussions with the core MMAS team. Cross-node disciplinary PIs also had multiple conversations with PIs in their corresponding discipline. By October of 2010, the node synthesis and the cross-node disciplinary reports were finished, and were ready to be used to produce outreach materials to influence global management and policy impacts.

Findings from cross-node disciplinary synthesis reports are below in Table 4-17.

Table 4-17: Cross-node disciplinary synthesis findings

Topics of Research (PI)	Selected Findings (Abstracted from Final Reports)
Ecological Monitoring Cross-Node Synthesis (Kaufman)	Well-enforced no-take areas quickly accumulate higher fish biomass than exploited areas, no matter where you are in the world. However, the benefits are ephemeral if fishing resumes or enforcement flags. MMAs are at the mercy not only of both global climate and local human impacts. Whether herbivorous fishes are positively or negatively correlated to fleshy algal biomass can be used as an indicator of ecosystem state and resilience. While a rapid rise in fish biomass may be observed following the implementation of a no-take area, conclusions should not be drawn until several years of data are in hand. If the regulation of fisheries extraction has an indirect effect on the health of corals and other benthic organisms, it was not apparent during the brief duration of this study.
Socioeconomic and Governance Effects Cross-Node Synthesis (Samonte-Tan)	MMA beneficiaries have both higher household income and fishing income than non-MMA beneficiaries. MMA beneficiaries are likely to have more diversified livelihoods than non-MMA beneficiaries. MMA beneficiaries have stronger perceptions of non-monetary benefits of MMAs and local values and beliefs than non-MMA beneficiaries. MMA users are more positive on their health situation than non-MMA users. MMA users perceive management in MMAs are more effective than non-MMAs compared to non-MMA users. MMA users are more likely to know the rules and regulations than non-MMA users. Respondents who use marine resources from MMAs more likely get information and training from MMA bodies than respondents who don't use marine resources from MMAs. Respondents who use marine resources from MMAs have stronger environmental awareness and knowledge than their counterparts who don't use marine resources from MMAs. Information dissemination is more efficient among MMA users than non-MMA users. If the respondent has ever received training in environmental education related to the MMA, the respondent is more likely to know the rules and regulations of MMAs. If the respondent or anyone in family has ever got a job related to MMA since the establishment of the MPA, the respondent is more likely to know the rules and regulations of MMAs.

Economic Valuation Cross-Node Synthesis (Pendleton)	While the Coiba fishery supports 275 direct fishing jobs on 49 boats, and generates nearly $7.5 million in gross revenues, the high cost of fishing means that the net economic contribution locally is only $1.3 million in producer surplus – a return of only 17%. In Belize, the regional fishery generates $3million annually in gross revenues, and $2.5million in net revenues – a return of more than 80%. In Bahia, Brazil, despite the high value of fish landings, costs in the Abrolhos area were relatively high compared to Gladden Spit, yielding only 23% profits. In Coiba, only $0.18/kg (or roughly 8% of the landed value) goes to processing jobs. With the average port near Coiba landing only 65,770 kg of fish annually, the average value of processing-related jobs amounts to just under $12,000 per port. Coiba contributes more than $234,000 annually in producer surplus, while in Belize, tour operations alone earned more than $1 million of which $678,000 was producer surplus. All of the MMAs are remote from the major markets of the United States and Europe, with Brazil being the most remote of the three countries considered. All three MMAs in this study collect entrance fees – generally less than $20/visit. The fee for Abrolhos is a flat fee.
Cultural Roles Monitoring Cross-Node Synthesis (Orbach)	The Critical Role of Cultural Belief, Attitudes and Practices The Role of Contextual Factors in Social and Cultural Process (for example, the general shift to leisure-tourism in coastal economies, labor migration in or out of the coastal communities, the availability of alternative occupations) The Potential for Support for or of Revitalization of Coastal Communities Through the Creation of MMAs The Potential for Disruption of Social and Cultural Systems Through the Creation of MMAs The Importance of Broad Local Stakeholder Involvement in All Parts of the MMA Development and Implementation Process

Table 4-17: Cross-node disciplinary findings (cont'd)

4.10 Impact on CI as an Institution

Institutional change at CI headquarters and field offices was coincident with MMAS' tenure. While it is impossible to tie these changes directly and unequivocally to MMAS, direct observation by this author and interviews with those most closely connected to MMAS and CI paint a picture of four likely major MMAS institutional impacts, listed below.

Unlike the nodes, these changes were not a result of outreach campaigns, directive councils, umbrella organizations, political advocacy, and the like. Rather, at MMAS headquarters, it was through MMAS staff participating daily with others, holding cross-programmatic meetings, discussing MMAS strategies, and showcasing MMAS successes. At field offices, it was due to (mainly) a large infusion of funds from the GBMF grant for growth and increased linkages to global and regional programs.

1. **Contributed to increased emphasis on human well-being within CI's mission and vision.** CI was undergoing significant change during the period of the MMAS program. As mentioned earlier, the CEO Peter Segilmann and the Board of Directors spearheaded a restructuring of CI in 2008 and 2009. Besides program and divisional shifts, this restructuring included changing CI's mission and vision to emphasize human welfare and human well-being. It is difficult to determine exactly to what degree this change was driven by MMAS, as an interview with Mr. Segilmann was not possible during the course of this research. However, MMAS' strong emphasis on looking at the economic, socioeconomic, governance, and cultural impacts of MMAs in the years prior to the restructuring, as well as Dr. Karrer's continuing participation in

CI-wide discussions, make it more than likely that MMAS contributed to the change. A core MMAS team member:

> When MMAS was being conceived, its explicit focus on natural-human coupling, ecosystem services, and human welfare were controversial among some within CI, because the project was not focused principally on endangered marine species or hot spots… Human welfare (as the securities) and ecosystem services are now central concepts in the shaping and execution of CI programs institutionally. The change in mission took place after the basic tenets of MMAS were established and during the execution of the project.

Further evidence comes from a CI employee who was a key player involved in the original design and development of MMAS within CI.

> It led the development of the vision as it is now, with human well being and conserving nature for human well being. There is a tradition in the marine area of recognizing that long before then the traditional terrestrial species conservation community came along. We were in a position early on to say, we can't go out and lock up this area for conservation, this endemic butterfly fish, but we can work on better stewardship and management, and that, by the way, should include preserving endemic and threatened species. That conversation went on.

2. **Spearheaded S2A approach.** While CI did produce and leverage science before MMAS, MMAS' emphasis on S2A brought CI's thinking about using science to influence human behavior to another level. Specifically, MMAS showed others within CI that policy and management impacts of science should be thought of early in science development, that there should be a specific amount set aside for S2A activities (15% in MMAS' case), and that science can be *successfully* used to catalyze changes at program

sites. As of 2011, S2A as a framework is used throughout CI; S2A terminology and concepts were included in a recent proposal to the GBMF. A core MMAS team member:

> I'd say our biggest institutions impact was influencing S2A thinking. In fact the phrase was the theme of the last Science & Knowledge Division proposal to Moore Foundation. MMAS is often looked to for input on S2A thinking.

3. **Increased emphasis on marine science, social science, and global learning within the Science + Knowledge Division.** Before MMAS, CI had a very small institutional focus on marine science and MMAs, particularly marine social science. The vast majority of science done by CI was terrestrial natural science. MMAS was CI's first big marine initiative that connected regional and international programs. Due in part to MMAS providing a successful example of how marine and social science can be useful , the Science + Knowledge division is now looking to implement more marine programs and programs that consider both natural and social science. MMAS spearheaded the approach of synthesizing findings from node sites and combining them into global insights, an approach not commonly taken before.

4. **Built capacity within headquarters and field offices.** Building capacity within CI and in the field was one of the overall objectives of MMAS. At headquarters, this was accomplished through the hiring of the core MMAS staff of Dr. Karrer, Mr. Tschirky, Dr. Samonte-Tan, and Mrs. Rustandi. This was a smaller staff than with other

CI programs; however despite the small size these individuals still contribute to overall CI capacity by bringing years of experience and skills to CI. As of 2011 they were still employed by CI and contributing their expertise.

At node sites with a CI office, MMAS funding allowed these offices to gain prominence. In Fiji, MMAS allowed CI-Fiji to expand into marine science and become an active partner in FLMMA. In ETPS, MMAS allowed partnerships that will guide CI ETPS' engagement in ETPS and continue to contribute to the management of Coiba NP. In Brazil, MMAS funding enabled CI-Brazil to significantly expand its conservation science efforts and forge stronger linkages with partners, consolidating its presence in marine affairs at the regional and national scales. A CI-Brazil employee:

> I think it consolidated well our presence in the country, in the region, in the marine. Marine conservation is new at CI compared to other NGOs, it is even newer for CI Brazil. It is an entire new dimension of conservation that is still in earlier days than other dimensions. So I think the MMAS was very important to consolidate CI in the marine landscape, at several levels.

This chapter has presented the main findings of the research on MMAS. Moving from an examination of MMAS' initial design, to exploring how it played out at each of the node sites, to looking at cross-node disciplinary synthesis, to impacts within CI as an institution, this chapter has laid a foundation for further discussion. The following chapter will connect MMAS results back to theoretical concepts and explore the practical implications of MMAS' lessons.

5 Chapter Five –Analysis of Key Factors

To recall, the central question of this dissertation has been: **what factors affect how ENGOs manage the boundaries across scales and between science and policy in international MMA science initiatives?** To answer this main question, I broke the question down into specific sub-questions regarding the MMAS program, namely:

1. How were the priorities and objectives of Conservation International's MMAS initiative developed? What key decisions were made, and what impact did these decisions have on the initiative's development?
2. How were programmatic goals, scientific priorities, and scientific results translated between the local, national, and international scales? Where was this translation more successful and what programmatic factors contributed to this success?
3. How was science translated into management, policy and capacity building changes at the four node sites? Where was this translation more successful and what programmatic factors contributed to this success?

This dissertation focused on the processes and outcomes in the four nodes and within CI as an institution. The non-node and global studies were not analyzed primarily because the data relevant to the above questions lay primarily in the CI headquarters/node relationships. Literature predicted that six factors would be critical to the success of an organization in managing the boundaries between scales and the science/policy interface: (1) how the program was initiated, (2) the use of networks, partnerships, and coalitions, (3) level of participation across scales and the science/policy boundary (4) degree of accountability and the ability to learn, (5) translation of scientific knowledge, and (6) assessment context. These factors are intertwined with one another; strengths in one contribute to strengths in the others.

Results from an in-depth examination of MMAS largely confirm theoretical predictions. Each of the factors above strongly influenced the ability of MMAS to manage the scalar and science policy boundaries at node sites and throughout the program. But how, specifically, did each factor play a role in MMAS? What additional insights came out of the initiative? While there has been some analysis of how these factors played out at the end of each node sub-chapter, the remainder of this chapter will further explore the role of these factors in MMAS' overall process.

6.1. *Question One: Impact of Early Decisions*

How were the priorities and objectives of Conservation International's MMAS initiative developed? What key decisions were made, and what impact did these decisions have on the initiative's development?

5.1.1 Program Initiation

STS literature predicts that design decisions made during the initiation of a program have outsized ramifications on how the program progresses and how science is ultimately turned into policy (Farrell and Jager 2006). The salience, credibility, and legitimacy of science are linked to the goals of the program and when and how those goals were determined. Stakeholders may view a program as unrepresentative and illegitimate if there is not sufficient local input during the earliest phases of program initiation, or if the goals of the program are not shared by the stakeholders (Mitchell et al. 2006). With MMAS, decisions on scientific objectives, timelines, S2A strategies, and mechanism of node entry affected how MMAS was perceived in each of the four nodes and ultimately how the scalar and science/policy boundaries were managed. Program initiation of MMAS can be broken down into two phases – the overall design of the initiative in 2003 – 2005, and the entry of the initiative into nodes in 2006 - 2007.

In 2003 – 2005, the overall structure of MMAS was determined by a relatively small group. Individuals within (mainly) CI's Center for Applied Biodiversity Science, Boston University, the GBMF, and other selected scientists and managers throughout the United States wrote the proposal, determined the initiative's timeline (5 years), and crafted the broad, basic scientific and S2A strategies. At first, the process of MMAS was somewhat unsystematic – a couple of opportunistic studies were funded that didn't fit into MMAS' core objectives (i.e. study in the Philippines, Hawaii Aquarium Fish Collecting Impacts study), the overall MMAS structure was still being built, and the SAC was, according to informants, not ideally utilized during group meetings. With the exception of Brazil, there was little consultation with (potential) node sites. 2004 and most of 2005 was spent moving MMAS from a relatively unstructured idea to a concrete, well-developed international program.

As MMAS was approved by the GBMF, two individuals had a particularly outsized role: Dr. Kaufman and Dr. Karrer. Dr. Kaufman determined the scientific design of the initiative, rooting MMAS in adaptive management principles and crafting the global MMA monitoring experiment. Dr. Karrer greatly increased the emphasis of MMAS on social science, and transformed the S2A process, setting aside 15% of the funding and infusing S2A concepts throughout the workplans.

These decisions affected how MMAS unfolded, with the decision on the scientific core of MMAS - the MMA global monitoring experiment - having the most profound impact. This scientific core of MMAS determined the structure for the initiative everywhere that MMAS worked. From a scientific perspective, determining that an international science initiative should be focused on MMA monitoring across multiple nodes and ecological gradients made sense. There is less research on MMAs versus their terrestrial counterparts, and there have been few, if any, opportunities to examine the effect of MMA zoning schemes in multiple countries simultaneously. The broad themes were selected based on perceived key issues for MMAs worldwide.

However, from a program implementation standpoint, determining that a set of core scientific questions should be the same in more than one node produced inevitable challenges. Each node in MMAS had its own perspective on the type of science it most critically needed to feed into policy and management, and the MMAS studies did not always address the issues at the top of the list. Thus, when stakeholders at some nodes were presented with a scientific program that they perceived as not salient, it led to feelings of resentment and disenfranchisement. This happened most prominently in Fiji and Belize, where MMAS was initially perceived by stakeholders as a foreign initiative with little local input.

Likewise, the early decision by Dr. Karrer to structure S2A in a particular way and emphasize social science had long-term ramifications. An S2A emphasis ensured a concerted effort by PIs and the node coordinators to craft policy and management applications for their results. Focusing on social science meant that MMA monitoring questions would be considered holistically instead of in disciplinary isolation. These decisions ended up serving to increase the salience, legitimacy, and credibility of the results, but they also lengthened the time within MMAS that needed to be dedicated to workplan construction and increased the inevitable complexity that comes from dealing with the different scientific 'cultures' of different disciplines.

How MMAS entered each node in 2006 and 2007 further affected how stakeholders initially perceived the initiative. While, in all nodes, the basic structure of MMAS had already been determined, additional factors contributed to the degree to which MMAS was perceived as foreign. In Fiji, MMAS partnering with WCS and the failure to approach FLMMA early further drew attention to foreign design. In Belize, the lack of a CI office and a need to rely on one-on-one meetings made it difficult to engage with a wide swath of stakeholder groups, and decreased initial study relevance. In Panama, Galapagos, and Brazil, the decision to use CI offices smoothed entry and allowed the studies to quickly feed into ongoing processes. CI offices proved to be crucial in allowing MMAS to have a local stamp and understanding the economic, socio-political, and biophysical context, creating more opportunities for S2A later on in the initiative's life.

Furthermore, the decision in 2006 and 2007 to not set up a mechanism for PIs to communicate *across* nodes meant that direct cross-node sharing ended up being sub-optimal. Individual studies were designed with little overlap of methodologies and research approaches; PIs had very little knowledge of scientific efforts at other nodes. The cross-node meetings that happened in 2009 and 2010 were a positive step, and the cross-node disciplinary PIs had a big impact later in MMAS' life. However, earlier discussions and direct PI sharing could have helped design the studies to be more complementary to one another, perhaps making construction of final reports an easier process.

