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Knowledge Processes and the Potential for Adaptive Governance of Inshore Fisheries in the Solomon Islands

Amber W. Datta
University of Montana, Missoula

KNOWLEDGE PROCESSES AND THE POTENTIAL FOR ADAPTIVE GOVERNANCE OF INSHORE FISHERIES IN THE SOLOMON ISLANDS

By

AMBER WAIALEA DATTA

B.A. Environmental Analysis, Pomona College, Claremont, California, 2013

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Approved by:

Scott Whittenburg, Dean of The Graduate School
Graduate School

Dr. Brian Chaffin, Chair
Department of Society and Conservation

Dr. Alex Metcalf
Department of Society and Conservation

Michelle Bryan, J.D.
Alexander Blewett III School of Law

Dr. Lorrae van Kerkhoff
Fenner School of Environment and Society, Australian National University

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Chairperson or Co-Chairperson: Dr. Brian Chaffin

Abstract

Rapid environmental change, ranging from the collapse of fisheries to the rise of sea levels, poses significant challenges for the governance of marine resources. In Pacific Island Countries and Territories (PICTs), these changes result in the loss of marine resources, threatening both the biodiversity of coastal ecosystems and the communities that rely on them. Existing top-down, centralized forms of environmental governance lack the flexibility needed to address these issues especially at local scales, while bottom-up approaches often lack the coordination and authority needed to respond quickly to change. More adaptive forms of marine governance are needed to ensure that PICTs are able to respond effectively to these environmental changes. Researchers in environmental governance have proposed "adaptive governance" (AG) as an alternative mode of governing resources that balances the benefits of top-down and bottom-up approaches. Past research has led to proposals for specific characteristics of such a system, including calls for enabling adaptive management, for inclusive participation of stakeholders, and for incorporating multiple types of knowledge into decision making. However, further empirical evidence is necessary to develop these characteristics and to identify the barriers to their emergence, especially in non-Western contexts. The thesis research described here contributes to filling this gap through a case study analysis of the Solomon Islands Fishery Management Act (FMA) of 2015 as a potential example of emerging adaptive governance. Specific focus is given to a provision within the FMA (2015) that will enable communities to use government police and court systems to enforce their local fishing rules, if they successfully submit a marine management plan to the government. This study location provides a unique opportunity to pay specific attention to the AG suggestion for the inclusion of different types of knowledge, as both science and local ecological knowledge are used by governance actors in the Solomon Islands. Data collection methods include a deductive policy analysis, participant observation, and semi-structured interviews with Pacific fisheries policy experts as well as fisheries managers, conservation practitioners, and fishers in the Solomon Islands. The results of this analysis indicate that several characteristics of AG may be emerging in the Solomon Islands with the introduction of the FMA (2015), including openness to the incorporation of multiple types of knowledge. However, a more in depth analysis of knowledge processes reveal some potential barriers to the emergence of this characteristic, and of AG more broadly; for instance, the strict requirements of the FMA (2015) may restrict the ability of communities to successfully submit plans and therefore benefit from this provision. This research builds a deeper understanding of knowledge-related barriers to the emergence of AG and introduces an approach to detect these barriers during an AG analysis that can be further developed in the future.

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1 INTRODUCTION

Rapid environmental change, ranging from the collapse of fisheries, to ocean acidification, to the rise of sea levels, poses significant challenges for the effective management of marine resources (Mullon et al. 2005, Folke 2007, Rockstrom et al. 2009, Osterblom and Folke 2013, IPCC 2014). In Pacific Islands Countries and Territories (PICTs), these threats are compounded by rapid social changes brought about by processes of globalization and the growth of a market-based economy. These shifts can lead to the unsustainable extraction of resources through activities like logging and offshore fishing (Albert et al. 2014, Jupiter et al. 2014). Addressing these threats is critical for mitigating potentially severe local impacts on the biodiversity of island ecosystems, and on the livelihoods of highly resource-dependent Pacific communities (Osterblom and Folke 2013).

Past approaches to resource management have incorrectly assumed that change only happens gradually, that it is enough to focus on just one issue or resource at a time, and that ecosystems will naturally return to a specific, balanced state (Lemos and Agrawal 2006, Folke et al. 2005). These perceptions have inspired centralized systems of decision making based on strong state control and scientific expertise (Folke et al. 2005). However, this frequently fails to adequately address environmental problems for several reasons: this approach does not respond effectively to rapid, severe changes, neglects to address issues at ecologically relevant scales, lacks the capacity to coordinate across scales and sectors, and does not effectively tailor efforts to specific contexts within state jurisdiction (Lemos and Agrawal 2006, Folke et al. 2005, Huitema et al. 2009). Recent research has suggested alternative, more adaptive systems for making decisions about natural resources that may possess the flexibility needed to overcome these challenges (Folke et al. 2005, Huitema et al. 2009). The potential for the use of different types of knowledge in decision making to improve adaptability is an emerging theme within this line of research. This thesis seeks to add to this conversation by exploring possible barriers to the emergence of more adaptive systems for governing resources, with specific attention given to barriers related to the use of different types of knowledge in decision making.

In this thesis, I investigate a case study of inshore fisheries in the Solomon Islands, where a recently passed national fisheries act provides a potential example of a policy improving the adaptiveness of a natural resource management system. A mix of customary marine resource

tenure systems and western approaches to resource management in this context facilitates the focus of this study on the incorporation of different types of knowledge into decision-making processes. This investigation of fisheries governance in a PICT where the impacts from rapid population growth, extractive industries (e.g. logging, offshore fishing), and climate change are imminent. The results of this research may contribute to the country's effort to address these issues, while also offering insights relevant to other PICTs and potentially to developing countries facing similar changes in other regions (Green et al. 2006, Macintyre and Foale 2004, Albert et al. 2014, Jupiter et al. 2014). I engage in this endeavor on the following premises: first, that the decision-making processes examined within governance research are intimately tangled up with concerns around what and whose knowledge is used in decisions, and, second, that because of the link between knowledge and power, a governance analysis that does not pay close attention to these concerns would not only be incomplete, but might also produce results that lack the contextual awareness required when working in post-colonial contexts. Here I offer a starting point for developing this awareness of knowledge-related concerns within an adaptive governance analysis.

1.1 Introducing Adaptive Governance

This study approaches marine management issues from the perspective of environmental governance. Governance is defined as the "structures and processes by which people in society make decisions and share power" (Folke et al. 2005). This includes the "system of institutions (including rules, laws, regulations, policies, and social norms) and organizations involved in governing environmental resource use and/or protection" (Chaffin et al. 2014). This perspective allows for a holistic examination of the formal *and* informal actors and institutions that influence the relationship between society and marine resources, bringing to the fore the role of institutions beyond government, such as NGOs and community-based groups (Lemos and Agrawal 2006, Folke et al. 2007, Osterblom and Folke 2013, Chaffin et al. 2014). This perspective informs proposals for alternatives to the centralized, technocratic systems that so often fail to address environmental issues (Folke et al. 2007).

The failure of centralized systems initially led to a number of bottom-up approaches to natural resource management, including collaborative conservation and community-based resource management (CBRM). Although these alternative approaches can produce more

context-appropriate strategies, they can suffer from coordination problems and an inability to react quickly to system-scale disruptions (Lemos and Agrawal 2006, Chaffin et al. 2014). In response, the idea of "adaptive governance," also called "adaptive co-management" (Huitema et al. 2009) or "network governance" (Scarlett and McKinney 2016), has emerged as a blended governance arrangement able to allow flexibility for coping with rapid socioecological change and uncertainty (Folke et al. 2005, Olsson et al. 2006, Chaffin et al. 2014, De Caro et al. 2017). Adaptive governance (AG) scholarship builds on research in CBRM and socio-ecological resilience (SES). Resilience research re-conceptualizes environmental problems by: 1) explicitly recognizing the link between environmental and social systems through a SES approach, 2) acknowledging the possibility of multiple states for an SES rather than assuming an SES has only one state to which it will always return after disturbance, and 3) focusing on the resilience of the SES. Resilience is defined by Folke et al. 2005 as the "extent to which a system can absorb recurrent natural and human perturbations and continue to regenerate without slowly degrading or even unexpectedly flipping into less desirable states" (Gunderson 2000, Gunderson and Holling 2002, Folke et al. 2005). From this perspective, AG is seen as the governance arrangement necessary for facilitating the ability of an SES to a) be resilient, meaning able to reorganize after a disturbance in order to remain in a desired state, or b) transform from an undesirable state towards a desirable state identified by actors within a governance system (Walker et al. 2004, Folke et al. 2005).

Literature on adaptive governance to date has focused on identifying key components of adaptive governance by investigating a limited number of empirical examples (Chaffin et al. 2014). The characteristics of adaptive governance vary across locations but typically include the following traits: nested, polycentric centers of decision making authority fit to a biogeographic scale appropriate for the environmental challenge being addressed, along with processes that allow for broad participation, enables leadership, social learning, experimental approaches to management and policy, and the inclusion of multiple types of knowledge in decisions (Folke et al. 2005, Olsson et al. 2006, Armitage et al. 2009, Huitema et al. 2009, Chaffin et al. 2014). Each of these characteristics is defined in the *Frameworks for Analysis* section. Examples of places where these characteristics of adaptive governance are emerging are starting to be recorded (e.g. Schultz et al. 2015, Chaffin et al. 2016), and design principles that may enable adaptive governance have been outlined (e.g. De Caro et al. 2017). However, more empirical evidence is

needed to understand what these characteristics look like in practice, and what barriers exist to the emergence of AG overall (Chaffin et al. 2014, Wyborn et al. 2016). It is especially necessary to explore AG in PICTS, where vulnerability to rapid environmental change and high-resource dependency make understanding and developing adaptive modes of governance especially important (Osterblom and Folke 2013, Jupiter et al. 2014). In this study, I gather empirical evidence through a case study of inshore fisheries[1] governance in the Solomon Island, with a specific focus on a new Solomon Islands National Fisheries Management Act (FMA) (2015). I assess the degree to which governance arrangements in this case study reflect the characteristics of adaptive governance proposed in the literature, with particular attention to the suggestion for the inclusion of multiple types of knowledge.

The suggestion for the inclusion of multiple types of knowledge provides an alternative to the approach of centralized, technocratic systems, which rely primarily on scientific expertise (Folke et al. 2005, Armitage et al. 2009, Wyborn et al. 2016). Van Kerkhoff and Lebel (2006) define knowledge as "justifiable belief," and recognize that different forms of knowledge use different criteria for what counts as justification (e.g., peer review is an important part of justifying scientific knowledge). The need to explicitly consider the relationship between knowledge and decision making in an adaptive governance analysis has been identified in the literature, but has not been fully explored (Armitage et al. 2009, Wyborn et al. 2016). Attention to this AG suggestion not only contributes to the overall need for empirical evidence to better understand what AG characteristics look like in practice, but also addresses a need to place more attention on understanding the power dynamics within adaptive governance arrangements (Chaffin et al. 2014, Wyborn et al. 2016, De Caro et al. 2017). This originates in discussions of good governance and the normative elements of adaptive governance, such as 'who' decides the desired state of an SES, which in turn raises questions about whose knowledge is drawn on and privileged in decision making (van Kerkhoff and Lebel 2006, Chaffin et al. 2014, Wyborn et al. 2016). The need to consider the power dynamics involved with the use of different types of knowledge in decision making is especially pressing in the post-colonial context of the Pacific, and is complicated by the presence of both customary and western systems of law that have become hybridized (Pulea 1993, Aswani et al. 2007). Here I add an additional lens to my

[1] "Inshore" fisheries here refers to the reef and shallow areas immediately adjacent to the shore, with the nearshore zone being further out.

analysis of AG characteristics in the Solomon Island by investigating the incorporation of different knowledge types into decision making, and identifying knowledge-related barriers to the emergence of adaptive governance. Within this I initiate a reflexive conversation around the methodology used to conduct governance analyses in the context of the Pacific, and the Global South more broadly.

1.2 Research Questions and Objectives

Questions:

1. How are different types of knowledge incorporated (or not) into decision making around inshore fisheries in the Solomon Islands?
2. What is the relationship between the use of different types of knowledge in inshore fisheries governance, and the emergence of adaptive governance in the Solomon Islands?
3. What, if anything, does a focus on knowledge add to an analysis of adaptive governance?