It is worthwhile to examine *why, when and how* these decisions were made. While many factors undoubtedly mattered, it is clear that the donor funding cycle played a dominant role in driving decisions during the 2003-2005 phase. First, the GBMF decision to make the program only 5 years spurred quick action; for example, expectations from the GBMF led Dr. Kaufman to begin several studies in 2005 before the overall MMAS structure was fully developed. Second, the need of the GBMF to have core programmatic questions determined before funding was approved restricted the ability to gain broad early input and tailor MMAS to local contexts. Few program participants were identified at the proposal stage of the program, and Dr. Karrer, Dr. Kaufman, and others didn't want to raise expectations by holding extensive early discussions with a large number of dispersed (potential) program participants when funding was not approved. A core MMAS team member spoke of a Catch-22: do you consult with nodes early and raise expectations, possibly wasting time and dashing expectations if the initiative is not funded? Or do you wait until the initiative is funded, and deal with the inevitable adaptation challenges? While the goal of avoiding unfulfilled expectations made sense at the time, it is clear that in hindsight that this ultimately affected how stakeholders perceived the initiative.

The decisions to enter nodes in a particular way in 2006-2007 were driven by a variety of factors, including expediency and professional history (Fiji), and presence of organizational offices (ETPS and Brazil) or lack thereof (Belize). In the Fiji case, the professional history of Dr. Kaufman with WCS produced implementation issues (although quick adaptive learning by CI, and subsequent collaboration with FLMMA, changed stakeholder's perceptions). In the ETPS and Brazil cases, the CI offices knew exactly how to enter the nodes and thus could help MMAS avoid entry mistakes. A lack of cross-node sharing came from the core MMAS team wanting to focus energy on setting up MMAS studies in each node and not seeing an immediate need to prioritize direct PI sharing across nodes.

An alternative explanation on the influence of early decisions may be that early decisions either didn't affect the outcome of MMAS, or that these effects are largely insignificant when combined with decisions made during program implementation. Chronologies of MMAS action in each node allowed investigation of casual sequences (Yin 2008); these chronologies – in addition to cross-node comparisons - revealed that this alternative explanation is not plausible. While the impact of these early decisions on policy, management, and capacity building outcomes was certainly muted by factors that interceded between program initiation and program completion (some of which will be discussed following), it is clear that they set MMAS down a particular path that shaped how it ultimately emerged. The influence of early decisions on the outcome of the entire MMAS program makes logical sense; it is unlikely that a program will change its structure midway through a program cycle. Fiji and the example of the Genetic Connectivity study – which started sub-optimally and then ended up being highly praised - is an illustration that nothing is set in stone; however, generally speaking once the wheels of the initiative were set into motion, the shape of those wheels helped to determine the overall direction.

5.2 Questions Two and Three: Crossing Scales and the Science/Policy Boundary

The phenomenon of crossing scales and the science/policy boundary involve similar phenomena, so they are consolidated in the following section.

How were programmatic goals, scientific priorities, and scientific results translated between the local, national, and international scales? Where was this translation more successful and what programmatic factors contributed to this success?

How was science translated into management, policy and capacity building changes at the four node sites and CI? Where was this translation more successful and what programmatic factors contributed to this success?

5.2.1 Networks, Partnerships, Coalitions

NGO theory emphasizes the power of networks, partnerships, and coalitions (NPCs) in enabling ENGO cross-scalar and science-policy work. NPCs connect organizations with common goals to each other across scales (Nelson 1997), enabling sharing of resources such as capacity, funding, and information (Josiah 2001). They create enduring bonds of trust that last beyond program completion (Keck and Sikkink 1998). Umbrella organizations can act as a clearinghouse for information and enable easier access to a wide variety of stakeholders (Josiah 2001), and strategic bridging of

ENGOs with business creates alliances that provide both the ENGO and the business with knowledge and resources (Stafford, Polonsky, and Hartman 2000). Involvement in an NPC allows an organization to cross scales, increase programmatic impact, engage in advocacy campaigns, tap information and capacity, and reap the other benefits that comes from being involved in collective action campaigns (Arts 2004; Roberts, J. P. Jones, and Frohling 2005). While engaging in NPCs has its challenges, and there is a risk that junior partners can be disempowered, NGO literature generally emphasizes that positive results will emanate out of an organization being engaged in them.

The experience of MMAS largely confirms these theoretical predictions. MMAS' involvement in NPCs in each node had a very clear impact on how the initiative crossed scales and the science/policy boundary. In Fiji, ETPS, and Brazil, where MMAS had stronger linkages to NPCs, managing scales and the science/policy boundary was more effective, leading to more extensive policy, management, and capacity building impacts. Conversely, where MMAS had fewer linkages to strong NPCs in Belize, management across scales and the science/policy boundary was more difficult, and programmatic achievements suffered.

NPCs in MMAS took the form of linking with organizational offices, umbrella organizations, academic institutions, and science and advocacy coalitions. In Fiji, FLMMA operated as a classic umbrella organization for MMAS. MMAS' linking with FLMMA – assisted by the CI offices in Samoa and Fiji – brought a myriad of benefits.

FLMMA brought together stakeholders from across multiple sectors and scales to discuss the MMAS studies and orient them towards relevant Fiji management needs. Thus, it served to reduce the feeling of foreign ownership created by MMAS' node entry. FLMMA also gave MMAS access to an extensive network of contacts with community stakeholders and local PIs, as well as to regular communication mechanisms through the working groups. FLMMA community workshops leveraged scientific results at the local scale, encouraging the creation of LMMAs and YMSTs.

In Belize, MMAS only succeeded in linking up to a strong NPC that could help them leverage MMAS' scientific results in 2009 and 2010, through a partnership with Dr. McField and the Healthy Reefs for Healthy People Initiative. While this partnership harnessed scientific and political acumen to insert the MMAS results into several ongoing processes, it came too late to overcome some negative perceptions. While MMAS tried to link with APAMO and the MBRS earlier, these NPCs ended up likewise not being productive due to APAMO and MBRS being too young, or too weak, to effectively enhance impacts.

The lack of a strong NPC in Belize during most of MMAS' implementation meant that cross-scalar and science/policy boundary management needed to rely on foreign PIs, a part-time node coordinator, and the core MMAS team. All of these individuals brought competence and experience to the effort. However, with the exception of Mr. Garbutt, they (not surprisingly) lacked the ability to spend extended amounts of time in the country, which in turn limited the ability of MMAS to gain contextual knowledge, enable strong local participation, and utilize local networks of information transfer. Garbutt was occupied with other commitments and was not able to commit his full time efforts to MMAS, unlike in other nodes where there were multiple individuals working on enhancing policy, management, and capacity building impacts. Thus, while MMAS' results in Belize did lead to some policy and management impacts, these impacts were muted compared to the other nodes.

In ETPS, CI offices greatly smoothed the way for cross-scalar discussions and science/policy boundary management. Partnerships with these offices gave MMAS an immediate country access point, time commitments from office personnel, and contextual knowledge of the countries' science and management needs. Feeding the MMAS studies through these offices allowed node stakeholders to see the studies as coming from a local entity.

Beyond these partnerships having valuable benefits of their own, CI offices in the ETPS linked MMAS into other NPCs. In Panama, CI ETPS and CI Meso Sur connected MMAS with STRI. STRI was an established, respected academic institution; this association meant that MMAS could more easily recruit local PIs from the University of Panama, understand Coiba NP's needs, connect with local stakeholders, and feed the results directly into the Directive Council and the Coiba Management Plan. In Galapagos, CI ETPS' partnership with the Charles Darwin Research Station operated in a similar fashion, allowing MMAS to harness the station's ecological knowledge and reputation and work through its relationship with the Galapagos National Park Service. MMAS in Panama and Galapagos made respectable management and policy impacts, with the Panama studies enabling a management plan that is viewed as a model throughout the country.

Brazil is perhaps the most vivid example of how NPCs can scale up impacts, increase access to capacity and resources, provide connections to policymakers and advocacy campaigns, and enable crossing scales. Like in ETPS, a CI office provided an access point, local science and management knowledge, and access to other NPCs. CI-Brazil's involvement in NPCs was wide-ranging, from academic institutions to governmental partnerships and science and advocacy coalitions. MMAS could leverage these relationships to recruit PIs from universities, gain input into MMAS study design at the local and national scales, organize meeting with policymakers, and fight against oil drilling and shrimp farms. CI-Brazil's strong reputation enhanced credibility of the studies, while communication through these connections served to increase salience and legitimacy. The management, policy, and capacity building impacts in Brazil are perhaps the most impressive of all nodes. There was action on the local, regional, and national scales, ranging from stopping shrimp farms in Abrolhos to establishing fishing monitoring partnerships with Brasilia ministries.

For a graphic summary of the key connections and partnerships in the MMAS program, see Appendix G – MMAS Partnership Structure. Note that this is a *vastly* simplified diagram of connections within MMAS; yet, it largely illustrates how MMAS worked to cross scales and the science/policy boundary. The solid lines represent strong connections and the dotted lines represent weak(er) connections.

An alternative theory may be that MMAS could have crossed scales and the science/policy boundary just as effectively without access to NPCs. Couldn't MMAS have hired a larger staff, or the core MMAS team spent more time travelling to node sites recruiting PIs, learning about management and policy needs, and directly implementing the initiative? In addition to the fact that this would have been logistically difficult and physically exhausting, this theory would be overlooking how each node succeeded (or not) compared to the others. The scenario above is similar to what happened in Belize, due to Mr. Garbutt being part-time and efforts to create NPCs with APAMO and MBRS not being successful. The experience of Belize versus Fiji, ETPS, and Brazil clearly illustrates that *strong* NPCs matter.

There is a core difference between a NPC that is an alliance among difference entities with different abilities and characteristics, and a NPC that is a single organization that operates through multiple offices on multiple scales, but under the same administrative roof. NPCs in MMAS operated in both ways. Both types of NPCs were productive and useful, but the benefits of NPCs were accessed faster when CI in

Arlington VA connected with other CI entities. For example, building an MOU with FLMMA took over a year; discussions between CI in Arlington and CI in ETPS and CI Meso Sur took much less time. However, NPCs with organizations outside of CI brought increased knowledge, local connections, and access to ongoing processes that would have been difficult to access through just CI offices. Even when an international ENGO is running an initiative, the initiative needs to be building and supporting NPCs with organizations outside of its administrative purview.

5.2.2 Participation

Both NGO and STS theory emphasizes the importance of participation in enabling ENGO cross-scalar and science-policy boundary management. Ideally, a program ensures *engaged* participation of actors at all scales throughout the life of the entire initiative (Cash and Moser 2000). Engaged participation is not simply ENGO education and outreach to get stakeholders in line with an agenda from the top (Campbell and Vainio-Mattila 2003). Rather, it includes creating or accessing mechanisms that allow stakeholders substantial input - adding to reports and giving opinions, taking part in meetings, holding workshops, influencing decisions and the like (Farrell and Jager 2006). Program delegation is a level of high participation (Arnstein 1969). Engaged participation of both scientists and policymakers in a program can blur the science/policy boundary (Jasanoff 1994) and make the translation of science to policy more effective. Keeping partners, managers, and policymakers participating is a crucial element of boundary spanning as it increases trust and buy-in into the results (Cash and Moser 2000; Farrell and Jager 2006; Mitchell et al. 2006; Josiah 2001).

NGO and STS theory point to several ways of creating engaged participation. An ENGO can delegate program responsibilities and decision-making power, creating opportunities for those closer to the local scale to feel ownership of the program and use their contextual knowledge and relationships (Rodriguez et al. 2007). Integration of TEK and traditional resource management practices can increase participation as it respects local worldviews and utilizes local way of relating to the environment (Drew 2005). Iterative communication mechanisms such as newsletters, workshops, and meetings provide venues and keeps participants engaged and supportive (Cash et al. 2003). Boundary organizations can speak to stakeholders across scales and the science-policy boundary (St Clair 2006).

The literature is also clear on what happens when participation is not emphasized in an ENGO program – programs are more prone to failure, stakeholders feel less engaged, and the salience and legitimacy of the science suffers. A concentration of decision making at the top can lead to substantial local resentment, anger, and frustration (Chapin 2004). The scientist doesn't know what the manager or the policymaker needs, the manager or policymaker doesn't know what the scientist is doing, and the science produced doesn't address the most critical problems (Cash et al. 2003).

Again, an examination of MMAS closely confirms theoretical predictions. Where participation was great in terms of frequency, duration, and level of engagement, the policy, management, and capacity building impacts of MMAS were more significant. Where participation was lesser, programmatic impacts were more muted. Participation created buy-in, trust, and respect from node actors. Mechanisms for participation in MMAS were most commonly (1) local PIs and their personal and professional networks, (2) working groups or councils, (3) workshops, (4) node coordinators, and (5) capacity building programs.

MMAS' partnership with FLMMA for example, allowed it to access the participation mechanisms core to FLMMA's structure. As mentioned in the last section, FLMMA helped to recruit local PIs, provided access to working groups, and generally brought stakeholders together to discuss MMAS and link it to FLMMA's work. Early on, local PIs used their networks to solicit input into the design of the studies. Likewise, the FLMMA working groups gave stakeholders from multiple sectors an opportunity to provide input into the studies and thereafter kept them regularly updated on MMAS' progress. Ms. Sivo's creation of FLMMA's working groups created opportunities to communicate MMAS progress and results. Construction of an MOU encouraged – indeed, mandated – that CI and FLMMA collaborate through mutual learning and data sharing. During the S2A phase of MMAS, a connection with FLMMA enabled MMAS results to be shared with communities through workshops and utilize TEK and TRM practices to site LMMAs.

In Belize, there *was* an effort by the core MMAS team to get Belizean stakeholders at multiple scales participating in the design and implementation of MMAS. There were one-on-one meetings with stakeholders, newsletters, and S2A workshops. Unfortunately, these efforts were not sufficient. Participation was low during the MMAS design and implementation phases and only reached a high level of engagement when Dr. Mcfield came on in 2009 and 2010. As a result, Belize ending up experiencing many of the conditions suggested by NGO and STS theory, including low scientific salience and legitimacy and stakeholder frustration. While there was a substantial capacity building component through the Ecological Monitoring program, this was not sufficient to create sufficient opportunities for participation across the spectrum of Belizean civil society.

Efforts in Belize to have engaged participation fell short due to several reasons. The one-on-one meetings were helpful but, because of their individual nature, could not reach a broad swath of group across sectors. There was an expansive stakeholder workshop in 2007; however it was perceived as coming too late to provide input into study design. The proportional of local PIs to foreign PIs was not optimal. The node coordinator in Belize was occupied with multiple responsibilities and was unable to devote a significant amount of time to MMAS result dissemination. There was no obvious working group or council into which to feed the MMAS results. APAMO and MBRS, originally envisioned as partners, ended up being too young and too weak to be mechanisms for participation. As a result, participation in Belize depended heavily on the initiative and travel schedules of the core MMAS team and individual PIs. With many of these individuals being foreign, it was difficult for them to create opportunities for regular communication and feedback. While the Ecological Monitoring study did create many opportunities for participation through capacity building – indicating that it is not as simple as local versus foreign individuals – overall Belize generally indicates that *in-country* participation mechanisms are needed.

In ETPS, program delegation to the CI ETPS and CI Meso Sur offices allowed those with a closer ear to the ground to make program decisions. Partnering with STRI in Panama brought access to the Coiba Directive Council and the Scientific Board. Involving stakeholders from the local and national scales, as well as scientists, managers, private enterprise, and policymakers, these governance mechanisms provided regular opportunities for MMAS information sharing and stakeholder engagement. Personal and professional networks of the local PIs helped solicit design input, while community workshops in the Coiba buffer zone made local stakeholders aware of what MMAS was doing. In Galapagos, engagement through participative processes associated with the

Galapagos National Park likewise brought opportunities to keep stakeholders aware and participating.

In Brazil, CI-Brazil used local PIs, MMA councils, personal and professional networks, workshops, (two) node coordinators, and capacity building programs to ensure that stakeholders across scales and the science/policy boundary were participating. Local PIs connected with their networks in universities, civil society, and local communities. As in Fiji and ETPS, the MMA councils regularly brought together a range of stakeholders to hold discussions and ensured MMAS study salience and legitimacy. Personal and professional networks of node coordinators allowed one-on-one conversations with policymakers. An S2A workshop let a wider range of groups give input into S2A applications. Involvement in science and advocacy coalitions linked MMAS studies to regional and national efforts and allowed those far from Abrolhos to feel involved. Capacity building programs such as the Open your Eyes to Science program engaged students and turned them into information multipliers in their communities.

Across nodes, the main mechanisms used for PIs to be participating with each other – in-person meetings in 2009 and 2010 – were only activated late in MMAS. Thus, PIs did not feel engaged with work in the other nodes. While there were cross-node disciplinary PIs, online working groups, earlier meetings and workshops, and overall more opportunities for interaction *directly* between PIs would have enhanced cross-node sharing and helped to build scientific collaborative networks.

At CI headquarters, participation served to ensure changes within the organization. Daily ongoing interactions between the core MMAS team and other CI employees helped to promote change. Participatory interactions had the effect of influencing other CI staff and disseminating particular discourses and themes. These discourses, in turn, showed up in future CI initiatives.

Does participation really matter? Do alternative theories, that participation is not necessary or simply too time consuming, make sense? Could MMAS have achieved the results it did without it? While engendering participation in MMAS was a time consuming activity – most vividly in Fiji where constructing the MOU and adapting the workplans with working groups – it had a pivotal impact on whether each node reached its full potential. Again, Belize offers the clearest example of a lack of participation mechanisms being detrimental to the initiative's progress. Brazil, with participation happening through multiple mechanisms simultaneously, illustrates a case where it led to a big payoff.

5.2.3 Accountability and the Ability to Learn

Accountability mechanisms and an ability to learn both enhance the ability of an ENGO cross-scalar program to work. As discussed in Chapter Two, accountability is "the process of holding actors accountable for their actions" (Fox and L. D Brown 1998, 12). Accountability mechanisms are therefore mechanisms which provide opportunities for this process to occur. Accountability mechanisms allow an ENGO to be responsible and connected to both program funders and program recipients, and understand when the program isn't working and thus needs to adapt and change focus (Fox and L. D Brown 1998). Accountability to both scientists and policymakers is necessary if an organization is interested in crossing the science/policy boundary (Cash 2001; W. C. Clark et al. 2002)

Upwards accountability to program funders is common. Most grants to ENGO programs come with the donor having strict reporting and disclosure requirements (Edwards and Hulme 1995). Annual reports from the ENGO to the donor give the funder information and making sure that the money is being spent wisely (Ebrahim 2003). Downwards accountability is less common. Program recipients cannot mandate requirements, so downwards accountability often depends on the initiative of the ENGO. However, without a means for downwards accountability, program recipients have no way of signaling to the ENGO that a program is not working or that they are unsatisfied, and program performance can suffer. Downwards accountability mechanisms can include self-regulation, local participation in programs and program evaluations, and social audits (Ebrahim 2003).

Accountability mechanisms are not enough; there must also be an organizational ability to learn and change as a result of the information that accountability mechanisms provide. Accountability may mean that program stakeholders can indicate pleasure or displeasure of ENGO actions. An organization must then learn from this information and adapt, increasing project performance in the process (Doyle and McEachern 2007; Edwards 1999).

The experiences of MMAS confirm theoretical predictions. MMAS had both upwards and downwards accountability mechanisms. Upwards and downwards accountability mechanisms kept MMAS responsible the GBMF and local stakeholders. Nodes with a greater degree of downwards accountability performed better. A propensity of CI to learn allowed it to adapt as program circumstances changed; however, learning was more difficult where downwards accountability mechanisms were absent. Accountability mechanisms that linked scientists with policymakers assisted with science/policy boundary translations.

MMAS used several mechanisms to be upwardly accountable to the GBMF: iterative communication, the MMAS overall workplan, annual reports, the S2A Assessment, and the MMAS final report. The GBMF was satisfied with this degree of accountability and received all the information that it needed to receive. Additionally, MMAS as a program was on the other end of upwards accountability - joint workplan construction with scientists was upwards accountability, in this case with MMAS as the funder and the scientists as the recipient.

CI designed MMAS so that node coordinators would be the primary downward accountability mechanism at each site. Node coordinators – by being immersed in culture, society, and sector in which they worked and lived – would be able to gather feedback and transmit this feedback up to the core MMAS team at CI. Node coordinators largely provided this function in Fiji and Brazil. In ETPS, a node coordinator in country not hired until 2009, with Dr. Quesada in Costa Rica performing the role previously. In Belize, the node coordinator, despite being well connected, did not sense and/or communicate stakeholder frustration with the initiative. Thus, MMAS was largely unaware of stakeholder resentment and perceptions of being shut out (despite earlier one-on-one conversations) of MMAS' design process until the 2007 S2A workshop.

Other mechanisms also helped the core MMAS team understand how MMAS was being perceived at node sites. In Fiji, ETPS, and Brazil, CI offices were mechanisms for stakeholder feedback and allowed the core MMAS team to (indirectly) become aware of what was happening at each site. Ongoing governance mechanisms such as councils and working groups provided a venue for stakeholders to interact and pass their feedback to the node coordinator and up to the US. In Panama, participatory workshops in communities gave local stakeholders a regular opportunity to provide comment on MMAS' performance. In Brazil, daily interaction of the CI-Brazil staff around Caravelas with local stakeholder created feedback opportunities.

CI demonstrated its ability to learn through experiences in Fiji, Belize, and Brazil. In ETPS, MMAS went relatively smoothly and thus presented no opportunities for major programmatic shifts. In Fiji, CI shifted tact and engaged with FLMMA when Fijian stakeholders and the CI regional office expressed displeasure with MMAS' node entry. In Belize, feedback from this author encouraged MMAS to retool, and motivated the core MMAS team to hire Dr. McField and strengthen S2A efforts. In Brazil, CI-Brazil engaged in a political battle through the media, the judicial system, and the legislative system against shrimp farming and oil drilling. As part of this effort, CI-Brazil had to adapt and change as circumstances required.

Again, Belize provides a clear contrast with the other nodes and thus makes alternative explanations – that downwards accountability and an ability to learn don't matter - implausible. The relative lack of downwards accountability mechanisms in Belize ensured that stakeholders couldn't be adequately heard, and this meant that MMAS was unable to shift tactics and improve until almost too late.

5.2.4 Translation of Scientific Knowledge

STS and NGO literature emphasizes that to successfully cross scalar and science/policy boundaries, scientific results must not be just be *transmitted* through NPCs and participatory mechanisms, but simultaneously *translated* into messages and outputs appropriate to the audiences to which it is delivered. For example, while a scientist can read and understand a dense scientific report, this same report may be incomprehensible to a local fisherman, and high-level policymaker may have no desire or time to read the same. Conversely, a colorful poster or t-shirt may be perfect for said fishermen, but would be inadequate to the scientist's needs. Translated scientific information helps to move past jargon and disciplinary barriers and makes information accessible and understandable (Cash et al. 2003). Translation for audiences in different scalar positions is also necessary (Cash et al. 2006); the relevance of a scientific result about a particular place may be of passing interest to a global organization but critically important to someone who lives there.

The literature provided several theories about how organizations translate information and enhance scalar and science/policy management. A *boundary object* is an analytical construct which keeps its meaning and relevance across social worlds, and allows for discussion and sharing (Star and Griesemer 1989). Boundary objects can be physical items such as reports, models, or multimedia, or more ethereal concepts such as states and scenarios. Boundary objects are similar to 'immutable mobiles', a term coined by Bruno Latour to refer to objects transmitted long distances that contain unchanging information (Latour 1987). Boundary organizations are also key in information translation (Cash 2001; W. C. Clark et al. 2002), helping to produce and disseminate these objects, and providing a space for scientists, managers, and policymakers to interact and learn.

The experiences of MMAS confirm theory: information translation is important. Translation – moving past dense jargon and incomprehensible scientific reports – helped create the conditions for successful scalar and science/policy boundary management by giving stakeholders access to understandable products and results that were salient to their lives. In MMAS, S2A outreach materials such as posters, booklets, t-shirts, scenarios, models, banners, newsletters, videos, and radio programs acted as boundary objects; they conveyed information to stakeholders that was appropriate for the audience to which it was delivered. S2A matrices organized key messages and provided a space for planning out target audiences and policy and management impacts. Scenarios and models were used with policymakers and managers to illustrate the costs associated with particular decisions. This happened most prominently in Brazil when CI-Brazil used an oceanographic oil spill model to illustrate the dangers of drilling near the Abrolhos Bank. Boundary organizations, such as CI-Brazil, produced and used these objects on multiple scales.

However, physical or ethereal boundary objects such as S2A outreach materials were not the *most* effective, or commonly used, way for MMAS results to be translated. While these materials were useful, undoubtedly helped stakeholders understand results, and were very explicitly tied to affecting management, earlier engagement in participatory processes was more critical. Thus, theories of how attention to process is critical to crossing the science/policy boundary are confirmed (Cash and W. C. Clark

2001; Mitchell et al. 2006; Miller 2006). In Fiji, community workshops provided opportunities for oral information translation to communities, linking scientific results with local livelihood concerns and traditional resource management practices. In ETPS and Brazil, involvement in councils, one on one meetings, and ongoing participatory workshops provided opportunities to communicate and translate results into a language that stakeholders could understand. In Belize, meetings and workshops in 2009 and 2010, as well as individual meetings between PIs and managers, proved to be more effective in communicating understandable messages than newsletters and booklets. Node coordinators or other highly connected individuals managed MMAS' interactions with these processes.

Chronologies of each of the MMAS nodes demonstrate that involvement in process was more critical than production of products for translation of scientific knowledge. In each node, major management and policy impacts largely happened before the bulk of S2A outreach materials were produced. Most S2A outreach materials were not produced until mid 2010, while community workshops, involvement in councils, meetings and the like took place as MMAS were ongoing through the life of the initiative. Outreach materials helped to cement gains made through earlier communication but rarely were the drivers of these gains.

An interesting comparison is between involvement in processes within nodes and across nodes. Within nodes, node coordinators could involve themselves in ongoing processes (councils, workshops, meetings) to communicate and make knowledge accessible to stakeholders. While there were some stumbles where these processes where not as available – Belize being the most visible example – stakeholders generally came to understand scientific results and accepted it as scientifically credible. Across nodes, involvement in these processes was not possible; people were physically removed from one another. Recalling interviews, some PIs had "no idea what the other nodes were doing" and thus didn't understand how the studies in other nodes were structured or organized. This difference generally illustrates how process matters.

5.2.5 Assessment Context

STS theory suggests that the socio-economic, cultural, political, and institutional context of a particular site and characteristics of the potential assessment user(s) affects how that assessment is received and how efforts to translate results of that assessment into across scales and the science/policy boundary work. The potential user(s) of the scientific information must be interested in that information and must have the capacity to understand and use it; the context must be ripe for the assessment to be effective (Mitchell et al. 2006). The political attention cycle, the issue domain, the institutional background, and other factors all play a role in making a context ripe (Eckley 2001). For example, if political attention is on another issue, or there is not societal capacity to act on recommendations, than it is less likely than an assessment will be able to cross scales and move science to policy.

The experiences of MMAS at each of the node sites confirm that assessment context is an important factor in the ability of a program to cross scales and the science-policy boundary. As this dissertation focused the bulk of its research effort upon MMAS as initiative rather than Fiji, Belize, ETPS, and Panama as countries, it was somewhat difficult to determine all the contextual factors that played a role in how MMAS crossed scales and the science/policy boundary.

Despite this, three specific findings did emerge from the examination of the process and outcomes of MMAS. First, assessment context in MMAS was heavily interlinked with other factors listed in this dissertation. In Fiji, the existence of an umbrella organization – FLMMA – gave MMAS opportunities to solicit participation, build NPCs, create downwards accountability mechanisms, and translate scientific results into understandable formats through workshops and working groups. Governmental instability in Fiji at the national scale meant that information translation primarily focused on FLMMA collaboration and community workshops. In Belize, the lack of a strong umbrella organization (APAMO was young/weak when MMAS began), low cohesiveness of civil society, and weak scientific capacity diminished the ability to create and link with NPCs, solicit participation, and be accountable to program recipients. In ETPS, the existence of an ongoing conservation process served to keep the MMAS studies on the agenda of policymakers. High scientific capacity in Panama enabled MMAS to find local PIs and solicit local participation. In Brazil, MMAS could depend upon a strong engaged civil society to build NPCs, provide participation avenues, and insert MMAS results into political decisions.

A second finding to come out of MMAS is that whatever the context, it is critically important to have an understanding of the context before a multi-scalar program begins. MMAS as an initiative was very cognizant of this; sections of the workplans designed between CI and PIs included descriptions on the country's scientific and conservation context. However, in Belize, due to reasons mentioned previously – 60% foreign PIs, no CI office, no linkages to *strong* NPCs etc –MMAS was not ideally situated to cross the science/policy boundary. In contrast, in Panama, knowledge of the conservation context allowed CI to know that the Coiba Management Plan needed scientific data and roll their own inputs directly into it.

Finally, the example of the shrimp farming and oil drilling threat in Brazil illustrated how large-scale threats in a country or region can mobilize political actors and quickly elevate the political importance of an issue. These threats spurred the creation or strengthening of NPCs and created a need for scientific data to support political decisions. MMAS data was well suited to fill this gap; being in the right place at the right time mattered. Much of these threats can be unpredictable at the start of an initiative, so it is important to be able to take advantage of these situations when they arise.

6 Chapter Six - Conclusion

This dissertation had two goals. The primary goal was to contribute to the practice of conservation. ENGOS are a growing force in environmental science and conservation, acting at the international, national, and local scales and across scales. ENGOs trumpet their successes at international conferences and in peer-reviewed publications, media campaigns, and glossy brochures. Accounts of these successes are disseminated far and wide, and used to bring attention to the ENGO and the need for urgent conservation action. However, there exist still few comprehensive examinations of ENGO programs that detail programmatic *challenges* – as well as successes - and perform a full analysis of program design, structure, processes, and outcomes. By performing an in-depth case study of an international MMA science initiative, this dissertation aimed to improve their implementation and provide lessons learned for the conservation community.

The second goal of this dissertation was to add to academic theory. This dissertation drew upon MMA, NGO, and STS literature. MMA literature was used to define MMAs and give a background on how MMAs are created and managed. NGO and STS literature was used to provide the theoretical framing for the examination of MMAS. NGO literature has historically focused on examining ENGO conservation *action* (such as government advocacy, program implementation, political lobbying) on a single scale or across scales. STS literature has focused on the process of designing effective assessments and has emphasized the power of boundary objects and boundary organizations for moving science into policy. NGO literature is lacking in examinations of conservation *science* initiatives, while STS has shied away from using ENGOs as units of analysis.

The comprehensive examination and analysis of Conservation International's Marine Management Area Science (MMAS) initiative looked to accomplish both goals. MMAS was a five year, $12.5 million dollar initiative with four main nodes of science and conservation work: Fiji, Belize, ETPS, and Brazil. It had three objectives: answer critical scientific questions about MMAs, build capacity at node sites and within CI, and turn the results of the science in policy, management, and capacity building impacts.

Using MMAS as my research case, I asked the question: **what factors affect how ENGOs manage the boundaries across scales and between science and policy in international MMA science initiatives?** To gather the data to answer this question, I engaged in a methodological approach I termed multi-sited pragmatic action research. Qualitative, multi-sited research at each of the four main node sites and in Arlington Virginia was combined with participatory engagement with Conservation International. Ultimately, I was able to gather a wide cache of data from documents, reports, meetings and informants and analyze it using standard qualitative analysis techniques. At the same time, I had the opportunity to engage with CI and returning results to the organization for adaptive management and learning.

The NGO and STS literature identified six factors as affecting how ENGOs manage the boundaries across scales and the science/policy interface. First, how a program is initiated has ongoing ramifications throughout the life of the entire program. Decisions made early in a program structure cross-scalar interactions and frame the breadth of possible policy outcomes. Second, networks, partnerships, and coalitions enhance the understanding of the local context, allow leverage of scientific results, increase the possibility of impacts, and tap resources unique to different partners. Third, early, iterative, and engaged participation with a wide range of stakeholder groups creates opportunities for communication and feedback and motivates buy-in and support. Fourth, accountability both upwards and downwards, as well as an ability to learn, enables organizational improvement. Fifth, active knowledge translation allows scientific information to become understandable, accessible, and more easily used. Finally, the assessment context matters; the circumstances of a particular program site alter the conditions in which it can have an impact.