Objectives:

- **1.** Assess inshore fisheries governance in the Solomon Islands, with a focus on the Fisheries Management Act (FMA) of 2015, to determine the degree to which current arrangements reflect institutional prescriptions for adaptive governance.
- **2.** Apply the knowledge governance analysis framework created by van Kerkhoff and Pilbeam (2017) to better understand the role of knowledge governance in the governance of inshore small-scale fisheries at the national and local level, and how this is adhered to or not within the FMA (2015).
    - **a.** Apply the framework to national level community-based fisheries management efforts and policy-making (generally centered on actors and decisions in the capital city of Honiara, Solomon Islands).
    - **b.** Apply the framework to local level decision making in Mbili Village, Solomon Islands around small-scale fisheries within their customary boundaries.
- **3.** Suggest theoretical refinements in the relationship between knowledge governance and adaptive governance with evidence from this empirical investigation. Specifically, provide insight into the utility of the knowledge governance framework when conducting an analysis of environmental governance contexts.

4. Propose modifications to van Kerkhoff and Pilbeam's (2017) knowledge governance framework based on my experience and evidence collected from the Solomon Islands case.

1.3 Organization of the Thesis

This thesis is organized into four major sections. The next section provides an in-depth discussion of my theoretical framework, which integrates literature on adaptive governance with research on the value of utilizing multiple types of knowledge. The methodology section introduces the detailed context of the study site and the methods used within this case study approach. Section three includes the results and discussion of the governance analysis. This is followed by a final concluding section summarizing key points, limitations, and future directions for research.

2 THEORETICAL FRAMEWORK

This section provides the theoretical framework for exploring the use of different types of knowledge within the analysis of a case study of adaptive governance. I elaborate on the development of this characteristic of adaptive governance, and introduce a theoretical lens used to guide this layer of the analysis. I explore the potential of this theoretical lens to expose knowledge processes that influence (support, undermine) the emergence of adaptive governance.

2.1 Adaptive Governance & the Recommendation to Include Multiple Types of Knowledge

The recommendation to include multiple types of knowledge in decision making relates closely to the academic discourse on the utility of "traditional" or "local" ecological knowledge (TEK or LEK; LEK used herein) for conservation and resource management. Here I will employ Berkes et al.'s (2000) definition of LEK: "a cumulative body of knowledge, practice, and belief, evolving by adaptive processes and handed down through generations by cultural transmission, and about the relationship of living beings (including humans) with one another and with their environment." The term "LEK" will be used here to focus on the idea that this knowledge is held by long-term local residents of a place, and to avoid the pitfalls of the term "traditional" as seeming to limit local peoples' knowledge to a certain time period (Berkes et al. 2000, Ellen and Harris 2000). Research on LEK is inherently interdisciplinary (Ruddle and Davis 2013), existing at the intersection between research on CBRM (e.g. Govan 2009, Lauer 2017), sustainability science (e.g. Cash et al. 2003), indigenous research (e.g. Simpson 2004), conservation biology (e,g. Gadgil et al. 1993), and SES resilience (e.g. Bohensky and Maru 2011); prominent researchers on the subject have authored papers in more than one of these fields, and have also authored papers in the field of environmental governance (e.g. Agrawal, Berkes, Folke, Ruddle).

Research on LEK originally emerged as a rebuttal to initial assumptions that LEK is inferior to science, which came out of a technocratic, colonial perspective that is severely critiqued by LEK scholars (Agrawal 1995, Tuhiwai Smith 2012). To briefly summarize conclusions from this work, the value of including LEK within decision making is generally motivated by an interest in (1) improving the knowledge base for conservation biology or natural resource management, or (2) indigenous empowerment (Gadgil et al. 1993, Bohensky and Maru

2011). The experiential knowledge of practitioners and indigenous peoples is valued because it can provide highly contextualized information gathered over long periods of time, which can fill gaps in scientific information (Gadgil et al. 1993, Bohensky and Maru 2011). Those interested in empowering indigenous peoples emphasize that in addition to providing useful information, the inclusion of LEK in decision making can provide a means of empowering indigenous peoples (Agrawal 1995, Bohensky and Maru 2011). The importance of incorporating LEK into management decisions is now widely recognized in research on community-based resource management (CBRM) and this has subsequently been infused into recommendations for adaptive governance (Gadgil et al. 1993, Agrawal 1995, Folke et al. 2005, Armitage et al. 2009, Bohensky and Maru 2011, Chaffin et al. 2014). This recommendation comes in alongside the suggestion that science should play an important role in decision making within adaptive governance regimes (Dietz et al. 2003, Folke et al. 2005).

The field of sustainability science promotes the incorporation of science and technology into decision making as a key strategy for achieving sustainable development, and explores the means to achieve this (Cash et al. 2003). Cash et al. (2006) bring this recommendation directly into adaptive governance scholarship, where it fits naturally with the recommendation that experimentation and adaptive management be enabled within governance regimes (Huitema et al. 2009, Chaffin et al. 2014). Recognition of the importance of both science and LEK in adaptive governance is summarized by Armitage et al. (2009, p.101):

> Both expert and non-expert knowledge can play productive and essential roles in problem identification, framing, and analysis. The tendency in most resource management contexts is to emphasize differences in knowledge systems. However, there are substantial contributions to social-ecological understanding, trust-building, and learning.

The inclusion of multiple types of knowledge is clearly indicated as important for the emergence of adaptive governance. A critical examination of this recommendation is therefore necessary on two fronts reminiscent of the conversation within LEK literature. First, because governance research recognizes that the benefits of incorporating multiple types of knowledge may facilitate a transition to adaptive governance, a method of assessing the extent to which this is being achieved is needed. Second, concerns regarding the power dynamics at play when bringing LEK and science together in decisions are closely related to other aspects of adaptive governance,

such as the prescription for inclusive participation, and the broader assumption that "good governance" is an essential aspect of adaptive governance regimes. "Good governance" is concerned with the normative aspects of how governance should be conducted and focuses on issues of social justice (Lockwood 2010). Although the concept arises from governance scholarship beyond environmental concerns (e.g., Weiss 2000), it's relevance to adaptive governance is starting to be debated in environmental governance literature (e.g., Lebel et al. 2006, Lockwood 2010, Chaffin et al. 2014). Lockwood (2010) articulates that governance is "good" when it is legitimate, transparent, accountable, inclusive, fair, connected, and resilient. If "good governance" is indeed important for the emergence and longevity of adaptive governance, the almost inherent link between knowledge and power demands that governance analyses give attention to power dynamics between knowledge holders (e.g. researchers, indigenous peoples).

There has been little previous work to develop a method for giving attention to either of these two concerns within empirical assessments of the emergence of adaptive governance. The concept of knowledge governance, described below, provides a critical lens for analysis that may begin to address each of these concerns by uncovering knowledge processes within a governance regime that present barriers to or catalysts for the incorporation of multiple types of knowledge, and by drawing attention to the norms and social rules within a regime that influence whose knowledge is valued in decision making.

2.2 Knowledge Governance

The few efforts that have been made to bring a more explicit consideration of knowledge processes into adaptive governance research have done so by utilizing research on knowledge co-production (e.g., Wyborn 2015). Research on knowledge co-production has been used to build an analytical framework for examining the use of science in decision making, referred to as "knowledge governance" (van Kerkhoff 2013). Knowledge governance refers to "the formal and informal rules and conventions that shape the ways we conduct or engage in knowledge processes" (van Kerkhoff & Pilbeam 2017). Such processes include knowledge creation, sharing, protection, access, and application (van Kerkhoff & Pilbeam 2017). This creates a shift from viewing knowledge as an input, to knowledge as the subject of governance, giving it the potential to reveal a different dimension of barriers and catalysts to AG emergence than explored in previous studies. Research in knowledge governance operates on the assumption that the rules

that govern these processes shape decisions and action, and that these rules can be manipulated towards defined goals (van Kerkhoff 2013). Knowledge governance and adaptive governance share an interest in the role of collaborative knowledge construction for addressing complex problems, and for reflexivity and learning in the face of the uncertainty (van Kerkhoff 2013).

Research on the governance of knowledge began with an interest in the challenges of connecting science with environmental decision making (Gerritsen, Stuiver, & Termeer 2013, van Kerkhoff & Pilbeam 2017). The concept of knowledge governance has its roots in two separate but related fields, which it intends to bridge: sustainability science, and science and technology studies (STS) (van Kerkhoff & Pilbeam 2017). Sustainability science comes from the normative perspective that science should have a "stronger voice" in decision making and has sought to understand science-society relationships with this goal in mind (van Kerkhoff & Pilbeam 2017). The problem of how to connect scientific knowledge with action is front and center in this field, which explicitly recognizes that using science to spread awareness of an issue is not enough—it must lead to action, but accomplishing this is difficult (van Kerkhoff & Lebel 2006). Cash et al (2003) contributed substantially to this field by suggesting that the extent to which science is accepted by the public is dependent on the extent to which it is perceived as credible, legitimate, and salient. This study and others in this field criticize the linear view of knowledge as something produced by researchers and subsequently brought to action by practitioners, on the grounds that it neglects to notice barriers between knowledge systems that prevent such a simple transfer (Cash et al. 2003, van Kerkhoff & Lebel 2006). Instead, they recommend that researchers engage as active participants in social change and suggest strategies like coproduction—joint knowledge creation between scientists and local actors—to effectively bring science into action (Clark et al. 2016, van Kerkhoff & Pilbeam 2017; Wyborn 2015). In summary, this research recognizes that the availability of science does not necessarily imply that it will be utilized, and provides a means for better integrating science with decision making by restructuring the process by which science is produced. Taking this perspective from knowledge systems research may help to address the first concern mentioned at the end of the previous section—the need for a way to identify the extent to which different types of knowledge are incorporated into decision making. Assessments of whether or not LEK and science are incorporated into decision making can learn from this initial challenge within sustainability science, and utilize the knowledge systems approach subsequently developed to avoid it.

Researchers in STS have similarly focused on the relationship between science and society, but have taken a critical approach, rather than the normative approach of sustainability science (Wyborn 2015). Critical approaches in social science are concerned with power dynamics; STS recognizes science as socially constructed, rather than objective, and questions the assumption that science should be closely tied to decision making processes (van Kerkhoff & Pilbeam 2017). As Jasanoff (2004) puts it, "science and technology are indispensable to the expression and exercise of power…[they] operate, in short, as *political* agents." The concept of civic epistemology was developed by Jasanoff (2005) to examine the social and cultural norms that form underlying patterns of socially-accepted knowledge processes; relating this to science, Jasanoff (2005) writes, "civic epistemology conceptualizes the credibility of science in contemporary political life as a phenomenon to be explained, not to be taken for granted" (p. 250). This has been used to understand such phenomena as how citizens in different countries have received science on climate change, and why citizens do or do not consider it credible (Jasanoff 2005, Jasanoff 2011, van Kerkhoff & Pilbeam 2017). This work is especially relevant in non-Western contexts, where the application of science is intertwined with colonial processes that have damaged local communities, undermined indigenous cultures, and usurped customary authority (Tuhiwai Smith 2012, van Kerkhoff & Pilbeam 2017). Knowledge governance research proposes that seeing knowledge processes as culturally and politically situated in this way has the potential to inform socio-politically sensitive approaches to bringing science to practice in diverse communities (van Kerkhoff & Pilbeam 2017). This is where the knowledge governance approach has potential to contribute to the second concern mentioned above, regarding the need to give attention to power dynamics associated with whose knowledge is incorporated into decision.

There are clear differences in approach and intention between STS and sustainability science research, but the potential for STS to offer insights for sustainability science research has inspired knowledge governance researchers to bring the two together. Van Kerkhoff and Pilbeam (2017) have drawn on both STS and sustainability science concepts to develop a conceptual framework for assessing knowledge governance in a given setting. Knowledge governance is conceptualized as having three nested levels: civic epistemology (what are the deep-seated patterns that structure the governance of knowledge?), knowledge systems (how do institutional arrangements shape the boundary between science and decision making?), and interventions (do

they conform to or challenge existing arrangements?) (van Kerkhoff and Pilbeam 2017). This framework draws from Jasanoff's (2005) concept of civic epistemologies in STS research, and Cash et al.'s (2003) work on knowledge systems in sustainability science. The framework operates through a series of questions about rules, regulations, formal policies, and informal practices that govern the general relationships between knowledge and decision making and their implications for action (van Kerkhoff and Pilbeam 2017). The specific questions used in the framework are further discussed in the methods section of this proposal.