As discussed in Chapter Five, results from MMAS were consistent with theoretical predictions. Each of the above factors affected how MMAS managed the boundaries across scales and the science/policy interface at the nodes and throughout the program. Thus, the findings from MMAS confirm theory. Findings from MMAS also extend NGO and STS theory by providing an example beyond cases currently in the literature. Findings suggest that success in international MMA science initiatives is influenced by the same factors as an ENGO program that only focuses on conservation action or an effort by an intergovernmental or academic organization to move science into policy. This is an important insight.

The following implications for conservation practice emerged from my examination of MMAS:

1. ***Individuals*, not just organizations or institutions, play a key role in ENGO program development.** The decisions of key individuals early on, such as Dr. Kaufman and Dr. Karrer, have ramifications throughout the life of the entire initiative. At each node, key individuals drove the initiative and ensured that it met its programmatic objectives. The insight of the power of the *individual* is often overlooked as scholars and practitioners look to assign agency to organizations, but organizations are made up of people and some of these people have more influence than others.

2. **Donor timelines and different objectives across scales can be incompatible with early local input. However, early local input is critical to get full buy-in and support.** In the early stages of MMAS, CI felt an obligation to work quickly with the Gordon and Betty Moore Foundation to show results and determine key research questions. This obligation, as well as the uncertainty of funding, spurred an early process in which the ability of CI to consult with targeted node sites was limited. There

needed to be more engagement with in-country partners during the design phase of initiative. Input from only selected stakeholders, or input once studies had already been designed, was often not seen as sufficient by in-country groups.

The design phase of MMAS indicates the necessity of longer term funding from donors for large-scale initiatives. If working in a country with an organizational office, it can be relatively easy to continue and expand ongoing work. However, when working in a country where an ENGO has limited experience and/or no office, five years is barely sufficient to establish relationships and begin to show monitoring results, let alone initiate deep and enduring connections or create a long term monitoring dataset. Longer term funding, especially in cases where engaging in a new country, may allow ENGOs to feel more relaxed about getting scientific work started and allow it to focus on creating a truly participatory process for input during program design.

Barring longer term funding from donors, an approach that would ensure greater multi-scalar participation during program design would be proposal development grants. These grants could be structured so to fund preliminary meetings between the ENGO and stakeholders in prospective node sites. Thus, stakeholders can be engaged into early initiative design and feel that the studies are more salient to their policy and management needs. Besides allowing greater input into initiative design, these grants would also help to build enduring relationships whether or not funding for the main proposal was approved.

3. **In an ENGO program that works in multiple countries, create tools and early opportunities for direct PI cross-site sharing.** In MMAS – for multiple reasons – direct PI cross-site sharing was not focused upon during the early stages of the program. Early on, there were no real mechanisms for PIs in different nodes to collaborate directly with each other besides working through individuals at CI in Arlington and with the cross-node disciplinary PIs. At the end of the initiative, there were direct cross-node PI meetings and joint production of S2A products. However, at this time PIs and the core MMAS team realized that *earlier* sharing opportunities would have been even more beneficial.

Cross-site coordination is a great way to synthesize methods and reflect on lessons learned across countries before results are finished. There need to be tools and mechanisms to accomplish this coordination early, such as in person cross-node PI meetings, online databases, and online working groups. Beginning all sites at approximately the same time also assists in cross-node coordination as PIs are simultaneously facing similar challenges.

4. **There is a need to connect early with strong connected in-country networks, partnerships, and coalitions. Creating or linking with NPCs takes time and should be planned for in program schedules.** NPCs provide an ability to increase impact, access

resources, share knowledge, and cross scales more effectively. NPCs can take scientific results and more easily insert these results into political decisions. The use of organizational offices can be optimal in that these offices share a vision with headquarters. Other members of NPCs can include academic institutions, umbrella organizations, and science and advocacy collations. NPCs bring access to local PIs, local science and management knowledge, and connections with governance structures and political processes.

In Belize, the node coordinator at the Southern Environmental Association proved less than effective, and efforts at linking to APAMO and MBRS to act as NPCs were unsuccessful. The corresponding lack of *strong* NPC in the country meant that program implementation depended largely upon the core MMAS team and PIs, hampering the ability to solicit participation and be downwardly accountable. Working with strong in-country NPCs such as STRI in Panama, Ms. Sivo and FLMMA in Fiji, and CI-Brazil in Brazil allowed the studies there to feed into ongoing work and enabled the use of existing networks of relationships. Policymakers saw the work as more salient to their needs, more legitimately produced, and thus were more willing to see it as valid.

Working with local groups, establishing relationships, negotiating MOUs, drafting collaborative workplans, working through institutional bureaucracies etc. takes time. This time for recruiting node coordinators and NPC building should be built into programmatic timelines and recognized as needed by both the implementing ENGO and the funding donor. In MMAS, time was needed to link with NPCs in each of the node sites, particularly with organizations that were outside of CI's administrative structure. For example, establishing a CI-FLMMA relationship and subsequently crafting an MOU took over a year. However, this linking ultimately paid off in terms of programmatic benefit.

5. **Participation matters a great deal. Engaged participation in ENGO programs is engendered through local PIs, governance mechanisms, early workshops, node coordinators, and capacity building programs.** In MMAS, while foreign PIs could solicit feelings of participation through S2A outreach and capacity building (Mr. Drew in Fiji and Mr. Shank in Belize being the obvious examples), overall local PIs local PIs had larger in-country personal and professional networks than foreign PIs. Thus, they could more easily gain input, create feelings of buy-in, connect with colleagues, and push for particular policy outcomes. Iterative governance mechanisms such as the Directive Council and FLMMA served to bring together a wide range of stakeholders regularly and were an excellent mechanism for keeping stakeholders engaged and participating. While workshops were never detrimental to creating opportunities for participation, only workshops that were *early* enough to let stakeholders become engaged in the design of the program were effective in creating feelings of engaged participation. Comparing the outcomes of the workshop in Panama versus in Belize illustrates this.

Node coordinators and capacity building programs also have the potential to create feelings of buy-in and support. In particular, MMAS node coordinators in Brazil served as a nexus through which academics, policymakers, managers, and local stakeholders could be exposed to scientific results. Capacity building programs simultaneously built stakeholder skills while creating information multipliers in communities and organizations.

One-on-one meetings with selected stakeholders by the core MMAS team was a strategy implemented at all four sites. While these meetings certainly didn't hinder participation, due to their limited scope they were less effective than above mechanisms.

6. **Participation can affect change in program headquarters as well as at program sites.** MMAS focused consciously upon engendering participation and affecting change at node sites. However, it also unconsciously served to affect change in headquarters through a more quiet form of participation – CI MMAS staff interacting with colleagues, utilizing particular discourses, and sharing MMAS successes and challenges. Through this form of participation, informants report that MMAS as a program had a significant impact upon CI as an organization.

7. **Downwards as well as upwards accountability is important for ENGO programs. Downwards accountability can be enhanced through node coordinators,**

organizational offices, governance mechanisms, progress reports, and participatory workshops. Many of the same elements that enhance participation also serve as mechanisms to funnel feedback upwards to the ENGO. In several nodes, organizational offices or node coordinators to MMAS kept the core MMAS team aware of stakeholder perceptions and needs. Iterative governance mechanisms – if someone connected to CI was involved – likewise were a mechanism for feedback from stakeholder groups. Progress reports (from this author) passed along time-critical information, while participatory workshops allowed local stakeholders to express opinions on MMAS.

8. **Accountability matters little without an organizational ability to learn and adapt.** Even if accountability mechanisms are in place, an organization still cannot benefit from them if they don't have an ability to learn from the information transmitted through these mechanisms, and a willingness to change as circumstances permit. CI demonstrated a strong ability to learn in MMAS, evidenced by its changing tact as it received new information from Fiji, Belize, and Brazil. No program is even perfectly constructed from the beginning; thus, an ability to learn and adapt is crucial so to be able to incorporate lessons and improve as the program is ongoing.

9. **Translation of scientific knowledge does not just go on at the end of a program cycle, but rather is continuous throughout. Involvement in processes rather than production of products is crucial to effective information translation**. In MMAS, while

S2A outreach materials were informative and useful, they generally weren't the main drivers of management, policy, and capacity building outcomes. Involvement in processes such as meetings, workshops, and councils gave opportunities for node coordinators and others to discuss MMAS results in understandable ways.

10. **Country-specific contextual factors affect the ability of ENGO program to have an impact.** If S2A is the goal, there should be a large amount of early attention paid to what is going on in particular countries. Knowledge of the context is crucial for understanding political veto points and orienting science towards management and policy needs. Context affects other factors such as the ability to create strong NPCs, the opportunities to engender participation, and others. MMAS illustrated that translating science across scales and the science/policy boundary works best in countries with ongoing conservation processes, high scientific capacity, a strong and engaged civil society, and large scale environmental threats.

While this dissertation has answered many practical and theoretical questions, it also opens the door for future research. MMAS focused its programmatic efforts in developing countries, generally also countries with a strong complement of engaged government institutions, NGOs, academic entities, and other partners. What would be the findings of an examination of an international MMA science initiative that worked in developed countries? What about an international MMA science initiative that worked in contexts where civil society was very weak (or non-existent), or a country that was extremely antagonistic to ENGO interventions? Would similar factors enable scalar and science/policy boundary management?

Another important area for additional research may be comparing international MMA science initiatives with different timelines for action. This dissertation has shown that (short) donor timelines affect the design and initiation – and thus the entire timeline – of ENGO programs. If an MMAS-like program had had ten years to build relationships, cross scales, and translate science into policy, how far could S2A been pushed? How would it have been differently designed? Only additional, perhaps comparative, research can answer these intriguing questions.

In 2003, MMAS was only a seed in the minds of a few people in the United States. By 2010, it had been transformed into an international MMA science initiative which, through the judicious application of funding and the efforts of hundreds of individuals and partners, had affected policy, management, and capacity building marine outcomes at multiple sites. MMAS had its challenges. However, these challenges are largely overshadowed by its significant successes detailed in this dissertation. It is my hope that others use MMAS as a case study of a largely successful multi-scalar MMA science program, and are motivated to replicate and expand its successes elsewhere.

The End.

Appendix A – Informed Consent Form

You are being requested to be involved in my research project. The objectives of this research are to determine factors that impacted on how Conservation International's Marine Managed Area Science initiative has:

(1) Conceptualized, initiated, and managed a large international science-based initiative,

(2) Produced original marine managed area science and prioritized competing pressures on science production decisions, and

(3) Worked across local, regional, and internal scales and between the worlds of science and policy action.

You are being asked to participate in this research because it is believed that you posses valuable information to inform these research objectives.

I would like to conduct an interview with you. The interview will likely last between thirty minutes and two hours. The interview will start with a set of general questions, and then will expand based on the direction of our conversation.

I do not anticipate any risk for you in participating in this interview. The questions are not of a particularly sensitive nature, and I encourage you to assess, as we converse, the extent to which you wish to answer a given question. If you believe that your responses might bring you professional harm, your identity will be kept confidential and anonymous, either entirely or for any remarks that you specify should be off the record. Otherwise, I would like to attribute some thoughts and opinions to individuals or to positions in named organizations.

Participation is voluntary; you may skip or re-direct questions and you may discontinue the interview at any time.

This interview is being conducted to inform an academic dissertation based on Conservation International's work. Results emanating from this interview may be included in an evaluative report delivered to CI and in academic publications. **However, I do not work for Conservation International and will respect your confidentiality and anonymity if you so wish.**

Results will serve to contribute to adaptive learning within Conservation International. Therefore, you may indirectly receive benefits from this research due to improvements in future project processes and outcomes.

All materials identifying participants will be kept solely in my possession and protected by various anti-theft measures.

For any additional questions, please contact me at jgh5@duke.edu or my advisor, Dr. Michael Orbach, at mko@duke.edu. For additional information about the rights of human research subjects, you can contact the Duke University Campus Institutional Review Board at (US) 1-919-684-3030 or by email at ORS-info@duke.edu.

If you consent to being involved in this research, please sign and date below.

______________________________________ Signature

__________________ Date

Appendix B – Interview Protocols

Interview with Key Informant at CI

Learning about the person

Describe yourself. What are your...

- Professional credentials?
- Work history?
- Role and responsibilities within CI?
- Closest work associates (who do you work with on a daily basis)?

Tell me what it is like to work for CI. What do you enjoy about it? What do you dislike?

Structure

- How is Conservation International structured?
- How is information transferred through the organization?

Culture

Tell me about the organizational culture of CI.

- Are there shared values or norms?
- What is the average workload?
- How do new employees learn?
- How are employees rewarded or reprimanded?
- How are conflicts or differences of opinion resolved?
- How willing are people to help each other?
- How are achievements celebrated?
- How friendly are colleagues with each other?
- What is the relationship like between higher and lower levels of staff?

Leadership

Tell me about the leadership of CI.

- How are decisions made?
- How willing is leadership to listen to new ideas?
- How is information solicited from differing levels or individuals on program ideas, funding, etc.?

Accountability

- What mechanisms are there in place to ensure input from CI employees? Donors? Program partners and field offices? Local stakeholders?

Adaptive Learning

- How does CI learn from the successes and failures of its programs?
- How does CI learn from the successes or failures of its employees?

Relationship with field offices, partner organizations, and local stakeholders

- Generally speaking, what is the nature and tenor of the relationship between CI and field offices?
- What is the nature and tenor of the relationship between CI and partner organizations?
- What is the nature and tenor of the relationship between local stakeholders or community groups?

Origin and Timeline of the Program

- What was the original impetus of the MMAS initiative?
- How was MMAS envisioned and developed? Who were the major players involved in conceptualization and acquiring funding? How was the programmatic focus of the initiative determined?
- From the beginning, how were staff, scientific advisory committee members, scientists, and donors solicited and brought on board?
- Give me a general timeline of the initiative, emphasizing elements that you think are important.

General networked information about MMAS

- Who are the key actors, organizations, and entities involved in the initiative (get information about each node)?
- How does information and decisions flow through the MMAS network? How do programmatic actors relate to the program and to one another?
- What programmatic actors do you interact with on a regular basis? Please list.

Science Production

- How has the focus of scientific projects been determined?
- How has participation of decision makers and local stakeholders in relevant stages of the science production process been encouraged?
- What attempts have been made to ensure that scientific results are understandable and acceptable as credible by local audiences?
- What attempts have been made to ensure the relevance of scientific work to decision makers needs?
- How have interactions between different stakeholders been organized? What systems have been created to mitigate and resolve conflicts?
- Bring me through a timeline of the process for the envisioning, approval, implementation, and completion of a scientific project. Who makes the decisions on what projects happen where?

Relationship with field offices, partner organizations, and local stakeholders

- Speaking specifically about the MMAS initiative, what is the nature and tenor of the relationship between CI and field offices?
- What is the nature and tenor of the relationship between CI and partner organizations?
- What is the nature and tenor of the relationship between local stakeholders or community groups?

Successes and Failures

- What do you view as some of the initiatives greatest successes?
- What do you view as some of the initiatives failures or disappointments?
- For each node, what do you view as being the greatest success? Challenge? Disappointment?
- What do you wish could have been done differently?

Interview with natural science and social science coordinators

Learning about the person

- Professional credentials/Work history?
- Role and responsibilities within CI, activities on a daily, weekly basis?
- Who do you work with on a daily, weekly basis?
-

Learning about the organization

- Tell me what it is like to work for CI. What do you enjoy about it? What do you dislike?
- How would you describe the culture at CI?
- How friendly are people with each other at CI?
- How would you describe the relationship between upper and lower levels of CI staff?
- How does CI learn from its successes and failures of its programs?