The initial test of this framework by van Kerkhoff and Pilbeam (2017) was done through a case study of Palau, a Pacific nation consisting of a vast range of islands (~500). Like the Solomon Islands, Palau has intact customary systems, but is part of the region of Micronesia, west of Melanesia (van Kerkhoff and Pilbeam 2017). The study looked specifically at the Palau Protected Areas Network (PAN), a group of locally managed protected areas with a supporting "PAN Fund" organization that funds projects that meet a range of requirements based on Western-style, scientific approaches such as monitoring. The study of the PAN led to three general conclusions regarding the usefulness of the framework: (1) the interventions of PAN were reframed as "less about science and decision making, and more about the processes of accommodation and resistance between [customary and globalized] knowledge governance regimes," (p. 35); (2) the approach itself prompted stakeholder reflection on their own institutional settings and on ideas for intervention; and (3) the framework was a useful practical guide to empirical analysis of the site, allowing for a specific focus on the knowledge-based elements of the complex relationship between science and decision making (van Kerkhoff and Pilbeam 2017). The pilot study recommends further tests of the knowledge governance framework in development settings to refine the framework. In this research I test the model proposed by van Kerkhoff and Pilbeam (2017) by using it to address the need to consider knowledge more explicitly within adaptive governance analyses, especially in non-western contexts. To do this, I consider the FMA (2015) as an intervention within inshore fisheries in the Solomon Islands.

2.3 Bringing the Knowledge Governance Lens to an Adaptive Governance Analysis

As recognition of the importance of LEK and other types of knowledge beyond science emerges in governance scholarship, the relationship between these different kinds of knowledge

becomes central to adaptive governance, and the need for a critical approach to assessing governance grows (Rist et al. 2007, Wyborn 2015). As described above, environmental governance scholarship has drawn on past research on CBRM and LEK in order to identify the need for the incorporation of both science and LEK in an adaptive governance regime; there has not, however, been much discussion of how to define and recognize when this element of adaptive governance has emerged, or how to identify associated barriers or catalysts to achieving it in practice. Without a deeper discussion of what it means for this criterion to be met or how this can be achieved, governance scholarship risks making the mistake that the field of sustainability science seeks to avoid—the assumption that simply having knowledge available means it will be used. Perhaps the closest governance research gets to avoiding this is Armitage et al.'s (2009) mention that adaptive governance requires the "openness of participants to share and draw upon a plurality of knowledge systems of sources" (p. 101). Even this, however, does not lend much insight regarding how to get to that point or how to recognize when this has been achieved. The perspective of knowledge systems may help to address the first part of the problem, while the civic epistemologies lens may be able to provide insight into identifying cultural norms that may serve as barriers or catalysts to being able to draw on both types of knowledge.

As discussed, sustainability science recognized that it is not safe to assume that connecting science to decision makers means that knowledge will actually be incorporated into decisions. Researchers in this field incorporated the concept of knowledge systems to reveal that knowledge must be perceived as relevant, salient, and legitimate before it is incorporated into decision making (Cash et al. 2003). Even this, however, failed to account for the STS concept that social and cultural norms shape the social acceptability of knowledge processes, until it was combined with the concept of knowledge systems in the development of the knowledge governance framework. Though this framework is recent, scholars have already been demonstrated that it is useful for uncovering the norms and rules that shape how science is used in decision making and suggested that it be tested in developing countries to reveal relationships between research-based knowledge and environmental and development programs (van Kerkhoff and Pilbeam 2017). Expanding this framework to examine not only science but also LEK makes it possible to add depth to suggestions that the integration of multiple types of knowledge (specifically LEK) are necessary in the emergence and development of adaptive governance. I

attempt this here by adapting van Kerkhoff and Pilbeam's (2017) analytical framework for revealing knowledge governance arrangements for use in an investigation a potential transition to adaptive governance (see Sec. 3.4: *Frameworks for Analysis*). This analysis allows for the improved identification of knowledge-related barriers or catalysts for the emergence of adaptive governance.

3 METHODOLOGY

The approach, methods, and conceptual frameworks I use to realize my research objectives are described in this section, along with a detailed description of the study sites. My approach to this research is a case study, within which I employ data collection methods including policy analysis, semi-structured interviews, and participant observation to address my research questions.

3.1 Approach: Case Study

I chose an analytical case study approach to address my research questions based on its appropriateness for asking the "how" question regarding the relationship between knowledge governance and the emergence of adaptive governance. A case study is defined as an "empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin 2009). An analytical case study involves building empirical evidence that tests a theoretical concept, allowing for generalization to other concrete situations and for developing new research directions (Yin 2009). This context-sensitive approach is useful for investigating the governance changes catalyzed by the Fisheries Management Act (2015) in real time, as it is implemented in the culturally complex setting of the Solomon Islands. It is also useful for detecting the knowledge governance arrangements related to small-scale fisheries governance as this requires a detailed inquiry into how specific individuals and groups interact with science and local ecological knowledge in their everyday work—an investigation of a phenomenon in context using multiple sources of data. I address my first and second research objectives by deploying the adaptive governance and knowledge governance frameworks described below at the national and local level in the Solomon Islands. Empirical evidence gathered in the capital city (national level) and in a rural fishing village (local level) is used to address the third objective of refining the theoretical connection between adaptive governance and knowledge governance. This

evidence is also used to pursue my fourth objective of refining the knowledge governance framework through testing its applicability to small-scale coastal management in a Melanesian PICT. I triangulate my findings through combining the data collection and analysis methods of policy analysis, semi-structured interviews, and participant observation to understand how inshore fisheries governance compares to elements of adaptive governance, and how knowledge is governed within this context. These methods are described in the next section, followed by a more detailed description of the case study location. The results of this analysis provide an empirical contribution to environmental governance and knowledge governance theory and may potentially apply to PICTs and similar contexts in regions other than the Pacific.

3.1.1 Focus for Analysis: The FMA (2015) as a Potential Catalyst for Adaptive Governance

My analysis of the potential emergence of adaptive inshore fisheries governance focuses on the FMA (2015). I selected the Solomon Islands, and the FMA (2015) in particular, because this PICT presents an unusual opportunity to assess the potential for adaptive governance in a context where LEK and western science are both incorporated into inshore fisheries governance (Aswani and Hamilton 2004, Bennett 2012). Evaluating the potential for adaptive governance in this context is especially important because, as with other PICTs, the Solomon Islands is a developing nation with highly resource-dependent communities, and is likely to feel the negative impacts of climate change in the near future—it is imperative that actors find ways to govern their resources to adapt to these changes (Green et al. 2006, Schwarz et al. 2011).

My preliminary analysis indicated that this new Act may reflect some key elements of adaptive governance. Specifically, the Act contains a provision for local communities to submit plans to the government that detail local rules for fisheries management; if these plans are approved, these rules gain the status of by-laws enforceable by national police and the national court system (s.18). In addition, this Act fits within a broader movement towards CBRM in the Pacific resulting from recognition that centralized systems have failed (Aswani et al. 2007, Aswani and Sabetian 2009), but is unique as one of few instances where this approach is incorporated directly into national policy in a PICT. The CBRM approach and its recognition within national policy represents a potential opportunity for adaptive governance to emerge, as it appears to reflect some of the key elements needed for this to occur. Among these elements are inclusive participation in decision making, polycentric decision making arrangements, and

perhaps improved bioregional fit, among others. These elements are investigated in depth in the AG portion of the analysis.

In addition to potentially reflecting some elements of AG, the FMA (2015) fits within the broader context of a hybrid inshore fisheries governance system where both formal, western-style government, and long-standing, customary tenure systems are present. As discussed in *Situating the FMA (2015),* the Solomon Islands provide a rich cultural context where LEK is prevalent at the local scale and acknowledged, alongside western science, at the national scale. This provides an opportunity to test the KG framework within a broader AG analysis in a place where it is especially important to ensure that the different knowledges available are drawn on and be attentive to the power dynamics about which types of knowledge (and which knowledge-holders) are included in decision making processes. By bringing the knowledge governance lens into an AG analysis of this SES, I aim to contribute to a better understanding of what culturally-aware suggestions for adaptive governance might look like in this context.

3.2 Methods

This section describes the specific methods of data collection used within the case study approach.

3.2.1 Policy analysis

I conducted a policy analysis of two recently passed Acts of Parliament in order to assess the extent to which current transitions in governance reflect elements of adaptive governance and to investigate knowledge governance arrangements at the national scale. I focused primarily on the Fisheries Management Act (2015), as this is central to the case study, but also analyzed the Protected Areas Act (2010) because it is an important component of the context in which the FMA (2015) was developed. These Acts contain complementary provisions that allow NGOs and community members to designate their conservation or tenure areas as nationally recognized protected areas via the PAA (2010) or fisheries management areas via the FMA (2015). Nationally recognized protected areas are intended for areas of national significance, while marine managed areas are generally for giving legal backing to areas already actively managed

by local residents.[2] I used deductive coding to examine the extent to which marine resource laws speak to the concepts of adaptive governance and knowledge governance (guided by Table 1 and Table 2).

3.2.2 Semi-structured interviews & participant observation

Semi-structured interviews and participant observation were employed as part of a triangulation strategy, which tests the validity of the data by drawing on multiple sources to see if results conflict with one another (Creswell 2007). The questions and key themes within the adaptive governance and knowledge governance frameworks were explored through semi-structured interviews at the national and local level. At both levels I used purposive and snowball sampling techniques to select study participants.

National level interviewees were selected based on their significant engagement with community-based resource management, and who have engaged with creating or implementing the FMA (2015), or who were familiar with the Act and had experience with its counterpart, the PAA 2010). I defined significant engagement as hands-on experience working directly with local communities on the development of management plans, often, but not always, for submission under the PAA (2010) or FMA (2015). Initial participants were selected based on recommendations from key informants; these informants included two researchers with extensive academic and professional experience in the Solomon Islands and one MFMR professional member. Subsequent participants were identified through snowball sampling from recommendations by the first five participants; this method is used to identify hard to reach or hidden populations of people (Salganik and Heckathorn 2004). These initial participants were asked to suggest individuals who had a key role in the Act, as well as individuals who were likely to hold a perspective substantially different from their own. The national level participants were primarily government professionals and NGO professionals interviewed in-person in Honiara over a two-week period. There were five national-level interviewees that were not based in Honiara: three researchers and one NGO professional were based in Australia, and one lawyer (policy-maker) was based in Rome. These interviews were conducted via phone or Skype, except for one in-person interview with a researcher who was based in Canberra.

[2] Information from interviews with government and NGO professionals at the national level.

Local level interviews were conducted during the nine weeks I spent on Turupu Island near Mbili village. The majority of interviews were done during the final four weeks of my stay, allowing participants to first become familiar with me, and allowing me to better understand islander's pijin and their accent when speaking English. As with the national level, I relied on key informants and selected local level participants using purposive and snowball sampling. The key informants included the village pastor and two rangers—rangers are locals who have been trained in basic ecological concepts and resource monitoring techniques, usually by NGOs working in the provinces.[3] A workshop on the process for submitting a plan under the FMA (2015) was conducted by government professionals a week before my arrival. I selected participants based on their likelihood of being highly involved, likely as a committee member, in the process of submitting a plan under the FMA (2015) if the community should choose to do so. To do this I considered a combination of factors: (1) their participation in the workshop[4] on the FMA (2015); (2) a high level engagement with fishing activities; and (3) their position of leadership within the community. All participants met at least two of these criteria.

I supplemented interviews with participant observation at the local level. This method allows for real-world observations that allows for otherwise inaccessible opportunities for data collection and can allow for more of an "insider" perspective (Yin 2014). In this case study I used informal observations of fishing behavior and informal conversations with residents during fieldwork. I lightly participated marine management and everyday life by living in one of the village satellite communities for 9 weeks and through volunteering on the local pastor's coral farming project. The project was funded by the United Nations Development Program (UNDP) Small Grants Program. I volunteered three to four days a week to help with the creation of small coral farms, which were located at six different sites throughout Marovo Lagoon. I assisted with writing up project progress and site descriptions based on interviews with owners of these sites in addition to helping with the collection and placement of coral on small trestles in shallow areas. I wrote memos about relevant events and conversations. The challenge of participant observation is the potential for biases produced through my involvement in events, with participants potentially changing their behavior due to being observed (Yin 2014, Babbie 2016).