Learning about the MMAS Program

- When did you come into the program? What had happened before you had come on board?
- Give me a general timeline of your work the last few years, emphasizing elements that you think are important.
- How has the focus, methods of these scientific projects determined?
- Bring me through a timeline of the process for the envisioning, approval, implementation, and completion of a scientific project. Who makes the decisions on what project happens where?
- Which projects do you view as the most successful?
- Which projects do you view as the most challenging, or disappointing?
- How have the projects strove to be relevant to policy? How have scientists, node coordinators, policy makers interacted? Give examples.
- How have the projects strove to be relevant to local communities needs? How have scientists, node coordinators, local community members interacted? Give examples.
- What differences have there been between how the projects have been designed and how they have actually come to pass?
- Generally speaking, what do you view as some of the initiatives greatest successes?
- Generally speaking, what do you view as some of the initiatives greatest challenges or disappointments? Anything that you wish could have been done differently?
- IF TIME: Quickly run me through a description of each project.

Interview with node coordinators

Learning about the person

Describe yourself. What are your...

- Professional credentials?
- Role and responsibilities as it relates to the MMAS program?
- Who you work with most closely with on a daily, weekly basis?

Initialization

- Bring me back to the beginning, and tell me about how you were approached to work on MMAS and how the process unfolded. From your understanding, how was this node selected? What was your reaction when the idea for the project was proffered to you?

Creation of scientific projects

- How was the focus of the scientific projects determined in this node? What type of freedom do you feel you have had in setting the agenda on these projects?
- How was tension between globally significant and locally relevant science priorities discussed and resolved?
- How were the monitoring sites selected?
- Tell me about your interactions with scientists and other stakeholders when the projects were first designed.
    - How were the scientists identified to do the projects?
    - How was the participation and input of policy makers, NGOs and partner organizations, and local stakeholders in the research design process encouraged?
    - When designing a project, what level of emphasis was put on:
        - Scientific credibility
        - Science needs by policy makers and decision makers
        - Science needs by local stakeholders
        - Conservation Impact
        - Capacity building
    - What was the reaction of the scientists to these emphases?

Continuing interactions with different stakeholder groups over the course of MMAS

- How much freedom do you feel you had and have in making decisions about how to engage with policymakers, partner organizations, and local stakeholders?
- Tell me how you have interacted with X here in this node. What attempts have been made to ensure their input, and ensure the relevance of scientific works to their needs? How have you fed scientific data back to them? Go into detail about how you have interacted at each phase; re: before the research started, while the research was continuing, and now that we are moving into S2A.
    - Policy makers and decision makers
    - NGOs and partner organizations
    - Local Stakeholders
- Tell me about the S2A workshop. Also, tell me, in detail, about any other stakeholder meetings. Who has invited, and how were these selections made? What came out of these meetings? What were the science priorities of locals, decision makers? What type of influence did they have on the science?
- Tell me about your interactions on the SAC. Go into detail about the content and tenor of the meetings. How has your input been solicited, encouraged? How useful were the meetings for information sharing and cross-node coordination?

- What type and amount of coordination and information sharing has there been between nodes - with your counterparts in other nodes, between scientists in multiple nodes?

Reception of scientific work and results

- Of the completed science, how has it been received? By decision makers? By local stakeholders? Give examples.
- What impact do you believe that MMAS science will have on moving policy action?

Reflections on the Macro Issues

- How has MMAS contributed to building local capacity in country?
- What is going to happen once MMAS funding ends?
- How relevant, scalable do you think the science produced in this node is to other sites and global insights?
- What do you view as MMAS' greatest successes in this node?
- What do you view as MMAS' greatest challenges or failure in this node? Do you wish anything could have been done differently?
- What factors do you see as contributing to the successes and failures?

Interview with MMAS Researcher

Learning about the person

Describe yourself. What are your...

- Professional credentials?
- Role and responsibilities as it relates to the MMAS program?
- Who you work with most closely with on a daily, weekly basis?

Initialization

- Bring me back to the beginning, and tell me about how you began working under MMAS and how the process unfolded. What was your reaction when the idea was proffered to you?

Creation of scientific projects

- How was the focus of your scientific project determined? What type of freedom do you feel you have had in setting the agenda on this project? Who did you work with to refine the work plan?
- How was your study site (s) selected?
- Tell me about your interactions with other stakeholders when the projects were first designed.
- How was the participation and input of policy makers, NGOs and partner organizations, and local stakeholders in the research design process of your project encouraged?
- When designing your project, what level of emphasis was put on:
    - Scientific credibility
    - Science needs by policy makers, partner organizations, and local stakeholders
    - Conservation Impact
    - Capacity building
- What was your reaction to this process?

Continuing interactions with different stakeholder groups over the course of MMAS

- How much have you engaged with policymakers, partner organizations, and local stakeholders? What attempts have been made to ensure their input, and ensure the relevance of scientific works to their needs? How have you fed scientific data back to them?
- Tell me, in detail, about any stakeholder meetings that you have attended. Who has invited, and how were these selections made? What came out of these meetings?
- [IF RELEVANT] Tell me about your interactions on the SAC. Go into detail about the content and tenor of the meetings. How has your input been solicited, encouraged? How useful were the meetings for information sharing and cross-node coordination?
- What type and amount of coordination and information sharing has there been with your disciplinary colleagues in other nodes?

Reception of scientific work and results

- Of your preliminary or completed results, how has it been received by decision makers and local stakeholders? How has it been used? Give examples.
- What impact do you believe that your science will have on moving policy action?

Reflections on the Macro Issues

- How has your project contributed to building local capacity in country?
- What do you think is going to happen with your monitoring or project once MMAS funding ends?

Interview with Government, NGO, Academic Partners

Learning about the person

Describe yourself. What are your...

- Professional credentials?
- Role and responsibilities in your current position?
- Who you work with most closely with on a daily, weekly basis?

Interactions with MMAS Science and Stakeholders

- Have you had a formal role within MMAS? If so, what has it been? How long have you had this role?
- Tell me about your exposure to the MMAS program.
- Who have you interacted with re: MMAS?
- When, and how frequently, have these interactions taken place? Describe the nature of the interactions.
- How has your participation in the science production process been encouraged?
- What attempts have been made to ensure your input into the science production process? When?
- Have you attended any stakeholder meetings? If so, what was the nature of these meetings? Do you feel like your input was encouraged and respected?

Salience, Credibility, Legitimacy

- Of the science that is in progress or completed, how useful do you view it in contributing to your organizations goals and mission? Will you use the scientific results?
- Of the science that is in progress or completed, how well do you think it incorporated your values and input?
- Of the science that is in progress of completed, how scientifically rigorous do you think it is?
- What have been some of the impacts of in-progress or completed MMAS science projects?

Enduring Effects of MMAS

- How useful do you view MMAS science as contributing to policy changes or concrete conservation action? Why?
- Has MMAS built local capacity here in country? If so, how?
- What are some of the other enduring effects of MMAS?
- What do you think will happen to MMAS after next year?
- What do you view as MMAS' greatest achievement?
- What do you view as MMAS' greatest flaw, or disappointment?
- Please tell me anything else about how you have perceived the MMAS program.

Interview with local stakeholder

Learning about the person

- Please state your name and profession. What do you do in your current [position, livelihood]? Whom you work with most closely with on a daily and weekly basis?

Interactions with MMAS Science and Stakeholders

Tell me about your exposure to MMAS projects.

- What projects have you been involved with or had exposure to? What has been the nature of the involvement?
- Whom have you interacted with regarding these projects?
- When, and how frequently, have these interactions taken place?

How has your participation in the projects been encouraged?

- Have you attended any stakeholder meetings?
- [IF YES] What happened at the meetings? What did you think of them?
- Did you feel like there were attempts to ensure your input into the scientific projects during the meetings, or at other times?

Salience, Credibility, Legitimacy

- How useful do you view the work of MMAS projects in contributing to conservation in [node]?
- How useful do you view the work of MMAS projects in contributing to your livelihood?
- How much have MMAS projects solicited and incorporated your input into their design or operation?
- How well have you been kept updated as to the progress of the MMAS projects?

Enduring Effects of MMAS

- Has MMAS built local capacity here? If so, how? Have they build capacity within your [village, town]?
- What do you view as some of the MMAS' initiative's strengths?
- What do you view as some of the MMAS' initiative's weaknesses? Anything that could have been done better?
- Please give me any additional thoughts about the MMAS initiative.

Interview with Science Advisory Committee Member

Learning about the person

Describe yourself. What are your...

- Professional credentials?
- When and how were you brought on board the Scientific Advisory Committee?
- What do you see as your roles and responsibilities on the Science Advisory Committee?

Process

- Talk a little about, from your perspective, the process of developing the MMAS initiative. [Ask questions as relevant based on history on SAC]
- How were the nodes selected? What criteria were used to select the nodes? What sorts of discussions were ongoing with people in node sites as they were being selected, and with CI and the GBMF?
- How was the emphasis on these specific themes, these specific projects determined? How was tension between globally significant and locally relevant science priorities discussed and resolved?
- How was the balance between natural and social science determined?
- How was the balance between science and science to action determined?
- How was the balance between site-specific studies and global studies determined?
- How were particular scientists solicited for the projects?
- How was staff, node coordinators at each of the nodes selected?

- Tell me a bit about what the SAC has done since the beginning of the initiative.
- How has the SAC supported and provided feedback to in-country science work and the initiative as a whole?
- What sort of emphasis has been put on ensuring the relevance of the scientific work to decision makers needs?
- What sort of emphasis has been on ensuring that the scientific results are understandable and accepted as credible by local audiences?
- What sort of emphasis has been on building local capacity at the node sites?

Evaluation

- What do you view as some of the initiative's strengths?
- What do you view as some of the initiatives weaknesses?
- Is there anything you think should or could have been done differently, with the SAC or otherwise?
- How relevant do you think the science produced in this initiative is to other sites and global insights?
- How has the MMAS initiative turned out differently than you expected?
- What impact do you think the MMAS initiative is going to have on moving science to policy action? Why?
- What do you envision as the future of the program?
- Please give me any additional thoughts on the initiative that you may have.

Appendix C – Stakeholders Interviewed

Non-Node Associated Informants	
Name	**Position**
Conservation International	
Roger McManus	Former Vice President, Global Marine
Les Kaufman	Senior Scientist, MMAS
John Tschriky	Natural Science Coordinator, MMAS
Giselle Samonte-Tan	Social Science Coordinator, MMAS
Leah Bunce Karrer	Senior Director, MMAS
Sebastian Troeng	Vice President, Global Marine
Other US NGOs	
Helen Fox	Marine Scientist - WWF
Stephanie Wear	Marine Scientist - TNC
Science Advisory Committee	
Andy Rosenberg	Former Professor, University of New Hampshire; CI Vice President S + K
Rashid Sumalia	Professor, University of British Columbia
Mark Hixon	Professor, Oregon State University
Keith Sainsbury	Researcher, Commonwealth Scientific and Industrial Research
Gordon and Betty Moore Foundation	
Barry Gold	Program Director, Marine Conservation Initiative
Meaghan Calcari	Manager, Marine Conservation Initiative

Fiji	
Name	**Position and Organization**
MMAS Researchers and CI Employees	
Saki Patrick Fong	Socio-Economic and Governance Monitoring
James Comley	Ecological Monitoring
Semisi Meo	Ecological Monitoring
Joeli Veitayaki	Cultural Roles
Loraini Sivo	Fiji Node Coordinator, CI-FIji
Sefanaia Nawadra	Head - CI Fiji

Sue Taei	Manager - CI American Samoa
NGOs/Academic/FLMMA	
Bill Aalbersberg	Director – Institute of Applied Science
Stacy Jupiter	Director - WCS
Sukulu Rupeni	Research Associate – University of the South Pacific
Alumeci Nakeke	Manager - SeaWeb
Helen Sykes	Executive Director – Resort Support
Ron Vave	Member - FLMMA
Kesaia Tabunakawai	Program Manager - WWF
Thomas Tui	Member - SeaWeb
Government	
Aisake Batibasaga	Research Principal Fisheries Officer – Ministry of Fisheries
Sunia Waqainabete	Senior Fisheries Officer, FLMMA Coordinator
Local Communities, Fishermen Reps	
Mesake Draniatu	YMST Coordinator - Ovalau Motoriki
Meli	YMST Coordinator - Cakaudrove
Tevita	Turan – ni koro Muavuso
Tiko	Coordinator - Waitabu Marine Park
Josefa	Villager - Waitabu Marine Park
Eta	Former Coordinator - Waitabu Marine Park

Belize	
Name	**Position and Organization**
MMAS Researchers and CI Employees	
Will Heyman	Ecotourism Effects on Spawning Fish
Jospeh Palacio	Cultural Roles
Dr Leandra Cho Ricketts	Cross-Shelf Habitat Linkages
Phil Lobel	Intereefal Habitats
Chantalle Clarke	Cultural Roles
Adeli Catzim	Socio-Economic Monitoring
Joseph Cigliano	DNA Conch Genetic Connectivity
Eli Romero	Ecological Monitoring, Cross-Shelf Habitat Linkages
Burton Shank	Ecological Monitoring
Richard Kliman	DNA Conch Genetic Connectivity

Dwight Neal	Enforcement Chain Analysis
Lindsay Garbutt	Belize Node Coordinator
NGOs	
Jack Nightingale	Former head of TASTE
Julie Stockbridge	Marine Scientist - Oceana
Yvette Alonzo	Executive Director – APAMO
Celia Mahung	Executive Director – TIDE
Denise Garcia	Biological scientist - SEA
Nicola Foster	Biological scientist – TIDE
Christina Garcia	Biological scientist – SEA
Janet Gibson	Director - Belize WCS Program
Dennis Garbutt	Manager of Sapadilla Cayes Marine Reserve
Glenn Eiley	Founder of Friends of Nature
Jocelyn Finch	Biological scientist - SEA
Imani Morrisson	Country Coordinator- OAK
Nellie Catzim	Executive Director - SEA
Rachael Graham	Scientist - WCS
Melanie McField	Director - Healthy Reefs, S2A Coordinator
Sharon Perrera	Manager - PACT
Nadia Bood	Marine Manager - WWF
Lisa Carne	Independent Consultant - Placencia
Government	
Isias Majil	Manager – Ministry of Fisheries
Vincent Gillet	CEO - Coastal Zone
Beverly Wade	Administrator – Ministry of Fisheries
James Azueta	Administrator – Ministry of Fisheries
Local Communities, Fishermen Reps	
Jack Young	Elder - Placencia Fishermen's Coop
Lawrence Lesley	Member - Fishermen's Cooperative
Eloy Cuevas	Fisherman, Placencia

ETPS	
Name	**Position and Organization**
MMAS Researchers and CI Employees	
Dolores Cordero	Cultural Roles
Hector Guzman	Ecological Monitoring
Ricardo Montenegro	Economic Valuation
Angel Vega	Fisheries Assessment
Juan Mate	Socioeconomic Monitoring
Arturo Dominici	ETPS Node Coordinator
Manuel Ramirez	Former head, CI Meso Sur
Osvaldo Jordan	Socioeconomic Monitoring, ACD Consultant
Daniel Suman	Governance Analysis
Scott Henderson	Head, CI-ETPS
Fernando Guitterrez	Galapagos Node Coordinator, CI-Ecuador
NGOs	
Alida Spadafora	Head - ANCON
Gabriela Etchelecu	Head - MARVIVA
Malena Sarlo	Project Coordinator - TNC
Dario Tovar	Consultant for the Coiba Management Plan
Raisa Banfield	Head - CIAM
Faustino Sánchez	Head - ARTURIS
Isis Pinto	Manager - MARVIVA
Claudio Atencio	Manager - ATP
Government	
Eddy Arcia	Manager - ANAM
Edgard Arúz	Manager - ANAM
Yessenia Del C. González	Director of Protected Areas - ANAM
Ramón Diez	Legal Advice Lawyer - ARAP
Jacinto Rodríguez	Project Evaluation - ARAP
Omar Abrego	Santiago Head - ANAM
Rolando Ruiloba	Manager - ANAM
Carlos Peralta	Manager - ARAP
Vladamir Torres	ARAP Rep for Directive Council
Etmara Donoso	Director of Coiba NP - ANAM
Santiago Rojas	Administrator - ANAM

Local Communities, Fishermen Reps	
Jose Espinoza	Major of Montijo
Hippolito Morales	Fisherman - Remedios
Edilsa Marin	Fisherwoman - Puerto Muertis
Marcial Camano	Fisherman - Remedios
Thomas Atencio	Arturis Rep - Remedios