[3] Information mentioned in several interviews with government and NGO professionals at the national level.
[4] One participant had attended a different workshop on similar fisheries management topics; I decided to include this because the participant was able to reflect on the value of science and LEK despite being less familiar with the FMA (2015) itself.

This is especially a risk in this situation, where my ethnicity and race drew attention and likely influenced behavior. To mitigate this, I reflected frequently on my role, noting in memos where I might have influenced data. I also emphasized confidentiality in conversations and did not take an enforcement position regarding a nearby protected area, which I could have done by reporting activities to the island owner or the manager of the lodge where I stayed. Additionally, I generally did not place myself in prominent roles (e.g. assisting the pastor with his project instead of leading project coordination or management). In all cases I sought to do ethical research by being clear about my role as a researcher and the intentions of my project (Babbie 2016). Some evidence that this was effective were study participants frequently confiding in me regarding opinions on other residents that they knew I was connected to; residents also frequently broke the protected area rules while I was present but the customary leader responsible for the protected area was absent.

Data collected during interviews and participant observation was first coded deductively for evidence of the presence of elements of adaptive governance and knowledge governance using guidance outlined in Tables 1 and 2 respectively, and then coded inductively to detect other concepts or negative cases. Negative case testing involves drawing an initial hypothesis from the data, then revisiting the data to detect any instances where this hypothesis is contradicted, and revise conclusions as necessary (Babbie 2016). Results from this analysis are used to address my first four objectives: to consider the extent to which elements of adaptive governance are present, to consider how the knowledge governance framework can be improved, to build theory on the relationship between knowledge governance and the emergence of adaptive governance, and to suggest revisions to the knowledge governance framework itself. These frameworks will be described in more detail following the below description of the study location and context.

3.3 Building Context

3.3.1 Welkam to Solomon Islands

The Solomon Islands are a part of the Melanesian region and sit just northeast of Australia. The islands rank sixth in the world for biocultural diversity (Cohen et al. 2015). The variety of species found in the rainforests, mangroves, and reefs of this region is rivaled only by the diversity of cultures and languages (~120) that characterize the communities of this Pacific

Island Nation (PIN) (PacLII (2001), Green et al. 2006, Cohen et al. 2015). The impacts of climate change on islands in this region include rising sea levels, ocean acidification, and an increasing frequency of destructive cyclones (Green et al. 2006, Carpenter et al. 2008). At the same time, processes of globalization and the growth of a market-based economy in the Pacific catalyze extractive industries like logging and offshore fishing, which are leading to unsustainable land use and overexploitation of fisheries and other resources (Macintyre and Foale 2004, Albert et al. 2014, Jupiter et al. 2014).

3.3.1.1 Ecological Context

A marine survey of the Solomon Islands conducted by The Nature Conservancy (TNC) in 2004 revealed 485 known coral species, and an additional nine that were unknown to coral experts (Green et al. 2006). The surveyors also recorded ten species of seagrass (representing 80% of the known species in the region) and 1,019 fish species. Collectively, this survey demonstrated the extremely high biodiversity of the archipelago, earning it the designation of belonging to the Coral Triangle, the global center of marine diversity (Green et al. 2006). The Solomon Islands are now the bottom right corner of the triangle, which stretches up to the Philippines and west across the Southeast Pacific to Indonesia (Green et al. 2006, Veron et al. 2009). Unlike other areas of the Coral Triangle, the reefs and marine ecosystems of the Solomon Islands are relatively intact (Roberts et al. 2002, Lovell et al. 2004).

Despite the current health of these ecosystems, concerns are being raised about their future. The Solomon Islands is a young nation that gained its independence from Britain in 1978, and it is now growing swiftly. The population growth rate in the country is 2.3%, with more than half of the current population under the age of 25 (Asian Development Bank (ADB) 2014). Estimates of the sustainable production capacity for country's coastal fisheries hover between 11,150 tons to 13,800 tons, but the annual catch required to ensure the protein needs of Solomon Islanders are met is estimated at 18,000 tons, and is expected to increase to 29,900 tons by 2030 (ADB 2014). It is therefore likely that overfishing is beginning to occur; declines in the catch rates of parrot fish, sea cucumber, and giant clams have already been detected, primarily as a result of increasing use of technology by fishers (Sabetian and Foale 2006, ADB 2014).

3.3.1.2 Governance Actors

The Solomon Islands is a parliamentary democracy under a constitutional monarchy (Queen Elizabeth II), and follows English common law. The country is part of the Commonwealth as a result of its previous status as a United Kingdom protectorate; the nation gained independence in 1978. The official languages of the country are Melanesian pidgin and English, with approximately 120 indigenous languages spoken across the archipelago (PacLII 2001). The Ministry of Fisheries and Marine Resources (MFMR) is the formal government body given responsibility for the management of inshore fisheries. The Fisheries Management Act (1998) gives the nine provincial governments primary responsibility for the management of reef, inshore, and freshwater fisheries, but this is supported by MFMR; the Fisheries Management Act (2015) upheld this allocation of responsibility. Responsibility for formally registered locally managed marine managed areas (LMMAs) falls under the jurisdiction of MFMR, while responsibility for marine protected areas (MPAs) is split between MFMR and the Ministry of Environment, Climate Change, and Disaster Management (MECCDM), depending on the purpose of the MPA. MPAs designed to conserve overall biodiversity fall under the jurisdiction of the MECCDM, while those focused on the management or protection of specific species fall under the jurisdiction of MFMR. Within the MFMR, and under the influence of regional collaborations like the Coral Triangle Initiative (see Sec.: 3.3.2.4), a new Community-Based Resource Management (CBRM) unit has been developed in the last five years; this unit will be responsible for processing applications for LMMAs and MPAs.[5]

The combination of relative ecological health with rapidly changing fishing practices and the growth of the fishing industry has spurred a wave of conservation efforts in the style of what might be called "last best place" conservation, meaning that the interests of environmental nongovernmental organizations (NGOs) are motivated by a desire to preserve a place because it is still healthy, rather than by a need to restore an area that has been lost (Green et al. 2006). A wide array of NGOs, including TNC, World Wildlife Fund (WWF), Conservation International (CI), and The WorldFish Center (WFC), have entered the Solomon Islands with the intention of seeing to it that the biodiversity and local livelihoods of this unique country are not lost (Green et al. 2006, Walter and Hamilton 2014). In doing so, these NGOs have met with existing customary systems of resource management, and seem to be in the process of learning to take a community-based approach that is tailored to these existing management practices (Govan et al. 2011, Goby

[5] Information from interviews with government and NGO professionals at the national level.

et al. 2012, Walter and Hamilton 2014). These actors have become a critical part of inshore fisheries and environmental governance overall in the Solomon Islands, providing a capacity for on-the-ground work that the government currently lacks.[6]

While the government has formal responsibility for marine management, and the NGOs provide capacity for implementation through informal and formal partnership arrangements, inshore fisheries and coastal areas are owned by tribes at the local level. This ownership operates through long-standing customary marine tenure systems (CMT) and is formally recognized in the Solomon Island Constitution (1978). The next section provides a closer look at these systems and their relevance to marine management.

3.3.1.3 Customary Marine Tenure Systems

In 1978, well-known tropical marine biologist Robert Johannes wrote a seminal piece describing traditional Oceania resource management methods, and predicted their imminent demise. He opens his piece with a heavy heart:

> The following is an account of the rise and decline of a millennia-old system of controlled exploitation of marine resources that incorporates a wisdom Westerners are only now beginning to appreciate after having brought about its widespread decay. (Johannes 1978, p. 349)

Johannes (1978) blamed this decay on the introduction of money economies, the breakdown of traditional authority, and the imposition of new laws by colonial powers. To the surprise of many, including Johannes himself, these customary systems survived a tumultuous journey of colonization and decolonization and are still in existence today (Johannes 2002, Aswani 2011). Johannes returned to the Pacific more than twenty years after his initial study and found many systems still intact, which he suggests is the result of local people recognizing the decline of their resources, growing cultural pride, and national independence leading to laws that back customary systems (2002). This holds true for the Solomon Islands, where the vast majority of land is held in customary ownership, and land ownership can only be held by Solomon Island citizens (Solomon Islands Constitution XI, 110; see also Lam 1998).

[6] Information from interviews with government and NGO professionals at the national level.

Johannes (1978) and others (e.g. Aswani et al. 2007) have argued that customary practices in many ways reflect adaptive characteristics useful for conserving and sustaining resources, while others have cautioned that these systems have not been under enough pressure or shocks to be able to detect if they are truly adaptive, and that in fact these systems are more oriented around maintaining social relationships (see Foale et al. 2011). Regardless, more recent research and personal observation indicate that the strength of these systems vary substantially across the archipelago, with some communities exhibiting the signs of decay that Johannes feared would come (e.g. Schwarz et al. 2011's discuss the erosion of social cohesion). This phenomenon, and its clash with NGOs, has generated a large body of academic and grey literature on the topics of customary marine tenure (CMT), NGO strategies for community-based resource management (CBRM), and the challenges and lessons learned from bringing the two together (e.g. Hviding and Baines 1994, Foale et al. 2011, Goby et al 2012, Walter and Hamilton 2014).

Many NGOs did not anticipate the complexity that customary systems add when doing conservation work in this context (i.e. conflicts that arise between biodiversity and livelihood priorities), leading to several initial failed attempts at CBRM efforts by NGOs (Walter and Hamilton 2014). This has led to documentation of lessons learned (e.g. Alexander et al. 2011), and a general desire by NGOs to share these lessons amongst national level governance actors.[7] These customary systems and history of NGO involvement set the context into which the FMA (2015) entered. The lessons learned from CBRM and the role of NGOs in implementing these types of projects are critical context for understanding interview responses to questions about the FMA (2015); this comes up in the *Experimentation and Learning* section and elsewhere in the results of this study.

3.3.2 Situating the FMA (2015): Political and Legal Context for the Act

3.3.2.1 Local Courts, Customary Law, & English Common Law

The Solomon Islands Government exists at the intersection of customary Melanesian systems of governance and the British-style, parliamentary democracy system. This means that the Constitution and other national policies must navigate between these systems, which includes

[7] Reflections from several NGO interviews at the national level.

identifying whether English Common Law or the customary system dominates when there is a conflict between the two. This is the case across the Pacific region, and each PICT reconciles the differences between these systems in their own way (Pulea 1993). In the Solomon Islands, the Constitution states that the principles of common law and equity apply, except in the following situations: "a) they are inconsistent with this constitution or any Act of Parliament, b) they are not appropriate to the circumstances of Solomon Islands from time to time, or c) in their application to any particular matter, they are inconsistent with customary law applying in respect of that matter" (Constitution, Schedule 3, (2)(1)(a-c)). Thus, customary law comes before common law in the Solomon Islands, with the Constitution having supremacy over both (Pulea 1993). Although this is established, it can be difficult to navigate in practice because customary systems are by nature unwritten; Parliament is given responsibility for providing for the ways in which customary law must be recognized (Pulea 1993). At the local level, the Local Courts Act authorizes customary courts to hear claims related to customary law and to resolve disputes over customary land. Court justices do not need to be legally trained but must be knowledgeable in customary law (Pulea 1993); in the east part of Marovo Lagoon, residents indicated that the courts were made up of local chiefs. The extent to which these courts engage in marine resource disputes appears to be relatively undocumented, although one study found that the courts have been used to deal with disputes over the distribution of baitfish royalties paid by tuna boats (Ruddle et al. 1992).

3.3.2.2 Previous Fisheries Acts & Relevant Changes in 2015

There have been two national fisheries acts prior to the FMA (2015), the first passed in 1972 and the second passed in 1998. According to Pulea (1993), the FMA (1972) did not make any reference to the preservation of fishing rights by Solomon Islanders nor did it recognize customary rights, instead leaving this to other Acts (e.g. the Provincial Government Act 1981). The FMA (1998) does recognize customary rights explicitly, but they are mainly mentioned in regard to commercial fishing; the Act ensures that commercial vessels that violate customary fishing rights can be ordered to pay compensation to the rights-holders by the courts (Part 2, s.12). Customary rights are also briefly mentioned in a section about the development of fisheries management plans by the Director, who must consult with relevant customary rights holders, and

in a section that states that provincial ordinances can provide for the registration of customary fishing rights and their boundaries.

The new FMA (2015) repeals and replaces the FMA (1998). This Act was developed over the course of a decade. The development process was delayed by changes in leadership, but ultimately was passed after pressure was applied from the European Union to improve tuna fisheries practices. The process ultimately included consultations with foreign researchers with extensive experience in the Solomon Islands, and with government and NGO professionals; most meetings and consultations were held in the final years of the Act's development (~2012-2014).

The new Act appears to build on the recognition of customary rights that was introduced in the FMA (1998). The recognition of customary rights and the requirement for commercial fishers to pay compensation if they are violated is retained in the new Act under Section 21. A novel feature of the FMA (2015), and the focus of this study, is the introduction of fisheries management plans that can be initiated by or on behalf of local communities, rather than just by the Director, as a means of providing local communities access to the use of formal government enforcement (s.18). The Director can still initiate plans at the local, provincial, or national level, in consultation with customary owners and the provincial government as appropriate, but is no longer the only person who can do so (FMA (2015) s.17). The requirements for the content of fisheries management plans are the same for plans initiated by the Director or by communities (FMA (2015) s.17-18 & Second Schedule), and are much more detailed than in the FMA (1998, s.8). The new Act requires more detailed information about the habitat relevant to the fishery under consideration, and unlike the previous Act it additionally requires information about the process for how the management plans will be enforced and monitored.

3.3.2.3 Other Relevant Policies, Acts & Ordinances

The following Acts and ordinances were occasionally mentioned in interviews and provide additional context for understanding the context of the FMA (2015). They are briefly described here primarily in regard to how they relate to the FMA (2015).

Provincial Government Act (1997)

This Act designated the jurisdictions (including marine) and administration of the nine provinces. This act aligns with the Constitution in recognizing customary rights (s.3(7)). These

provinces are in turn given primary responsibility for the development and management of the fisheries in their waters under the FMA (2015).

Western Province Provincial Fisheries Ordinance (2011)

This ordinance established a process for registering marine areas at the provincial level using management plans, which is similar in principle to Section 18 in the FMA (2015). Either environmental NGOs or "customary groups" can apply for an area to be declared as a marine protected area (s.28 (2)). Some of the same stakeholders (e.g. NGOs, researchers) were involved in the development of both this ordinance and the FMA (2015).

Protected Areas Act (2010)

The Protected Areas Act (PAA) (2010) was in development at the same time as the FMA (2015). According to government and NGO participants they were not intentionally designed to complement each other, but some attention was given to clarifying the role of the FMA (2015) versus the PAA (2010) both before and after it was passed. Like the FMA (2015), the PAA (2010) allows for communities or NGOs to submit management plans for approval at the national level; if approved, the plans gain the status of by-law. The PAA (2010) applies to both terrestrial and marine areas, whereas the FMA (2015) applies only to marine resources and to fisheries in particular (rather than the broader habitat, although that must be acknowledge in the plans). This was still a point of confusion amongst participants, and some clarification was provided during interviews with government professionals. The differences as described in interviews are discussed below.

The FMA (2015) is focused on strengthening enforcement for rules around resource use, while the PAA (2010) aims to protect areas with biodiversity of national significance. The PAA (2010) is focused on habitat protection, while the FMA (2010) is focused on the enforcement of local rules. Both acts seem to have potential to be effective against foreign industry interests, but perhaps not against infringements by local residents. By adding the FMA (2015) alongside the PAA (2010), communities that may not possess areas of national biodiversity significance will now have a means of protecting their marine (but not terrestrial) areas from extractive industry. Several participants directly compared the FMA (2015) to the PAA (2010), the latter of which they found to have an arduous registration process for protected areas that similarly involves the

submission of local level management plans. Participants mentioned that submitting management plans under the PAA (2010) often took many iterations, with the first protected area finally declared in 2017, seven years after the act was passed and an initial plan was first submitted. Many were concerned that the same difficulties of submission would occur with the FMA (2015), and that even if there was success, there would be little means for the government to actually enforce rules.

National Strategy for the Management of Inshore Fisheries and Marine Resources 2010-12

This policy describes the vision and principles for meeting "national and international obligations towards sustainable management and utilization of inshore resources." It is intended as a 'living document' with a two-year review process, but this seems to be the most recent iteration of the strategy. One of the five "pillars" for achieving the vision of "sustainable and secure inshore fisheries and aquatic resources by 2020" is CBRM. The strategy emphasizes a "people-centered" approach to fisheries management, and "recognizes that community-based initiatives will be the driving force of sustainable economic development in the inshore marine resource sector." The development of community-based management plans and promoting livelihood diversification are two main strategies set forth under the CBRM pillar. The content of this strategy suggests an enabling environment for the creation of the provision for community-driven plans in the FMA (2015).

3.3.2.4 Relevant International Conventions, Initiatives, and Agreements

Coral Triangle Initiative & National Plan of Action

The Coral Triangle Initiative on Coral Reefs, Fisheries, and Food Security (CTI) is a multi-lateral partnership formed in 2007 between the governments of Indonesia, Malaysia, Papua New Guinea, the Philippines, Solomon Islands, and Timore-Leste. The partnership was developed to address shared issues such as food security, climate change, and marine biodiversity (CTI-CFF 2018). Each country involved in the initiative has its own "National Plan of Action" (NPOA) to meet agreed upon objectives. The Solomon Islands NPOA aims to have "50% of Solomon Island coastal, watershed, and inshore area under improved management through CBRM and [Integrated Coastal Management] approaches by 2015. It seeks to achieve this by making CBRM as the "core" of its national strategy to "deliver food security, adaptive

capacity (climate change and other pressures), conservation of target or threatened species and habitats." The plan outlines the intention to establish a system of CBRM appropriate to Solomon Islands, including long term support systems at the national and provincial level. This sets the stage for the FMA (2015) and links it to the regional concerns expressed through the CTI partnership.

Convention on International Trade in Endangered Species

The Solomon Islands have been party to the Convention on International Trade in Endangered Species (CITES) since 2007. The Wildlife Protection and Management Act (2017) was passed to enable the government to fully implement the requirements of CITES. However, marine species were covered in the FMA (2015) in regard to the import and export of live fish (Part 7 (59)(5)). At the local level there does not seem to be any explicit connection between CITES and the creation of community management plans, although this might come into play if endangered species like turtle or dugong were addressed in the plan. The plans under the FMA (2015) are primarily focused on fisheries, whereas the plans under the PAA (2010) are more concerned with biodiversity significance; this seems like the more likely place for CITES to interact with local level governance.

United Nations Declaration on the Rights of Indigenous Peoples

In 2007 the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP) was adopted by the General Assembly to affirm the equality and rights of indigenous peoples in response to a history of injustice towards these peoples (General Assembly 2008). Although the Solomon Islands was absent for this adoption, and is yet to endorse the UNDRIP (Cultural Survival 2015), some of the principles of the declaration are reflected in both the Solomon Islands Constitution (1978) and the FMA (2015). Both policies recognize the customary rights of indigenous people to possess and manage their land. However, while indigenous rights organizations like Cultural Survival praise the Solomon Islands Government for this acknowledgment, they criticize the government for being lax about protecting these rights in some instances, such as allowing extractive industries like logging without consent from local peoples (Cultural Survival 2015). The government's response to this criticism remains to be seen, but has potential to influence the implementation of the FMA (2015) and other natural

resource policies given the close tie between indigenous rights and natural resource management in this context.

3.3.3 Specific Study Sites:

3.3.3.1 National Level Site: Honiara

Honiara is the capitol city of the Solomon Islands, located in the Guadalcanal Province. It has a population of approximately 65,000 and is the only city in the country with a population greater than 10,000 (SIG Census 2009). The Ministry of Fisheries and Marine Resources (MFMR) and the Ministry of Environment, Climate Change, and Disaster Management (MECCDM) are both housed within the city. This is also where the national offices for all of the major international environmental NGOs operating in the country, including WorldFish, World Wildlife Fund (WWF), and The Nature Conservancy (TNC), along with the only locally-based NGO, the Solomon Islands Community Conservation Partnership (SICCP). The development of the national Fisheries Management Act (2015) took place in Honiara, led by the MFMR and involving consultations with NGO professionals.

3.3.3.2 Local Level Site: Marovo Lagoon, Western Province

The Western Province has a population of approximately 77,000, making it the third most populated of the nine provinces (SIG Census 2009). Marovo Lagoon is a 750 km^2 expanse of inshore sea protected by a double barrier reef in the Northeast part of the Western Province of the Solomon Islands (Albert et al. 2014). This lagoon follows the coasts of three volcanic islands, and is home to approximately 10,000 Solomon Islanders that speak five different languages (Hviding & Baines 1994). A relatively intact traditional system of marine tenure operates in some parts of the region, in which ownership and resource rights are determined based on connection to local kinship groups (Hviding & Baines 1994). The coral species of the lagoon were surveyed during a nation-wide assessment by TNC, and were found to be amongst the most biodiverse in the world (Green et al. 2006). Though parts of the lagoon at one point suffered from sedimentation as the result of logging in adjacent watersheds, cessation of logging has led to the recovery of reef health in some areas, but not all (Albert et al. 2014).

My research was conducted in Mbili Village, located near Bunikalo, the first ferry port arrived at when coming from Honiara. Mbili is a small fishing village in the Southeast portion of

Marovo Lagoon with a local governance system consisting of a community chair and leadership committee, though the chief is still part of the community and appears to be responsible for assisting with the settlement of tenure area disputes. Many villages in the Solomon Islands are in a period of transition from the chief having authority to local committees with democratically selected chairs; though Melanesian chiefly systems always been more collective and less hierarchical than the structures characteristic of Polynesia, these systems seem to be dissolving in favor of more democratic approaches to governance. The satellite "villages" (consisting of one family and their extended relatives) in Figure 1 are Tibarra (1A), home to the chief's family, and Turupu (1B), owned by family that paid compensation to the chief in order to obtain ownership (an apparently unusual mechanism for obtaining customary tenure rights in the Western Province). I spent nine weeks at a small lodge located on Turupu and conducted interviews with fishermen and village leaders in Mbili and on Tibarra and Turupu. To integrate with the village I participated in Mbili village activities including occasional attendance the Seventh Day Adventist (SDA) church and some participation in daily volleyball practice sessions.

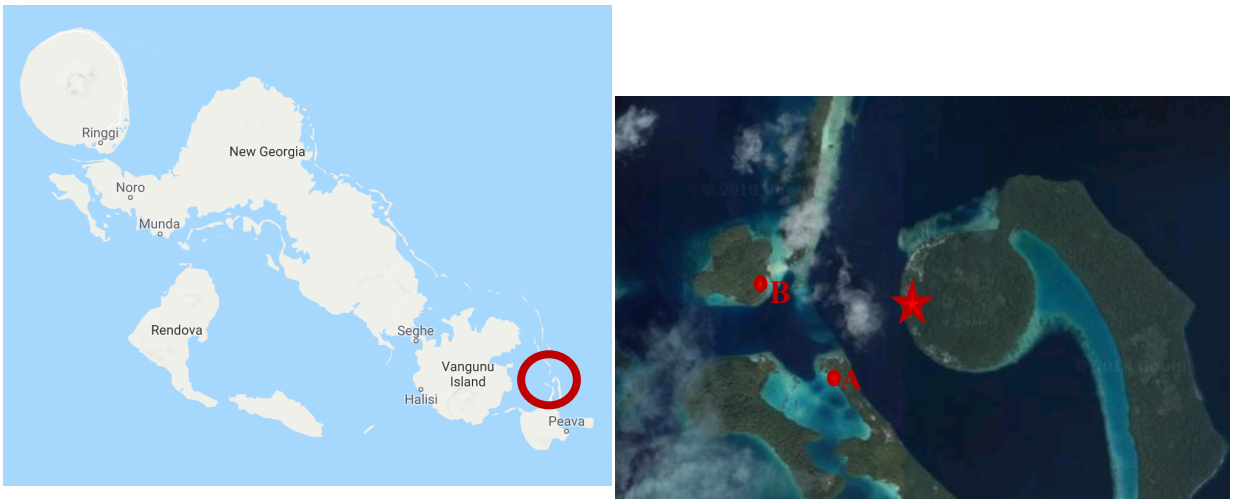

Figure 2. Location of study site within Marovo Lagoon, Western Province. Marovo Lagoon is the entire area between Vangunu Island and the barrier reefs on the East side of the map; this lagoon also stretches several hundred kilometers further north (750km^2 area). Local level interviews were conducted at Mbili village (red star) and two satellite villages (red dots), Tibarra (A) and Turupu (B).