Brazil	
Name	**Position and Organization**
MMAS Researchers and CI Employees	
Erika Oliveria	MMAS Fellow
Carolina Minte-Vera	Ecological Monitoring, focused on fisheries sciences
Ronaldo Francini-Filho	Ecological Monitoring, focused on reef ecology
Isabela Curado	Socio-economic and Cultural Roles Monitoring
Alex C. Bastos	Ecological Monitoring, focused on physical oceanography
Paulo Sumida	Researcher and MMAS Partner - University of S. Paulo
Guilherme Dutra	Director - CI-Brazil Marine, node coordinator
Rodrigo Moura	Field Manager - CI-Brazil Marine,, node coordinator
Jeronimo Carvalho	Socioeconomic Coordinator, CI-Brazil
Pablo Faget	S2A coordinator, CI-Brazil
Alexandre Prado	Manager - CI-Brazil Brasilia
NGOs	
Renato Cunha	Head - Gamba
Fabio Motta	Manager - SOS Mata Atlantica
Jorge Galdino (Do)	Head - Cultural Movement Arte Manha
Eduardo Camargo	Head - Humpback Whale Institute
Jean Francois-Timners	Environmental Consultant and MMAS Partner
Jaco Galdino	Film Director - Movimento Cultural Arte Manha
Government	
Erismar Novaes Rocha	Manager - ICMBio in Canavieiras
Ronaldo Oliveira	Head – ICMBio, Corumbau Extractive Reserve
Sergio Freitas	Head - ICMBio in Canavieiras
Ana Paulo Prates	Coastal Nucleus Head - Ministry of Environment
Letícia la Plata	Project Manager - Ministry of Fisheries

Rafael Magris	Manager – ICMBio in Brasilia
Joaquin Neto	Director – ICMBIO, Abrolhos National Marine Park
Silvio Souza	Management Plan Coordinator – ICMBio, Brasilia
Rodrigo Santana	Oceanographer - Ministry of Fisheries
Du	President - Fishermen's Guild
Marco Antonio	Assistant Director – ICMBIO, Abrolhos National Park
Local Communities, Fishermen Reps	
João Barbudo	Community Leader - Canavieiras
Cythia Campolina	Open your Eyes to Science Coordinator
Antonio Flora	Member - Cassuruba Dwellers Association
Du	Head - Colonia
Juninho	Municipal Deputy - Caravelas
Isaias Marcelino dos Santos	Member – STR class entity
Lierte Abreu Siquara	Head - APESCA
Carlinhos Santos	Member - Fishermen's Association, Canaverias
Irasema	Fisherwoman - Corumbau
Ita	Fisherman - Corumbau
Milton	Fisherman - Corumbau
Miscellaneous	
Antonio Diegues	Cultural Anthropologist

Appendix D – Grounded Theory Coding, Round One

Subcodes listed in descending order in terms of frequency mentioned in transcripts (most mentioned is at the top of each list). T mentioned by only one respondent are not included in this list. Note that themes at same approximate level in different nodes may have different frequencies in transcripts.

MetaCode: Strengths/Successes in Each Node

Code: *Fiji*

Sub-codes: CI collaborating with FLMMA, researchers on project design
Local Capacity Building
Enable scientific understandings of MPAs
Cross Node Collaboration
Formal and informal information dissemination by researchers
CI work professionally managed by NC
Contribution to FLMMA trust fund
Communication
S2A Potential
Income for locals through projects

Code: Belize

Sub-codes: Local Capacity Building
Engaging with local stakeholders
Attempting to feed MMAS projects into ongoing processes
Science targeted towards management
Multi-disciplinary Science
Creation of a scientific baseline
Filling Information Gaps
Creation of networks
Feedback of data to decision makers
Bringing additional experts into the country
Local Meetings to Identify Information Needs
Enthusiastic and Competent Core Team

Code: Panama

Sub-Codes: Feeding of MMAS Projects into Process of Coiba Management Plan
Involvement of communities in the development of Management Plan
Collaboration and Information Sharing through Consejo Directivo
Creating Scientific Baselines for Future Work
Collaboration and Information Sharing between organizations
Cost Sharing between MMAS and other grants
Local Capacity Building

Code: Brazil

Sub-codes: Partnerships
Local capacity building
Strengthened capacity to influence policies
Existing monitoring data built upon and expanded into new realms
Involvement of policymakers, communities

Provided opportunities for scientific work long wanted
Independence to make initiative work

MetaCode: Weaknesses/Challenges in Each Node

Code: *Fiji*

Sub-codes: Communication
Lack of cross-node coordination
Waiting on final results
Lack of involvement of key stakeholders at very beginning
Logistical issues with Ecological Monitoring
Bureaucracy of CI FLMMA Collaboration in Design
Little time available for Science
Illuminated internal FLMMA problems
Only Linking with Strong Partners of FLMMA

Code: Belize

Sub-codes: Lack of Communication to Stakeholders
Lack of Belizean Ownership of Projects
Limited Cross-Node Coordination
Need to have full time CI Marine Staff
Lack of Communication, Coherence between Projects
Assistance to CI has subtracted from other efforts

Code: ETPS

Sub-codes: Limited cross-node information sharing
Communication, lack of visibility of projects with stakeholders
Project too ambitious for funding
Lack of concern for human development, local community worries
No Baseline to compare data to
Lack of organization, representation of fishers
CI communicating directly with PIs
Limited coordination between in country projects

Code: Brazil

Sub-codes: Communication and relationship with communities, reserves
Small staff, overworked and overextended
Too little resource for S2A or wrong S2A approach
Lack of cross-node coordination
CI DC pressure, micromanagement early on
Small amount of funds invested in nodes
MMAS science not top of communities' priorities
Follow up issues
Lack of node involvement in design discussions
SAC irrelevance

Appendix E – Theory to Data Coding, Round Two

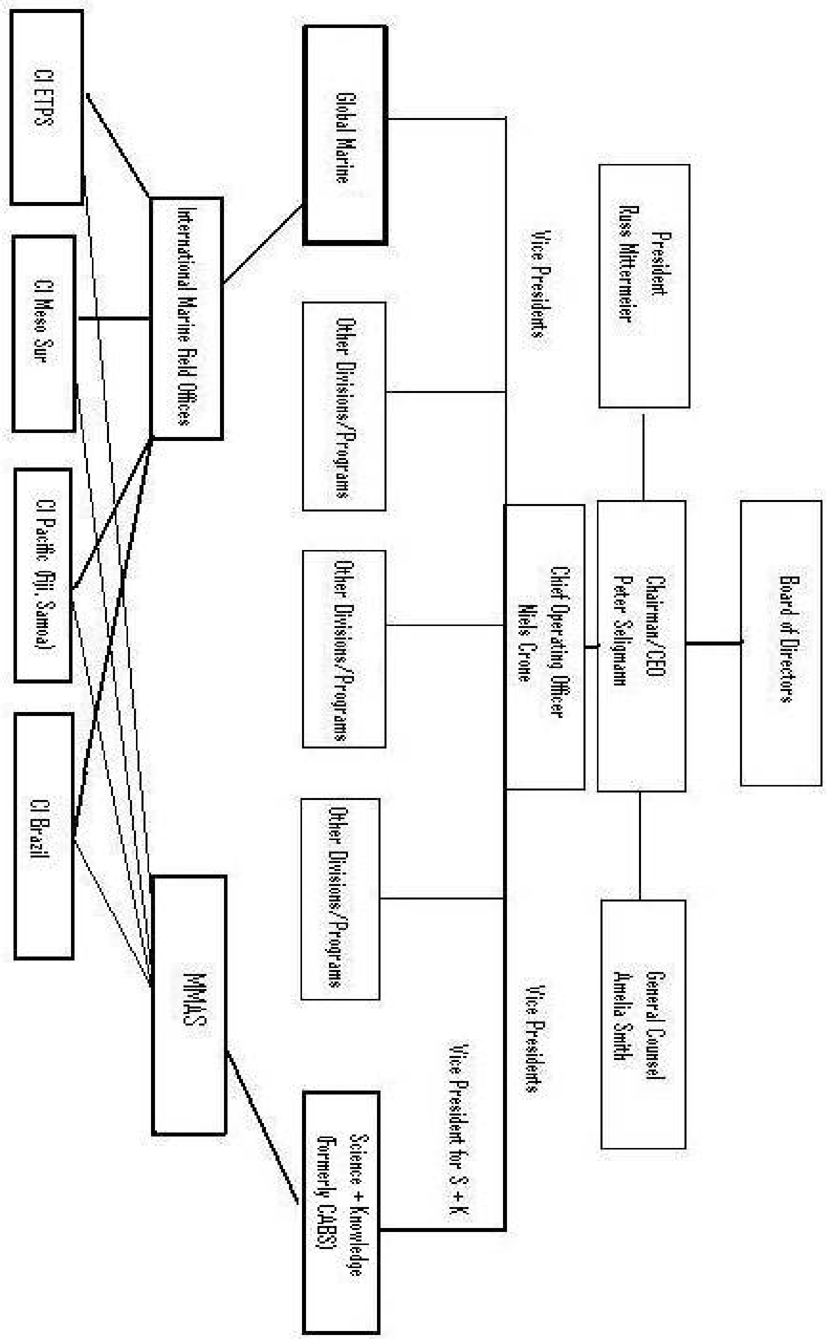
Metacode: MMAS Chronology

Code: Setting, Structure of CI and MMAS
CI vs. other BINGOs
MMAS Organizational Structure
MMAS themes, budget, timelines
Defying Ocean's End
Early Projects
Early Proposal Development
SAC
Leah's Hiring, Move to S2A Focus
Node Selection
From Global to Local Fiji
From Global to Local Belize
From Global to Local - ETPS
From Global to Local Brazil
From Science to Policy Fiji
From Science to Policy Belize
From Science to Policy ETPS
From Science to Policy Brazil
Impact on CI as an Institution
Policy Outcomes Fiji
Policy Outcomes Belize
Policy Outcomes ETPS
Policy Outcomes Brazil
Cross-Node Sharing
Translation from Local to Global

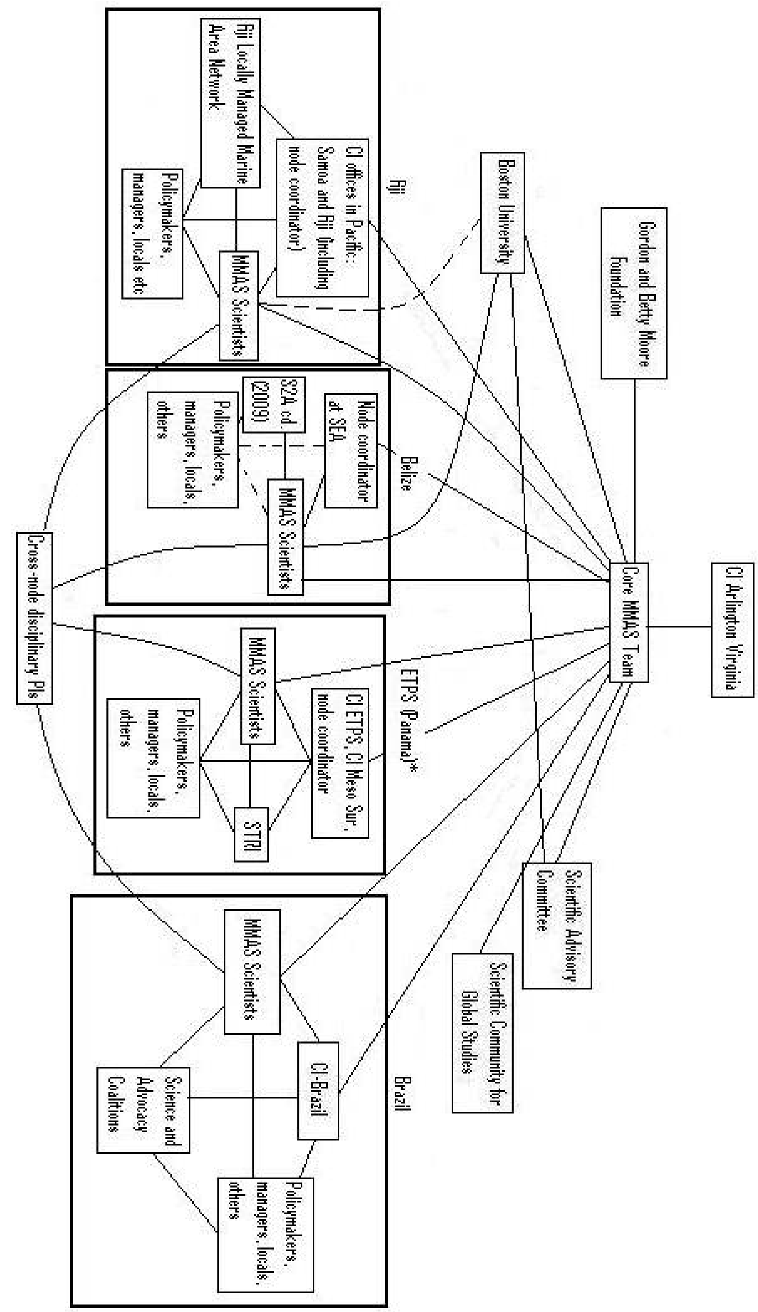
Metacode: MMAS Factors for Success Across Nodes

Code: Program Initiation
Networks, partnerships, and coalitions
Participation
Accountability and Ability to Learn
Translation of Scientific Knowledge
Assessment Context

Appendix F – Organizational Chart of MMAS within CI



Appendix G – MMAS Partnership Structure



Dotted lines indicate weaker connections while solid lines indicate stronger connections.

* For Galapagos, the core MMAS team connected to CI ETPS, and then onwards to the Charles Darwin Research Station and scientists, policymakers, managers, etc.

References

Agardy, T. 1994. Advances in marine conservation: the role of marine protected areas. *Trends in Ecology & Evolution* 9, no. 7: 267–270.

Alvesson, M., and S. Deetz. 2000. *Doing critical management research*. SAGE Publications Ltd.

Andersen, I. 1995. *On the art of doing field studies: an experience-based research methodology*. Wiley-Blackwell.

Arnstein, S. R. 1969. A ladder of citizen participation. *Journal of the American Planning Association* 35, no. 4: 216–224.

Arts, B. 2004. The global-local nexus: NGOs and the articulation of scale. *Tijdschrift voor Economische en Sociale Geografie* 95, no. 5: 498-510.

Aswani, S. 1999. Common property models of sea tenure: a case study from the Roviana and Vonavona Lagoons, New Georgia, Solomon Islands. *Human Ecology* 27, no. 3: 417–453.

———. 2005. Customary sea tenure in Oceania as a case of rights-based fishery management: Does it work? *Reviews in Fish Biology and Fisheries* 15, no. 3: 285–307.

Aswani, S., and R. J Hamilton. 2004. Integrating indigenous ecological knowledge and customary sea tenure with marine and social science for conservation of bumphead parrotfish (Bolbometopon muricatum) in the Roviana Lagoon, Solomon Islands. *Environmental Conservation* 31, no. 01: 69–83.

Atkinson, P., and M. Hammersley. 1994. Ethnography and participant observation. *Handbook of qualitative research* 248: 261.

Avant, D. 2004. Conserving nature in the state of nature: the politics of INGO policy implementation. *Review of International Studies* 30, no. 03: 361-382.

Barrett, C. B, K. Brandon, C. Gibson, and H. Gjertsen. 2001. Conserving tropical biodiversity amid weak institutions. *BioScience* 51, no. 6: 497–502.

Baskerville, R., and J. Pries-Heje. 1999. Grounded action research: a method for understanding IT in practice. *Accounting, Management and Information Technologies* 9, no. 1: 1-23.

Baskerville, R. L. 1999. Investigating information systems with action research.

Communications of the AIS 2, no. 3.

Baskerville, R. L., and A. T. Wood-Harper. 1996. A critical perspective on action research as a method for information systems research. *Journal of Information Technology* 11: 235-246.

Beaulieu, A. 2004. Mediating ethnography: objectivity and the making of ethnographies of the internet. *Social Epistemology* 18, no. 2: 139–163.

Berkes, F., J. Colding, and C. Folke. 2000. Rediscovery of traditional ecological knowledge as adaptive management. *Ecological applications* 10, no. 5: 1251–1262.