3.4 Frameworks for Data Analysis

Initially, I adapted a conceptual framework for identifying elements of the emergence of adaptive governance primarily from the principles outlined by Huitema et al. (2009) and Chaffin et al. (2014), but also augmented with some criteria identified from the broader body of adaptive governance literature. The conceptual framework I use to describe knowledge governance arrangements is based on van Kerkhoff and Pilbeam (2017), but has been modified in two general ways: (1) I expanded the framework to investigate how local knowledge, in addition to science, is governed; (2) I also tailored toward examining the governance of knowledge in policy and policy-making processes, which differs slightly from its original use for application to conservation interventions.

3.4.1 Identifying Characteristics of Adaptive Governance

To identify the emergence of adaptive governance I adapted a framework based on criteria described in key studies of adaptive governance (Table 1). This framework was used to guide the policy analysis and interview analysis described later in this section. This framework allows me to characterize governance arrangements in a "snapshot" at a single point in time based on qualitative data collected through semi-structured interviews and document analysis. The key characteristics identified include: bioregional fit, clear boundaries, nested polycentricity, enforcement and conflict resolution, inclusive participation, leadership, experimentation and learning, and the inclusion of multiple types of knowledge. The suggestions for clear boundaries and for enforcement and conflict resolution were recently proposed as "candidate" institutional design principles that need further testing. The recommendation for well-defined boundaries is motivated by the sense that this can helpfully clarify legal and institutional jurisdictions (De Caro et al. 2017). However, research in CMT suggests that there may be benefits to having fuzzier boundaries because this allows tenure holders to be more flexible in Pacific contexts—the pros and cons of clarifying boundaries are discussed further in *Elements of Adaptive Governance.*

Table 1. Framework for analyzing adaptive governance arrangements.

AG Characteristics	Description
Bioregional Fit (Huitema et al. 2009)	•Do political jurisdictions mirror or align closely with ecological boundaries? •Do nested governance jurisdictions resemble nested ecological boundaries?

Experimentation and Learning (Huitema et al. 2009, Folke et al. 2005)	•Are AM processes enabled or supported? •Is experimentation and failure acceptable?
Inclusive Participation (Huitema et al. 2009, De Caro et al. 2017 citing Ostrom (1990, 2010))	•Do individual participants have a high level of access to decision making processes/venues?; do they influence decisions? •Are participants representative of relevant stakeholder groups? •What groups/interests lack capacity to be at the table?
Inclusive of multiple types of knowledge (Armitage et al. 2009)	•Can both expert and non-expert knowledge play productive and essential roles in problem identification, framing, and analysis?
Nested Polycentricity (Huitema et al. 2009, Folke et al. 2005)	•Are legitimate decisions made in multiple locations? •Are decisions are made at different levels depending on relevance to each level (with some overlap and ideally some coordination)? •Regional and national policy supports collaborative management (Armitage et al. 2009)
Well-defined boundaries (De Caro et al. 2017 citing Ostrom (1990, 2010))	•political, institutional, eco boundaries well defined so that legal and institutional jurisdiction is clear
Internal and external enforcement and conflict resolution (De Caro et al. 2017 citing Ostrom (1990, 2010))	•In addition to external monitoring, enforcement, and conflict resolution, are there also internal mechanisms within a locality that can be leveraged before seeking external help?
Leadership	•Key leaders to "champion" process (Armitage et al 2009) •Empathetic leaders (Gosnell et al. 2017)

3.4.2 Characterizing Knowledge Governance

Van Kerkhoff and Pilbeam's (2017) framework for assessing knowledge governance in a given context consists of three nested layers: civic epistemology, knowledge systems, and interventions (Figure 2). This was developed to investigate the role of science in decision making but has been tested in a context where LEK is also prominent; here I adjust the framework to explicitly address both science and LEK. The layer of civic epistemology draws on STS studies and its representation as the broadest layer reflects the idea that epistemology underlies all knowledge processes that occur during a given intervention (i.e., a conservation

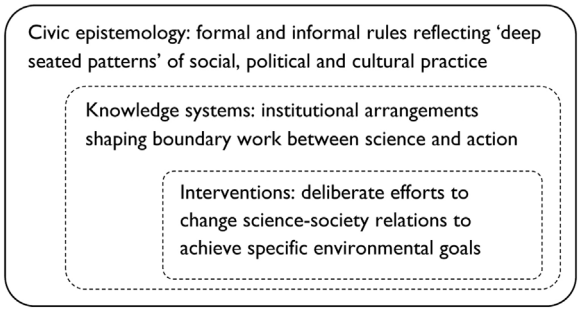

Figure 1. Three-layer conceptual framework of knowledge governance as described by van Kerkhoff and Pilbeam (2017).

project or policy). The middle knowledge systems layer draws on sustainability science and focuses on the institutions in place that shape the role of science during an intervention. A knowledge system is defined as "a network of actors connected by social relationships, formal or informal, that dynamically combined knowing, doing, and learning to bring about specific actions for sustainable development" (van Kerkhoff and Szlezak 2016). In other words, these actors mediate the relationship between science and action, and this layer looks at the institutional arrangements through which they do that. The final layer focuses specifically on the intervention at hand and examines the extent to which it accommodates or challenges existing knowledge governance arrangements (van Kerkhoff & Pilbeam 2017). The framework also includes specific questions to assess how each layer plays out in a given context. This original framework is provided in Appendix A.

The questions posed within this framework required some revisions in order to adapt the framework to investigate the governance of multiple types of knowledge during decision making in the development and initial implementation of the Fisheries Management Act (2015). The revised framework presented below was initially developed during an 8-week fellowship at the Australian National University, during which I was mentored by Dr. van Kerkhoff. The framework is organized with themes on the left related to civic epistemologies and then knowledge systems. These themes are defined in the second column, while the third column considers the FMA (2015) policy as an intervention and includes questions used to analyze how the Act aligns or does not align with existing knowledge governance arrangements.

Table 2. Key themes derived from Van Kerkhoff & Pilbeam (2017).

Themes	**Description and application of themes**	**Intervention: How does the FMA policy conform or challenge existing arrangements?**
Civic Epistemologies		
Dominant style of knowledge making	Defines who has public endorsement to generate accepted knowledge on certain issues. The dominant methods for information to become knowledge and generate action?	What information is required and accepted into the management plans? How is this information likely to be generated and by whom?
Public accountability	How knowledge is tested, and in so doing, deemed credible and trustworthy.	What government standards are set for evaluating whether or not a plan is working or needs to be reviewed?

Effectiveness	How the benefits or outcomes of knowledge are demonstrated to the wider public.	What counts as effective? How will the impacts of plans be shared? What part of the plans will be dedicated to showing effectiveness?
Objectivity	How knowledge claims seek to appear objective. Jasanoff construes this as a fairness issue in that it seeks to avoid subjective bias.	What knowledge claims will be needed in the plans? Do they need to be objective, or are perceptions valued? How is fairness understood?
Expertise	Expertise is largely ascribed through unwritten cultural rules. Considers how experts are identified, and whether their status as experts is held personally or institutionally.	Do plans need expert guidance? Is this stated formally or implied informally? Who can submit a plan in practice? Who must be consulted for their expertise during the plan development?
Transparency	Institutional mechanisms for permitting public observation and in turn, participation in decision making processes.	Who is required to participate in plan development? Why? Who must be aware of the plans before and after they are submitted/gazetted? Who CAN participate, not just required to?
Knowledge Systems		
Credibility	The kinds of knowledge (and who it belongs to) that tend to be most readily accepted by decision-makers. Considers the role of participation in supporting credibility, and what kinds of knowledge have a role in formal accountability processes. Questions whether there are different forms of expertise, and how and why these come together or are kept apart. Examines who holds authority based on their knowledge.	What knowledge must be included for a plan to be approved? What information is needed for it to be considered a credible document? What knowledge is not accepted in plans?
Salience	The visibility of the knowledge-based needs of decision-makers to knowledge-makers. Considers what processes enable this visibility and whose interests are included or excluded.	What knowledge do community members need to be able to write plans? Do they have a means of getting that information from whomever can provide it? Do government professionals responsible for approving plans have a means of determining what knowledge they need to be able to approve plans?
Legitimacy	Examines whose concept of public good or desired outcome dominates and why. Looks specifically at whether required decision processes (science-based or otherwise) reinforce or challenge existing power relations. Considers societal expectations of objectivity and their effect on the role of science or	What is the desired outcome of local plans; does this differ between the local and national level? What knowledge will approval and revision of plans be based on, and how does this relate to how decisions are typically made? When there is a conflict between knowledge types, which type "wins" or is trusted more?

	LEK in decision making, and what type of knowledge might have a mediating role between conflicting societal views.

4 RESULTS & DISCUSSION

4.1 Elements of Adaptive Governance

Research on adaptive modes of governing resources indicates that while the specifics of what makes governance adaptive in different contexts may vary, there are some shared characteristics across systems (Huitema et al. 2009, Chaffin et al. 2014). The *Frameworks for Analysis* section draws on past summaries of these characteristics as a sort of "ideal type" for governance. While no one system is expected to reflect all of these characteristics fully, a system that seems to be moving towards these traits may be improving its ability to be adaptive. The results presented in this section compare the current arrangements of inshore fisheries governance to this set of characteristics, with a particular focus on the changes brought about by Section 18 of the FMA (2015). A few interviewees with a background in governance and policy research explicitly mentioned the relation of adaptive governance principles to the development of the Act, suggesting that some actors may directly connect these concepts to policy work in practice. However, the majority of these themes were not directly discussed by participants, with the data presented here being derived from interview questions designed to address these elements.

4.1.1 Bioregional Fit

Bioregional fit refers to the degree to which institutions or political jurisdictions are matched to the ecologically functional scale relevant to the problems they seek to address (Huitema et al. 2009). This can be achieved through aligning political jurisdictions to relevant bioregions, combining jurisdictions to reach appropriate biophysical scales, or creating partnerships across existing jurisdictions to reach the relevant scale of social-ecological problems (Huitema et al. 2009). The discussion of fit begins with the general institutional structure of the Solomon Islands Government, followed by a more specific focus on fisheries governance.

The Solomon Islands are divided into nine provinces, with inshore fisheries managed at both the national level and provincial level, and with primary responsibilities given to the provinces for their own provincial waters (see Sec. 4.1.3: *Polycentricity*). There are no formal government institutions responsible for fisheries at smaller scales; local and regional tribal councils exist at lower levels but are not responsible for fisheries management. However, the

Provincial Government Act (1997) and Constitution explicitly recognizes traditional rights through existing customary systems at the local level (Pulea 1993).

Following the lead of the Constitution and other acts, the FMA (2015) also recognizes customary rights (s. 21), and through Section 18 provides an avenue for making specific customary rules around fisheries enforceable. On its face, this has some potential to improve the biogeographic fit of fisheries governance institutions. The FMA (2015) establishes that communities can submit management plans for their own tenure areas, and that if approved these plans are gazetted at the provincial level. Once entered in the *Gazette*, the plans have the legal status of regulations made under the FMA (2015). While the term "community" is not explicitly defined in the Act, it does state that plans can be written "by or on behalf of customary rights holders" (s. 18 (1)). This essentially transitions informal arrangements for enforcing customary rules into a more formal arrangements that allow for police and courts to intervene as they would for violations against any other regulation under the Act.

It might be said that bioregional fit is slightly improved by this provision for community plans, as these bylaws allow for formal enforcement at a finer scale. However, customary areas in the Solomon Islands are determined by social factors rather than ecological factors; therefore a registered tribal area rarely if ever "fits" the relevant ecological scale. To give a hypothetical example, a tribe could own a reef and create bylaws that apply to fishing that reef, but they might not be able to protect a nearby spawning area or mangrove nursery that is critical for the population of fish on that reef. Furthermore, although the FMA (2015) enables communities to submit plans, it does not require it nor is it expected that many communities will actually do this. It is more likely that only communities with strong governance and the assistance of NGOs or the government will be able to effectively navigate the approval process. Therefore the areas where finer scale management occur will be scattered and unlikely to add up to any significant improvement in bioregional fit.

Given this assessment, overall the FMA (2015) keeps the bioregional fit of inshore fisheries institutions at more or less the same level as previous to the Act. An exception to this could occur in the unlikely event that plans for areas where tenure boundaries happen to line up with relevant ecological scales, or, even more unlikely, when adjacent tenure areas are registered such that together they improve fit to relevant scales. One government professional noted that a "nice vision is…lagoon-wide management plans" (Interview 8), but emphasized that this was

unlikely to happen any time soon because it is difficult to get adjacent tribes to agree with one another on rules, as discussed more extensively in the next section. Therefore it seems unlikely that the FMA (2015) improves bioregional fit in any significant way.

4.1.2 Boundaries

De Caro et al. (2017) suggest well-defined boundaries as a potential design principle for adaptive governance on the premise that this will provide clarity around legal and institutional jurisdictions. The topic of boundaries came up in three quarters of the interviews, usually in the context of discussing challenges for communities developing plans; customary boundaries are often nebulous and flexible, and writing them down as precise lines can cause disputes over ownership. This has interesting implications for how the development of plans, which require boundaries to be written down (FMA 2015 Second Schedule), may affect the adaptiveness of this system.

On the one hand, participants suggested that this will improve enforceability and the ability of the nation to report progress towards international agreements. One NGO professional reflected:

> The benefit of writing the boundaries into the plan is basically that report up ability. Like to be able to say this percentage of land is in protection…I know the ministry in terms of their obligations that they sign up to, they report to, you know how many percentage of the country is managed, that sort of thing…wanting to know what area of Solomon islands is under local management. But I think it's also in, even for the Coral Triangle program in country, that's one thing that they report against, the country report against as well. (Interview 13)

Writing down the boundaries therefore provides a way to track progress towards these goals. On the other hand, NGO and some government professionals were quick to point out the difficulties of writing down previously verbal boundaries, which resonates with literature on the difficulties of formalizing customary systems (Pulea 1993). One NGO professional notes that writing boundaries into plans is "easier for communities who have clear tenure ownership…But for areas that don't have clear tenure ownership, then that *is* a sort of a potential source of issues" (Interview 13). Another NGO participant echoed this concern:

> You need to document that your neighbors, so the people that own the land adjacent to the protected area, uh, approve of it and are happy with it, and agree with the boundaries that you've set. So that's, that boundary agreement has been a bit of a sticking point in some of the applications we've been developing, because typically these, these tribes or communities are sort of at war with each other, because of, fundamentally, because of logging disagreements. (Interview 3)

At worst, land disputes may become so intense that NGOs or government professionals trying to assist communities will be forced to step back until the conflict is resolved. This could mean their plans never come to be at all; some NGO and government participants indicate a willingness to come back after a conflict is resolved, while others seemed to hint otherwise.

> Normally for sorting out the landownership, we put it back to them, there is a dispute, we just, we don't involve in dispute. We just sit back and, ask them to sort it out between them, then we can go back and help them. (NGO professional; Interview 12)

> "If there's a conflict going on in the community or with another community, you have to stand back and say look we can't work." (NGO professional; Interview 1)

This suggests that writing down boundaries may provide clarity but will likely slow the process of developing plans. This could in turn delay approval and enforcement that may be desperately needed; some participants expressed concern that communities wishing to submit plans may be driven by imminent threats, such as the start of a logging operation that could pollute a reef:

> Unfortunately a logging operation descended upon the community…about less than a kilometer away from their mpa. So they are digging up the corals and [community leader] wants to take them to court and all that…he's sort of, pushing ahead with trying to register their management plan. (NGO professional; Interview 13)

On the surface then, following De Caro's (2017) suggested criteria, the FMA (2015) improves the clarity of boundaries and therefore should improve the adaptiveness of the system. However, considering the benefits of flexible verbal customary systems

(Hviding 1998, Aswani et al. 2007), and the challenges that writing down boundaries has caused for CBRM efforts in the past, perhaps this 'candidate design principle' should be questioned when applied in this context. Given the interview responses above, it is reasonable to question whether the process of writing down boundaries has more drawbacks for adaptability than the benefit of the outcome of having clear boundaries. Taking this a little further, it is also worth noting that a document that must be upheld in court and enforced by police is inherently going to need this level of clarity. This opens the conversation to a broader question of whether legal enforcement is the best option in places where boundaries are often a sensitive topic—perhaps other methods should be included first. One government professional imparted this sentiment, stating, "this is one tool…It's *one* option, it's one avenue for communities…you don't need this to do CBRM. [Communities] can just do it on their own" (Interview 8).

4.1.3 Nested Polycentricity

Huitema (et al. 2009) defines a system as polycentric when it has multiple centers of power. This means that political authority is dispersed to entities with overlapping and nested jurisdictions that are not arranged in a hierarchy, or are at least not only arranged in a hierarchy (Folke et al. 2005, Huitema et al. 2009 citing Skelcher (2005)). This recommendation for AG comes from recognition of the failure of centralized, technocratic systems of governing to provide flexible, contextually-appropriate, and adequately responsive means of managing resources (Huitema et al. 2009). This is recognized to some degree in the Pacific; Aswani and Sabetian (2009) point out "that centralized and science-driven coastal fisheries programs in the region have, in general, failed," adding that this has led to an interest in the role of customary governance systems in marine management. A polycentric arrangement of decision making authority is considered better able to cope with change and uncertainty than monocentric arrangements for the following reasons: a) issues can be addressed at the scale relevant to the scope of the problem, b) high overlap and redundancy in decision making bodies reduces vulnerability by allowing one unit to take over the functions any units that fail, and c) the large number of decision making units facilitates experimentation, in turn allowing units to learn from one another (Huitema et al. 2009). This does however come with tradeoffs, as polycentricity will cause a need for collective decision making made difficult by the complex and overlapping

decision making system; this will require careful coordination which can be costly and can risk a loss of democratic accountability when responsibilities are especially dispersed (Huitema et al. 2009). Folke et al. (2005) suggests that the aim of polycentric governance is to strike "a balance between decentralized and centralized control," which suggests the need to evaluate tradeoffs between the degree of redundancy between institutions and the cost of coordinating such a system to find the balance appropriate for a given context. Polycentricity is frequently suggested as an essential context necessary for the emergence of adaptive governance (Dietz et al. 2003, Folke et al. 2005, Huitema et al. 2009, Chaffin et al. 2014). However, there is no generally agreed upon scale or scope or substance for measuring polycentricity, which limits this analysis to empirical observations without a scale to compare directly to other contexts (Huitema et al. 2009). Here I will make observations about the degree to which elements of inshore fisheries governance currently reflect elements of polycentricity relative only to the status of inshore fisheries previous to the passage of the new fisheries act.

The FMA (1998) established that provinces are responsible for the management of reef, inshore, and freshwater fisheries. The FMA (2015) reiterates this, stating that "each Provincial Government shall have primary responsibility for the conservation, management, development and sustainable use of fisheries resources within its provincial waters" (Part 3 Section 14 (1)). The FMA (2015) does not change the jurisdictions of formal government institutions, but does uphold that the primary responsibility for inshore fisheries is placed on the shoulders of provincial governments. According to interview participants, the provinces will be responsible for part of the plan approval process for the Act, and may be the level at which accepted plans are gazetted. The process for approval once a plan is submitted to the government is still being finalized, and participants held conflicting views on where final approval would be made; this is process will be finalized this year. After plans are approved, the process for day-to-day management and enforcement would be led by the local committee, which would consist of customary rights holders. The tentative approval process as described by government professionals working on standard operating procedures (SOPs) is as follows (Figure 2):

1. Local committees consisting of customary rights holders must work with the relevant Provincial Executive to approve plans before they can be approved at the provincial level (FMA (2015) Part 4 s.18(3))

2. Plans will be submitted to provincial fisheries offices and will need to align with both the provincial level ordinances, bylaws, and existing government plans, and with the FMA (2015) (Part 4 s.18(5)); all provinces will need to create or revise existing provincial fisheries ordinances to ensure alignment with the FMA (2015). Plans will also be submitted to the Director at the national level to receive final approval; it is unclear whether submission to the provincial and national level will be simultaneous or sequential with the provincial approval coming first (this is where interview responses conflicted). This will be worked out in the SOPs, with government professionals indicating that it would be sequential (province then national) even though it appears to be simultaneous in the text of Act, which reads: "[plans] shall be submitted to both the Provincial Executive and Director at the same time, for their respective review and approval" (FMA (2015) Part 4 s.18(5)).

3. If approved by the Director at the national level, plans will be sent back to the provinces to be gazetted at the provincial level.

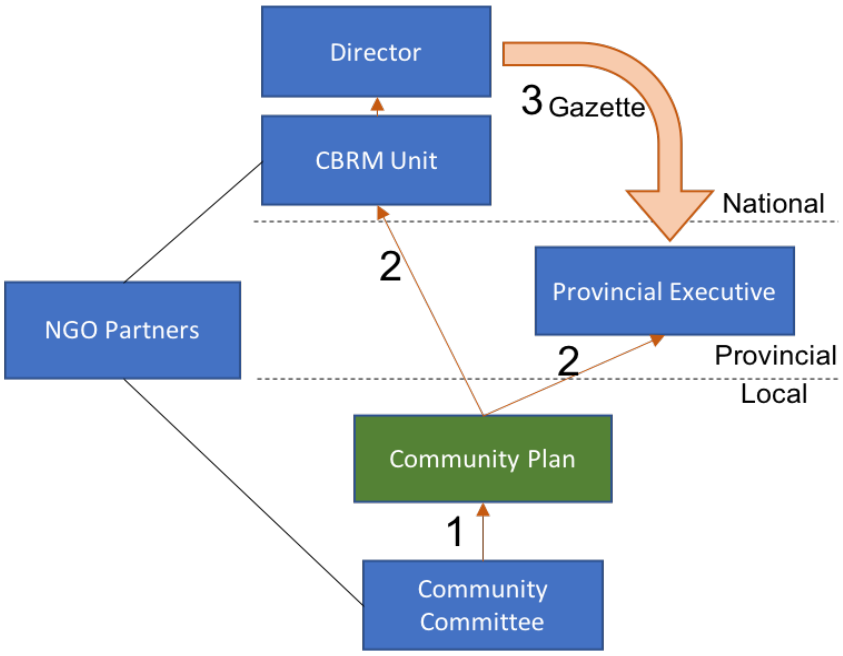

Figure 2. Potential plan approval process as described in Fall 2017.

This is the first time that local level plans created and governed by customary rights holders will be incorporated into national policy, according to my review of the two previous fisheries acts, and comments from interview participants. It represents a transition from the

previous fisheries management act, which delegated primary formal responsibility for inshore fisheries to the provinces, but not to local level leaders. Now, customary rights holders will have explicit rules enforced by national government if their plans are approved. Any plans with rules pertaining to customary tenure areas and any revisions to such plan require the review and written consent of customary rights holders (FMA (2015) Second Schedule (13-14)). This new Act aligns with the SI constitution, which explicitly recognizes the rights of customary tenure holders, and provides a means for realizing this recognition. This was a point of confusion amongst study participants, as it is unclear whether or not police or courts could be called upon to enforce local rights on a constitutional basis alone. It appears that the FMA (2015) *does not change* the legal recognition of customary rights in any way, and indeed reinforces it (s.21). What it does do is provide an avenue for government enforcement of specific fisheries rules.[8] Previously, the government would uphold customary claims to tenure areas but seems to have needed the FMA (2015) to enable legal enforcement of specific rules. Based on the interview responses of NGO and government professionals, the assumption seems to have been that customary leaders are enabled to enforce their own rules, but the strength of these customary systems has broken down in some areas, leaving communities to seek help with enforcement from the government.

Although the interaction between the FMA (2015) and constitutional support for CMT remains a bit blurry, the new Act is widely seen by interview participants as a first opportunity to formalize rules prescribed by customary owners in a legal format. The shift from informal to formal can in this context be seen as a change in Folke et al.'s (2005) "balance" between centralized and decentralized control, with a shift towards the latter, but this claim must be made carefully in the context of customary systems and is dependent on perspective. The idea of "control" is not defined by Folke et al. (2005), so in discussing the shift here I will focus on control as "ability to enforce" rather than the right to make rules, though the term seems to imply both.

[8] The action of formalizing unwritten customary systems into written and often rigid forms is controversial and has been the subject of much debate in the Pacific (Pulea 1993, Hviding 1998). This literature could perhaps be drawn on to inform future modifications to adaptive governance prescriptions when considering ways to improve their relevance in the Pacific, and in other places where land tenure and resource use is not based on private property rights.