Bestor, T. C. 2001. Supply-side sushi: commodity, market, and the global city. *American anthropologist* 103, no. 1: 76–95.

Betsill, M. M, and E. Corell, eds. 2008. *NGO Diplomacy: The influence of nongovernmental organizations in international environmental negotiations*. Cambridge, Massachusetts: The MIT Press.

Betsill, Michele M., and Elisabeth Corell. 2001. NGO influence in international environmental negotiations: a framework for analysis. *Global Environmental Politics* 1, no. 4: 65-85.

Brown, K. 2003. Three challenges for a real people-centred conservation. *Global Ecology and Biogeography* 12, no. 2: 89–92.

Brown, K., W. N. Adger, E. Tompkins, P. Bacon, D. Shim, and K. Young. 2001. Trade-off analysis for marine protected area management. *Ecological Economics* 37, no. 3: 417–434.

Bryant, R. L. 2002. Non-governmental Organizations and Governmentality:'Consuming'Biodiversity and Indigenous People in the Philippines. *Political Studies* 50, no. 2: 268–292.

Bryant, R. L., and S. Bailey. 1997. *Third world political ecology*. London and New York: Routledge.

Burris, D. 2007. NGOs and multi-layered management of protected resources in Belize and Malaysia. *Development in Practice* 17, no. 3: 439-444.

Campbell, L. M, N. J Gray, and Z. A Meletis. 2007. Political ecology perspectives on ecotourism to parks and protected areas. In *Transforming parks and protected areas: policy and governance in a changing world*, 200.

Campbell, L. M., and A. Vainio-Mattila. 2003. Participatory development and community-based conservation: opportunities missed for lessons learned? *Human Ecology* 31, no. 3: 417-437.

Capitini, C., B. Tissot, M. Carroll, W. Walsh, and S. Peck. 2004. Competing Perspectives in Resource Protection: The Case of Marine Protected Areas in West Hawai ‘i. *Society & Natural Resources* 17, no. 9: 763–778.

Cash, D. W. 2001. "In order to aid in diffusing useful and practical information": Agricultural extension and boundary organizations. *Science, Technology, & Human Values* 26, no. 4: 431-453.

Cash, D. W., W. N. Adger, F. Berkes, P. Garden, L. Lebel, P. Olsson, L. Pritchard, and O. Young. 2006. Scale and cross-scale dynamics: governance and information in a multilevel world. *Ecology and Society* 11, no. 2: 8.

Cash, D. W., and W. C. Clark. 2001. *From science to policy: assessing the assessment process*. Faculty Research Working Papers Series. John F. Kennedy School of Government: Harvard University. Google Scholar.

Cash, D. W., W. C. Clark, F. Alcock, N. Dickson, N. Eckley, D. H. Guston, J. Jäger, and R. B. Mitchell. 2003. Knowledge systems for sustainable development. *Proceedings of the National Academy of Sciences* 100, no. 14: 8086-8091.

Cash, D. W., W. C. Clark, F. Alcock, N. Dickson, N. Eckley, and J. Jäger. 2002. *Salience, credibility, legitimacy and boundaries: linking research, assessment and decision making*. Faculty Research Working Papers Series. John F. Kennedy School of Government: Harvard University. Google Scholar.

Cash, D. W., and S. Moser. 2000. Linking global and local scales: designing dynamic assessment and management processes. *Global Environmental Change* 10, no. 2: 109-120.

Cassell, C., and P. Johnson. 2006. Action research: Explaining the diversity. *Human Relations* 59, no. 6: 783.

Chapin, M. 2004. A challenge to conservationists. *WorldWatch*, December. www.worldwatch.org.

Chartier, D. 2006. Can we understand the role of NGOs in environmental politics without questioning the nature of the changes they propose and the scales they work at? *Graduate Journal of Social Science* 3, no. 1: 49.

Chein, I., S. W Cook, and J. Harding. 1948. The field of action research. *American Psychologist* 3, no. 2: 43–50.

Christie, P., K. Lowry, A. T. White, E. G Oracion, L. Sievanen, R. S. Pomeroy, R. B. Pollnac, J. M Patlis, and R. L. Eisma. 2005. Key findings from a multidisciplinary examination of integrated coastal management process sustainability. *Ocean & Coastal Management* 48, no. 3: 468–483.

Chuenpagdee, R., J. Fraga, and J. Euan-Avila. 2002. Community perspectives toward a marine reserve: a case study of San Felipe, Yucatan, Mexico. *Coastal Management* 30, no. 2: 183–191.

Cinner, J., and S. Aswani. 2007. Integrating customary management into marine conservation. *Biological Conservation* 140, no. 3: 201–216.

Clark, W. C., R. B. Mitchell, D. W. Cash, and F. Alcock. 2002. *Information as influence: how institutions mediate the impact of scientific assessments on global environmental affairs*. Faculty Research Working Paper Series. John F. Kennedy School of Government: Harvard University. Google Scholar.

Coad, L., N. Burgess, L. Fish, C. Ravillious, C. Corrigan, H. Pavese, A. Granziera, and C. Besancon. 2008. Progress towards the Convention on Biological Diversity terrestrial 2010 and marine 2012 targets for protected area coverage. *Parks* 17, no. 2: 35.

Crawford, B., M. Kasmidi, F. Korompis, and R. B Pollnac. 2006. Factors influencing progress in establishing community-based marine protected areas in Indonesia. *Coastal Management* 34, no. 1: 39–64.

Crowley, C., R. Harre, and C. Tagg. 2002. Qualitative research and computing: methodological issues and practices in using QSR NVivo and NUD* IST. *International journal of social research methodology* 5, no. 3: 193–197.

Culotta, E. 1994. Is marine biodiversity at risk? *Science* 263, no. 5149: 918.

Da Fonseca, G. A.B. 2003. Conservation science and NGOs. *Conservation Biology* 17, no. 2: 345–347.

Davison, R. M., M. G. Martinsons, and N. Kock. 2004. Principles of canonical action research. *Info Systems* 14: 65-86.

Derman, B. 1995. Environmental NGOs, dispossession, and the state: The ideology and praxis of African nature and development. *Human Ecology* 23, no. 2: 199-215.

Dick, B., E. Stringer, and C. Huxham. 2009. Theory in action research. *Action Research* 7, no. 1: 5.

Dixon, J. A. 1993. Economic benefits of marine protected areas. *Oceanus* 36, no. 3: 35–

40.

Doyle, T., and D. McEachern. 2007. *Environment and politics*. London and New York: Routledge.

Drew, J. A. 2005. Use of traditional ecological knowledge in marine conservation. *Conservation Biology* 19, no. 4: 1286–1293.

Drew, J. A, and A. P Henne. 2006. Conservation biology and traditional ecological knowledge: integrating academic disciplines for better conservation practice. *Ecology and Society* 11, no. 2.

Dumaup, J. N. B., R. M. Cola, R. B. Trono, J. A. Ingles, E. F. B. Miclat, N. P. Ibuna, and others. 2004. Conservation plan for the Sulu [Philippines]-Sulawesi [Indonesia] Marine ecoregion.

Eade, D. 2007. Capacity building: who builds whose capacity? *Development in Practice* 17, no. 4: 630–639.

Ebrahim, A. 2003. Accountability in practice: mechanisms for NGOs. *World Development* 31, no. 5: 813-829.

Eckley, N. 2001. *Designing effective assessments: the role of participation, science and governance, and focus*. Environmental issue report. Copenhagen, Denmark: European Environment Agency. http://www.unep.org/DEWA/water/MarineAssessment/reports/germany_report/EEA-report-issue_26.pdf.

Eden, C., and C. Huxham. 1996. Action research for management research. *British Journal of Management* 7, no. 1: 75-86.

Edwards, M. 1999. NGO performance–what breeds success? New evidence from South Asia. *World Development* 27, no. 2: 361-374.

Edwards, M., and D. Hulme, eds. 1995. *Non-governmental organisations: performance and accountability beyond the magic bullet*. London: Earthscan.

Edwards, M., D. Hulme, and T. Wallace. 1999. NGOs in a global future: marrying local delivery to worldwide leverage. *Public Administration and Development* 19, no. 2: 117-136.

Escobar, A. 1998. Whose knowledge, whose nature? Biodiversity, conservation, and the political ecology of social movements. *Journal of political ecology* 5, no. 1: 53-82.

Farrell, A. E., and J. Jager, eds. 2006. *Assessments of regional and global environmental risks: designing processes for the effective use of science in decisionmaking*. Washington, D.C.: Resources for the Future.

Farrell, A. E., S. VanDeveer, and J. Jäger. 2001. Environmental assessments: four under-appreciated elements of design. *Global Environmental Change* 11: 311-333.

Fauzi, A., and E. Buchary. 2002. A socioeconomic perspective of environmental degradation at Kepulauan Seribu Marine National Park, Indonesia. *Coastal Management* 30, no. 2: 167–181.

Feldman, M. S, J. Bell, and M. T Berger. 2003. *Gaining access: A practical and theoretical guide for qualitative researchers*. Altamira Pr.

Fisher, W. F. 1997. Doing good? The politics and antipolitics of NGO practices. *Annual review of anthropology* 26: 439–464.

Fitzgerald, D. 2006. Towards a theoretical ethnography of migration. *Qualitative Sociology* 29, no. 1: 1–24.

Forsyth, T. 2003. *Critical political ecology: The politics of environmental science*. London, U.K.: Routledge.

Fowler, A. 1996. Demonstrating NGO performance: problems and possibilities. *Development in practice* 6, no. 1: 58–65.

Fox, J. A, and L. D Brown. 1998. *The struggle for accountability: The World Bank, NGOs, and grassroots movements*. The MIT Press.

Francini-Filho, R., and R. Moura. 2008. Dynamics of fish assemblages on coral reefs subjected to different management regimes in the Abrolhos Bank, eastern Brazil. *Aquatic Conservation: Marine and Freshwater Ecosystems* 18, no. 7: 1166–1179.

Freidberg, S. 2001. On the trail of the global green bean: methodological considerations in multi-site ethnography. *Global Networks* 1, no. 4 (10): 353-368. doi:10.1111/1471-0374.00020.

Friedlander, A., J. Nowlis, J. Sanchez, R. Appeldoorn, P. Usseglio, C. McCormick, S. Bejarano, and A. Mitchell. 2003. Designing effective marine protected areas in Seaflower Biosphere Reserve, Colombia, based on biological and sociological information. *Conservation Biology* 17, no. 6: 1769–1784.

Geertz, C. 1973. *The interpretation of cultures*. New York: Basic Books.

Gemmill, B., and A. Bamidele-Izu. 2002. The role of NGOs and civil society in global environmental governance. In *Global environmental governance: Options and opportunities*, ed. D. C. Esty and M. H. Ivanova. New Haven, CT: Yale Center for Environmental Law and Policy.

Gieryn, T. F. 1983. Boundary-work and the demarcation of science from non-science. *American Sociological Review* 48, no. 6: 781-95.

———. 1995. Boundaries of science. In *Handbook of science and technology studies*, ed. S. Jasanoff, 393–443. Thousand Oaks, CA: Sage Publications.

Girgis, M. 2007. The Capacity-building Paradox: using friendship to build capacity in the South. *Development in Practice* 17, no. 3: 353-366.

Glaser, B. G., and A. L. Strauss. 1967. *The discovery of grounded theory*. New York: Aldine de Gruyter.

Govan, H. 2009. Achieving the potential of locally managed marine areas in the South Pacific. *SPC Traditional Marine Resource Management and Knowledge Information Bulletin*, no. 25 (July). http://manejocomunitario.marvivablog.com/files/2010/08/Trad25_16_Govan.pdf.

Govan, H., W. Aalbersberg, A. Tawake, and J. Parks. 2008. Locally-Managed Marine Areas: A guide for practitioners. *The Locally-Managed Marine Area Network*.

Govan, H., A. Tawake, K. Tabunakawai, A. Jenkins, A. Lasgorceix, A. M. Schwarz, B. Aalbersberg, et al. 2009. Status and potential of locally-managed marine areas in the South Pacific: meeting nature conservation and sustainable livelihood targets through wide-spread implementation of LMMAs. *SPREP/WWF/WorldFish-Reefbase/CRISP. 95pp* 5.

Gummesson, E. 2000. *Qualitative methods in management research*. Sage Publications, Inc.

Gusterson, H. 1997. Studying up revisited. *Political and Legal Anthropology Review* 20, no. 1: 114-119.

Guston, D. H. 1999. Stabilizing the boundary between US politics and science: The role of the Office of Technology Transfer as a boundary organization. *Social Studies of Science* 29, no. 1: 87-112.

———. 2001. Boundary organizations in environmental policy and science: an introduction. *Science, Technology & Human Values* 26, no. 4: 399.

Haas, P. M. 2004. When does power listen to truth? A constructivist approach to the policy process. *Journal of European Public Policy* 11, no. 4: 569-592.

Hammersley, M., and P. Atkinson. 2007. *Ethnography: Principles in practice*. Taylor & Francis.

Hannerz, U. 2003. Being there... and there... and there!: Reflections on Multi-Site Ethnography. *Ethnography* 4, no. 2: 201.

———. 2004. *Foreign news: exploring the world of foreign correspondents*. University of Chicago Press.

Helvey, M. 2004. Seeking consensus on designing marine protected areas: keeping the fishing community engaged. *Coastal Management* 32, no. 2: 173–190.

Hendry, J. 2003. An ethnographer in the global arena: globography perhaps? *Global Networks* 3, no. 4: 497–512.

Hine, C. 2000. *Virtual ethnography*. Sage Publications Ltd.

Hodgson, D., and R. Alcadipani. 2008. By Any Means Necessary? Ethnographic Access, Ethics and the Critical Researcher. Unpublished Paper. Manchester Business School. Google Scholar.

Hudson, A. 2001. NGOs transnational advocacy networks: from legitimacy to political responsibility? *Global Networks: A Journal of Transnational Affairs* 1, no. 4: 331-352.

Huntington, H. 1998. Observations on the utility of the semi-directive interview for documenting traditional ecological knowledge. *Arctic* 51, no. 3: 237.

Jameson, S. C., M. H. Tupper, and J. M. Ridley. 2002. The three screen doors: can marine "protected" areas be effective? *Marine Pollution Bulletin* 44, no. 11: 1177–1183.

Jasanoff, S. 1987. Contested boundaries in policy-relevant science. *Social Studies of Science* 10: 195-230.

———. 1994. *The fifth branch: Science advisers as policymakers*. Cambridge, Massachusetts: Harvard University Press.

———. 1996. Beyond epistemology: relativism and engagement in the politics of science. *Social Studies of Science* 26: 393-418.

———. 1997. NGOs and the Environment: From Knowledge to Action. *Third World Quarterly* 18, no. 3: 579-594.

———. 2004. *States of knowledge: the co-production of science and social order*.

Routledge.

Jeffrey, D. W. 2001. The Roles of Environmental Non-Governmental Organisations in the Twenty-First Century. In *Biology and Environment: Proceedings of the Royal Irish Academy*, 101:151–156.

Jennings, S., S. Arnstein, and N. Polunin. 1996. Seychelles' marine protected areas: comparative structure and status of reef fish communities. *Biological Conservation* 75, no. 3: 201–209.

Jepson, P., and S. Canney. 2003. Values-led conservation. *Global Ecology & Biogeography* 12: 271-274.

Johannes, R. E. 2002. The renaissance of community-based marine resource management in Oceania. *Annual Review of Ecology and Systematics* 33: 317–340.

Johnson, E., and A. Prakash. 2007. NGO research program: a collective action perspective. *Policy Sciences* 40, no. 3: 221–240.

Johnson, J. C. 1990. *Selecting ethnographic informants*. Sage Publications, Inc.

Jones, P. 1994. A review and analysis of the objectives of marine nature reserves. *Ocean & Coastal Management* 24, no. 3: 149–178.

———. 2001. Marine protected area strategies: issues, divergences and the search for middle ground. *Reviews in Fish Biology and Fisheries* 11, no. 3: 197–216.

Jordan, L., and P. Van Tuijl. 2000. Political responsibility in transnational NGO advocacy. *World Development* 28, no. 12: 2051-2065.

Josiah, S. J. 2001. Approaches to expand NGO natural resource conservation program outreach. *Society and Natural Resources* 14, no. 7: 609-618.

Keck, Margaret E., and Kathryn Sikkink. 1998. *Activists beyond borders: advocacy networks in international politics*. Cornell University Press, March.

Kelleher, G., ed. 1999. *Guidelines for marine protected areas*. Gland, Switzerland and Cambridge, UK: IUCN.

Kelleher, G., C. Bleakley, and S. Wells. 1995. A global representative system of marine protected areas. 4 volumes. Great Barrier Marine Park Authority, The World Bank. *World Conservation Union, Washington, DC*.

Kelleher, G., and R. Kenchington. 1992. *Guidelines for Establishing Marine Protected Areas. A Marine Conservation and Development Report*. Gland, Switzerland:

IUCN.

Latour, B. 1987. *Science in action: How to follow scientists and engineers through society*. Harvard Univ Press.

Lewis, D. 2003. NGOs, Organization Culture, and Institutional Sustainability. *The Annals of the American Academy of Political and Social Science* 590: 212–226.

Lewis, D., A. J. Bebbington, S. P. J. Batterbury, A. Shah, E. Olson, M. S. Siddiqi, and S. Duvall. 2003. Practice, power and meaning: frameworks for studying organizational culture in multi-agency rural development projects. *Journal of International Development* 15, no. 5: 541-557.

Lundquist, C. J, and E. F Granek. 2005. Strategies for successful marine conservation: integrating socioeconomic, political, and scientific factors. *Conservation Biology* 19, no. 6: 1771–1778.

MacDonald, C. C. 2008. *Green, Inc.: An Environmental Insider Reveals How a Good Cause Has Gone Bad*. Lyons Pr.

Malinowski, B. 1922. *Argonauts ofthe western Pacific*. London: George Rutledge and Sons, Ltd.

Marcus, G. E. 1995. Ethnography in/of the world system: the emergence of multi-sited ethnography. *Annual review of anthropology* 24, no. 1: 95-117.

———. 1998. *Ethnography through thick and thin*. Princeton Univ Pr.

———. 1999. What is at stake–and is not–in the idea and practice of multi-sited ethnography. *Canberra Anthropology* 22, no. 2: 6–14.

———. 2002. Beyond Malinowski and after Writing Culture: On the future of cultural anthropology and the predicament of ethnography. *The Australian Journal of Anthropology* 13, no. 2: 191–199.

Markowitz, L. 2001. Finding the field: notes on the ethnography of NGOs. *Human Organization* 60, no. 1: 40-46.

Mascia, M. B. 2003. The human dimension of coral reef marine protected areas: recent social science research and its policy implications. *Conservation Biology* 17, no. 2: 630–632.

Mathews, J. T. 1997. Power shift. *Foreign Affairs* 76, no. 1: 50-66.

McCarthy, J. 2005. Scale, sovereignty, and strategy in environmental governance.

Antipode 37, no. 4: 731-753.

McClanahan, T. 1999. Is there a future for coral reef parks in poor tropical countries? *Coral Reefs* 18, no. 4: 321–325.

McClanahan, T., M. Marnane, J. Cinner, and W. Kiene. 2006. A comparison of marine protected areas and alternative approaches to coral-reef management. *Current Biology* 16, no. 14: 1408–1413.

McField, M., and Nadia Bood. 2007. Our reef in peril - Can we use it without abusing it? In *Taking stock: Belize at 25 years of independence*, by J. J. Awe, 171-171. Cubola Productions.

Miller, H. 2006. Adaptive Governance, Integrating Science, Policy and Decision Making. *Forestry* 79, no. 5: 609.

Mitchell, R. B., W. C. Clark, D. W. Cash, and N. M. Dickson, eds. 2006. *Global environmental assessments: information and influence*. Cambridge, Massachusetts: MIT Press.

Morin, T. 2001. Sanctuary advisory councils: involving the public in the National Marine Sanctuary Program. *Coastal Management* 29, no. 4: 327–339.

Morrill, C., D. B Buller, M. K Buller, and L. L Larkey. 1999. Toward an organizational perspective on identifying and managing formal gatekeepers. *Qualitative Sociology* 22, no. 1: 51–72.

Moura, R., C. Minte-Vera, I. Curado, R. Francini-Filho, H. Rodrigues, G. Dutra, D. Alves, and F. Souto. 2009. Challenges and Prospects of Fisheries Co-Management under a Marine Extractive Reserve Framework in Northeastern Brazil. *Coastal Management* 37, no. 6: 617–632.

Murphy, B. K. 2000. International NGOs and the Challenge of Modernity (Les ONG internationales et le défi de la modernité/As ONGs internacionais eo desafio da modernidade/Las ONG internacionales y el desafio del mundo moderno). *Development in Practice* 10, no. 3: 330-347.

Nader, L. 1972. Up the anthropologist: Perspectives gained from studying up. *Reinventing anthropology* 1972: 284–311.

National Research Council. 2001. *Marine protected areas: tools for sustaining ocean ecosystems*. Washington, D.C.: National Academy Press.

Naughton-Treves, L., M. B. Holland, and K. Brandon. 2005. The role of protected areas in conserving biodiversity and sustaining local livelihoods. *Annual Review of*

Environment and Resource 30: 219-252.

Nelson, P. J. 1997. Conflict, Legitimacy, and Effectiveness: Who Speaks for Whom in Transnational NGO Networks Lobbying the World Bank? *Nonprofit and Voluntary Sector Quarterly* 26, no. 4: 421.

Oberthür, S., M. Buck, S. Müller, S. Pfahl, R. G Tarasofsky, J. Werksman, and A. Palmer. 2002. *Participation of Non-Governmental Organizations in International Environmental Governance: Legal Basis and Practical Experience*. Berlin, Germany: Ecologic Institute.

Orlove, B. S., and S. B. Brush. 1996. Anthropology and the conservation of biodiversity. *Annual Review of Anthropology* 25, no. 1 (10): 329-352. doi:10.1146/annurev.anthro.25.1.329.

Park, P. 1999. People, knowledge, and change in participatory research. *Management Learning* 30, no. 2: 141–57.

Peluso, N. L. 1993. Coercing conservation? The politics of state resource control. *Global Environmental Change* 3, no. 2: 199-219.

Peterson, R. B., D. Russell, P. West, and J. P. Brosius. 2008. Seeing (and Doing) Conservation Through Cultural Lenses. *Environmental Management* 45, no. 1: 5-18. doi:10.1007/s00267-008-9135-1.

Pohl, C. 2008. From science to policy through transdisciplinary research. *Environmental Science & Policy* 11, no. 1: 46–53.

Pomeroy, R., J. Parks, and L. Watson. 2004. *How is your MPA doing?: a guidebook of natural and social indicators for evaluating marine protected area management effectiveness*. Gland and Cambridge: IUCN.

Princen, T., and M. Finger. 1994. *Environmental NGOs in world politics: linking the local and the global*. London and New York: Routledge.

Princen, T., M. Finger, J. P Manno, and M. L Clark. 1994. *Environmental NGOs in world politics: linking the local and the global*. Routledge London.

Raustiala, K. 1997. States, NGOs, and international environmental institutions. *International Studies Quarterly* 41: 719-740.

Redford, K. H., P. Coppolillo, E. W. Sanderson, G. AB DA FONSECA, E. Dinerstein, C. Groves, G. Mace, S. Maginnis, R. A. Mittermeier, and R. Noss. 2003. Mapping the conservation landscape. *Conservation Biology* 17, no. 1: 116-131.

Richards, L. 1999. *Using NVivo in qualitative research*. Sage.

Robbins, P. 2004. *Political ecology: A critical introduction*. Malden, MA: Blackwell.

Roberts, S. M., J. P. Jones, and O. Frohling. 2005. NGOs and the globalization of managerialism: A research framework. *World Development* 33, no. 11: 1845-1864.

Roberts, S. M., J. P. Jones, and O. Fröhling. 2005. NGOs and the globalization of managerialism: A research framework. *World Development* 33, no. 11: 1845–1864.

Robinson, J. G. 1993. The limits to caring: sustainable living and the loss of biodiversity. *Conservation Biology* 7, no. 1: 20–28.

Rodriguez, J. P., J. A. Simonetti, A. Premoli, and M. A. Marini. 2005. Conservation in Austral and Neotropical America: Building Scientific Capacity Equal to the Challenges. *Conservation Biology* 19, no. 3 (6): 969-972. doi:10.1111/j.1523-1739.2005.00555.x.

Rodriguez, J. P., A. B. Taber, P. Daszak, R. Sukumar, C. Valladares-Padua, S. Padua, L. F. Aguirre, R. A. Medellin, M. Acosta, and A. A. Aguirre. 2007. Globalization of Conservation: a view from the South. *Science*.

Romero, C., and G. I. Andrade. 2004. International conservation organizations and the fate of local tropical forest conservation initiatives. *Conservation Biology* 18, no. 2: 578-580.

Rudd, M., M. Tupper, H. Folmer, and G. Van Kooten. 2003. Policy analysis for tropical marine reserves: challenges and directions. *Fish and Fisheries* 4, no. 1: 65–85.

Russ, G. R., and A. C. Alcala. 1999. Management histories of Sumilon and Apo Marine Reserves, Philippines, and their influence on national marine resource policy. *Coral Reefs* 18, no. 4: 307–319.

Sanday, P. R. 1979. The ethnographic paradigm (s). *Administrative Science Quarterly* 24, no. 4: 527-538.

Sandersen, H., and S. Koester. 2000. Co-management of tropical coastal zones: the case of the Soufrière Marine Management Area, St. Lucia, WI. *Coastal Management* 28, no. 1: 87–97.

Sanderson, S. 2002. The Future of Conservation. *Foreign Affairs* 81, no. 5: 162-173.

Schwartzman, H. B. 1993. *Ethnography in organizations*. Qualitative Research Methods

Series 27. Thousand Oaks, CA: Sage Publications.

Shami, S. 2004. New approaches to migration? Transnational communities and the transformation of home. *Journal of Refugee Studies* 17, no. 2: 246.

Silva, M. E, E. M Gately, and I. Desilvestre. 1986. *A bibliographic listing of coastal and marine protected areas: a global survey*. Woods Hole Oceanographic Institution.

Simmons, P. J. 1998. Learning to live with NGOs. *Foreign Policy* 112: 82-96.

Smith, L. M. 1978. An evolving logic of participant observation, educational ethnography, and other case studies. *Review of research in education*: 316–377.

Smith, V. 2001. Ethnographies of work and the work of ethnographers. *Handbook of ethnography*: 220–33.

Sobel, J. A., and C. Dahlgren. 2004. *Marine reserves: a guide to science, design, and use*. Washington, D.C.: Island Press.

Sorensen, J. 1997. National and international efforts at integrated coastal management: definitions, achievements, and lessons. *Coastal Management* 25, no. 1: 3–41.

St Clair, A. L. 2006. Global Poverty. *Global Social Policy* 6, no. 1: 57.

Stafford, E. R, M. J Polonsky, and C. L Hartman. 2000. Environmental NGO-business collaboration and strategic bridging: a case analysis of the Greenpeace-Foron Alliance. *Business Strategy and the environment* 9, no. 2: 122–135.

Star, S. L., and J. R. Griesemer. 1989. Institutional ecology,“translations” and boundary objects: Amateurs and professionals in Berkeley’s Museum of Vertebrate Zoology, 1907–39. *Social Studies of Science* 19, no. 3: 387–420.

Stevens, T. 2002. Rigor and representativeness in marine protected area design. *Coastal Management* 30, no. 3: 237–248.

Susman, G. I., and R. D. Evered. 1978. An assessment of the scientific merits of action research. *Administrative science quarterly* 23, no. 5: 582-603.

Sykes, H., and C. Morris. 2009. Status of Coral Reefs in the Fiji Islands, 2007. *South-West Pacific Status of Coral Reefs Report*: 1.

Teh, L. C.L, L. S.L Teh, B. Starkhouse, and U. Rashid Sumaila. 2009. An overview of socio-economic and ecological perspectives of Fiji's inshore reef fisheries. *Marine Policy* 33, no. 5: 807–817.

Terborgh, J. 2004. *Requiem for nature*. Island Press.

Tribbia, J., and S. Moser. 2008. More than information: what coastal managers need to plan for climate change. *Environmental science & policy* 11, no. 4: 315–328.

Usher, P. J. 2000. Traditional ecological knowledge in environmental assessment and management. *Arctic* 53, no. 2: 183.

Van Maanen, J. 1988. *Tales of the field: On writing ethnography*. Chicago: University of Chicago Press.

Veitayaki, J., B. Aalbersberg, A. Tawake, E. Rupeni, and K. Tabunakawai. 2004. Mainstreaming resource conservation: The Fiji Locally Managed Marine Area Network and its influence on national policy development.

Walker, P. A. 2007. Political ecology: where is the politics? *Progress in Human Geography* 31, no. 3: 363.

Wallace, A. 1972. Paradigmatic Processes in Culture Change. *American Anthropologist* 74, no. 3: 467-478. doi:10.1525/aa.1972.74.3.02a00160.

Walmsley, S. F., and A. T. White. 2003. Influence of social, management and enforcement factors on the long-term ecological effects of marine sanctuaries. *Environmental Conservation* 30, no. 04: 388–407.

Wapner, P. 1996. *Environmental Activism and World Civic Politics*. New York: State University of New York Press.

Werner, T., L. P. Pinto, G. Dutra, and P. G. Pereira. 2000. Abrolhos 2000: Conserving the Southern Atlantic□s Richest Coastal Biodiversity into the Next Century. *Coastal Management* 28, no. 1: 99–108.

West, P. 2006. *Conservation is our government now: the politics of ecology in Papua New Guinea*. Durham and London: Duke University Press.

White, A. T., and H. P. Vogt. 2000. Philippine coral reefs under threat: lessons learned after 25 years of community-based reef conservation. *Marine Pollution Bulletin* 40, no. 6: 537–550.

White, A. T., H. P. Vogt, and T. Arin. 2000. Philippine coral reefs under threat: the economic losses caused by reef destruction. *Marine Pollution Bulletin* 40, no. 7: 598–605.

Whyte, W. F. 1989. Advancing scientific knowledge through participatory action research. *Sociological Forum* 4, no. 3: 367-385.

Wilshusen, P. R, S. R Brechin, C. L Fortwangler, and P. C West. 2002. Reinventing a square wheel: Critique of a resurgent" protection paradigm" in international biodiversity conservation. *Society & natural resources* 15, no. 1: 17–40.

Wittel, A. 2000. Ethnography on the move: From field to net to internet. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*. Vol. 1.

Wootliff, J., C. Deri, S. Strategies, and E. Worldwide. 2001. NGOs: the new super brands. *Corporate Reputation Review* 4, no. 2: 157-166.

Yanacopulos, H. 2005. The strategies that bind: NGO coalitions and their influence. *Global Networks* 5, no. 1: 93–110.

Yin, R. 2008. *Case study research: Design and methods*. Third. Applied Social Research Methods Series. Thousand Oaks, CA: Sage Publications.

Zimmerer, K. S., and T. J. Bassett, eds. 2003. *Political ecology: an integrative approach to geography and environment-development studies*. New York, N.Y.: The Guilford Press.

Biography

Jesse Hastings was born in Stoneham, Massachusetts on September 23rd, 1981. Raised near Boston, he graduated with highest honors from University of North Carolina – Chapel Hill in 2003, majoring in International Studies and minoring in Environmental Studies. In 2006, he graduated with a Masters of Public Policy from the Sanford Institute of Public Policy at Duke, with a focus on global policy and protected area management and governance. Since enrolling in the Ph.D. program at the Nicholas School, he has been the recipient of the University Scholars Fellowship, the Duke International Fellowship, the Dissertation Travel Award, the J.B. Duke Fellowship, the Duke Endowment Fellowship, and the Joshua E. Neimark Travel Award. In 2008, he received an honorable mention for the NSF Graduate Research Fellowship. During his time as a Ph.D. candidate, he published an article entitled "International ENGOs and Conservation Science and Policy: A Case from Brazil" in *Coastal Management*, and as of April 2011 had several more articles in preparation.