The preexistence of customary systems backed by constitutional law in SI means that control over user behavior does not, supposedly, shift to the government, even though the Act was often perceived that way at the local level. The Act instead appears to intend that customary leaders maintain their control but are enabled to draw on government enforcement to do so. However, the Act does state that a plan "may provide for a commitment by the relevant community, customary owners of fisheries resources and fishing rights and other stakeholders…to manage the fisheries…in the designated area *only* in accordance with the Plan" (FMA (2015) Second Schedule (10), emphasis added). This suggests that local leaders could potentially trap themselves in their own rules; an approved plan is legally binding, which may risk reducing leaders' control by limiting their ability to change their own rules. This concern was directly voiced by a local fisher, "[Plan is] very good for our future, but sometime we will go and trap ourselves…because for me, stop our [marine protected] place, area for go. But we forgot it and go fishing, we spoil our reefs." In other words, the plan is perceived as useful but is also concerning because the consequences for violating rules could be severe. Anecdotally, one participant at the local level recalled a story about a customary leader in the Arnavons being caught by rangers for a rule he himself had written and signed as part of a management plan created in collaboration with NGOs. This occurred before the Arnavons were officially registered through the Protected Areas Act (2010), using a process very similar to the FMA (2015), so the consequences for that individual were likely less severe than they would be now. This particular story is unverified but suggests that at the very least this is something on the minds of people at the local level, and that the effect of a gazetted plan on leaders' control over resources should be clarified. More generally, this concern points to the inherent tradeoffs between different elements of AG (e.g. improved enforcement through bylaws vs flexibility to easily change rules), and the need to identify context-appropriate ways to balance these tradeoffs.

The Act itself states that "the Director, in consultation with the relevant communities, may amend a [plan] by notice in the Gazette" (FMA (2015) Part 4 Section 18 (8)). Concern over how plans will be modified was occasionally raised by interview participants, and it was not clear if and how community leaders could initiate this. According to interviews with government professionals, the details of how plans will be amended will be incorporated into regulations or SOPs: "…(changing gazetted plans) is also a concern for us…it didn't really specify in the act that a management plan should be for five years, or six years, but we are hoping that will be

captured in the regulations." Given that there seems to be concern around this issue at the national level, it seems likely that SOPs that address concerns over revisions will be worked out, but this remains to be seen.

In conclusion, on its face this Act seems to increase the polycentricity of inshore fisheries governance by requiring the formation of committees and formalizing their role through by-laws, thereby devolving at least a small amount of power, in the formal government sense, to the local level. That said, in practice the Act only slightly modifies a system that has until now been operating informally, meaning operating within customary systems but not explicitly described through policies in the more Western-style government. From the perspective of the local level, it could be argued that this Act actually appears to shift towards more (police and courts) centralized governance because it outsources the most severe enforcement from the local level to national authorities, and requires approval of plans and any revisions by the Director; local committees are responsible for day-to-day enforcement but can bring in outside authorities if needed (see Sec. 4.1.4: *Enforcement*). Regardless of perspective, there is a shift here toward *government* polycentricity even if this doesn't change the polycentricity of *governance* in practice except for the requirement of a special fisheries committee separate from the general committees that often run local villages. It does this by requiring approval at the local, provincial, and national level; creating some redundancy in the system. Until the lack of clarity around whether submission to the national or provincial level will occur simultaneously is resolved, it is difficult to draw definite conclusions. The Act seems to imply that submission to both levels is simultaneous, but interview responses from government professionals indicated it would travel sequentially, first to the provincial level then to national, and then back again to be gazetted at the provincial level. If simultaneous, this implies increased redundancy, but not necessarily less hierarchy in the system. That said, the requirement for Director approval still implies a degree of centrality, with participants from government additionally indicating that MFMR intends to play a growing "coordinating" role for CBRM in SI (both through the Act and in general). This underlines the idea that the government is attempting to become more polycentric through shifting towards the local scale through the plans and playing a coordinating role.

4.1.4 Enforcement & Conflict Resolution

The need for effective enforcement at the local level is widely recognized in CBRM and adaptive governance scholarship. De Caro et al. (2017) draw on this in proposing an institutional design principle for enforcement: "in addition to external monitoring and enforcement systems, organizations and collectives…have internal mechanisms to monitor and enforce compliance." This emphasis on both external and internal enforcement is particularly relevant to the FMA (2015), which introduces external enforcement mechanisms (e.g. police) for communities while still keeping primary enforcement responsibilities internal to communities through their local committees. The FMA (2015) states that "enforcement powers and authorities" must be included in management plans but provides no further guidance or restrictions on who those authorities must be at the local level (Part 4 s.17 (7) (ii)). It seemed to be assumed by interviewees that the enforcement would be by members of the local communities, paid or unpaid. Some participants referred to "rangers" as the likely enforcement authorities; these are local residents trained by government or NGOs on monitoring and enforcement.

The addition of outside enforcement options suggests a significant change in how marine resources, and especially inshore fisheries, are governed at the local level. Up until this point management has been done through "informal" customary means[9]. Dietz et al. (2003) write that regardless of whether enforcement mechanisms are formal or informal, "those who impose them must be seen as effective and legitimate by resource users or resistance and evasion will overwhelm the commons governance strategy." In some areas of the Solomon Islands, including the village I visited, there seems to be a sort of "legitimacy crisis" regarding enforcement. Local level interviews suggested a generational shift in perception of which source of enforcement is considered "effective and legitimate." Many interviewees suggested that the need for registration under the FMA (2015) is driven by the desire to regulate the behavior of a younger generation, and a belief that this generation will respect formal bylaws more readily than "traditional" local leaders. One village participant indicated that past mechanisms of enforcement, such as whipping offenders, were no longer in use; another interview at the national level confirmed that public whipping was used in the past in some communities. While disputes, especially domestic

[9] Assigning customary systems the title of "informal" is meant to indicate that these systems are different from common law and not written down in the "formal" way of the Western world; whether something is seen as "formal" or "informal" does however seem to be a bit a matter of perspective. The tribes may very well see their systems as formal too.

disputes, were occasionally settled violently, there were not any public forms of corporal punishment, and even domestic violence was somewhat frowned upon, seemingly due to the strong influence of the church on communities. It seems that while public methods of punishment like this have become outdated, there is nothing in place to replace it, and that this is what makes the Act appealing to local leaders. One leader in the community reflected, "…hard time today, our new generation…maybe the law can guide them." This sentiment arose consistently across local level interviews, but these interviews were primarily conducted with residents over the age of 30.

Further interviews should be conducted with more individuals in the 18 to 30 age range to assess whether or not this generation is indeed the source of most fishing violations, what their ideas are on fisheries management, and if they do indeed respect the law more than customary systems (perhaps they respect neither, or both). There were two participants who fell into this age range, and while one was not as familiar with the FMA (2015) as I expected, the other was actually quite supportive of the need for active management and the potential utility of plan submission under the Act to achieve this. This young generation of fishers was difficult to reach during the relatively short time period of my study, for two reasons. First, my sampling focus was initially on those who had attended the government workshop on the Act because I was interested on getting local perspectives on the provision for plans. As it happened, few members of the young generation had attended this workshop, which may indicate that the older generations' perceptions are warranted, and also made it more difficult to identify participants. Second, this generation was particularly hard to connect with as an outsider with light skin, and this was confounded by cultural norms around cross-gender interactions; many of the prominent fishers were men, and it is not typical for men and women to speak one-on-one with the privacy that interviews require. For this reason, government and NGO projects often go out of their way to ensure that both men and women are involved in outreach efforts to communities[10].

Although many participants at the local level suggested that legal enforcement may be needed for the younger generation, several participants also voiced reservations about switching to this method. While whipping is no longer used in the village, the importance of interpersonal relationships, a well-known characteristic of CMT systems (Hviding and Baines 1994), was prominent in discussions about marine management, and residents seemed concerned about the

[10] Information from national level interviews.

ramifications of formalizing customary rules for relationships. In many ways respect for village rules was tied up in individuals' concern over their image within the community. There were a few instances where residents knew that I had witnessed them breaking rules associated with the church, and they would beg me not to "spoil their name" by reporting their actions. Though there was substantially more social pressure associated with church rules than with fishing rules, it is clear that the incentive to follow rules of any sort comes from a desire to preserve personal reputation. This entered the discussion of writing management plans when participants voiced concern over how calling the police on fishers from both within and outside of the community. In the village I visited, one of the village leaders voiced concern over how other communities would respond if the police were called on one of their residents for fishing without permission. This was a subtle concern that emerged in the following conversation:

> Participant: We need to register our community and we register our area. If someone come and breach our rules, we will take that guy to the court…but if we community, we can settle the problem. Easy to settle the problem. Talk about it…
>
> Interviewer: With the person coming in?
>
> Participant: Yah, talk to the guy, oh you don't do it again, yah? But if we do register…
>
> Interviewer: If you register it, then what happens?
>
> Participant: Then we, let's say we open it, get the guy, we will end up go to the court. So, for me, it's okay. Our relationship here, with the villages, will not really…
>
> Interviewer: Not as good?
>
> Participant: Yah, that's what I think.
>
> Interviewer: So…if you go to the courts, it's not as good for the relationship, but if you keep it here locally…?
>
> Participant: We can settle it, easy to settle it.

The leader here is essentially describing informal interactions of reprimanding through conversation, and despite earlier voicing concerns about enforcement, did not seem to concerned about that here. It may be that enforcing against external violators is more easily achieved than enforcement against violators internal to the community. However, some participants seemed hesitant to use police internally either. The problem of concern

would be the personal ramifications of calling out either a relative or a resident from another family. Given that the community is very small, it is easy to see why this would be a concern; in an environment where community members are interdependent, calling the police on someone would likely damage social bonds that are relied upon in other aspects of life. The details of such concerns would be better addressed through more in-depth, longitudinal sociological or anthropological research, but the takeaway here is that formal enforcement might not be welcomed.

The discussion up until this point has focused on what the shift in enforcement looks like in terms of the text of the Act and its interpretation by interviewees, but enforcement "on paper" can be very different than enforcement in practice. The ability of the government to enforce the rules within local plans was one of the biggest concerns brought up by participants when asked about challenges for implementing the act. Questions were raised about where the capacity for enforcement would come from at the national level, though at the local level this concern was not mentioned at all. One NGO participant stated rather wryly, "It's not so much the [plan] I think it's gonna be fine, it's just the enforcement part of it all is going to be the challenge," then added "not just here in the Solomons but in the Pacific in general…you'll see a lot of fisheries acts and so forth, but the enforcement is always the weak part." The limiting factor for government seems to be lack of personnel capacity, and the cost of fuel, which is quite expensive in rural parts of the Solomon Islands (it was ~SBD$13/liter, or ~US$6.50/gallon in Marovo Lagoon while I was there). On the other end, the potential cost to communities of trying to bring someone to court may also be prohibitive. One NGO professional explained this:

> I would prosecute in the customary way, like he or she will pay compensation to whatever community. But going up to the national level, how would that happen? It may take time, it may cost money which the community could not afford.

The cost to the government for police enforcement and the cost to communities for taking violators to court could be quite high. This may in part be mitigated by the requirement that plans assign primary enforcement responsibilities within the community, but given that one of the main points of registration is to give access to the police, this appears to be a relatively serious concern for the implementation of the Act.

The lack of faith in government enforcement that was so prominent at the national level was comparatively lacking at the local level, even though the nearest police station is a two-hour

boat ride from the village. Frustrations with the government that surfaced during interviews seemed to be more about failure to provide promised development assistance or failure to offer development assistance in the first place. Two participants from the same family relayed the story of clearing land and planting an oil palm plantation after the government promised to assist with building oil processing plants in the lagoon. The family invested their time and money into the plantation, only to find that the government did not hold up their end of the bargain, causing the fruit to go to waste. Despite this history, when asked what the role of government ought to be in fisheries at the local level, many participants (including those involved in the oil palm plantation) responded that the government should provide materials, training, and capital to improve fishing and help with the enforcement of rules. Many requested a "rafter," referring to a fish aggregating device (FAD), which is a wooden float placed in nearshore waters so that fish will gather underneath it, which makes catching them easier. One participant did go so far as to accuse the government of misusing money, saying that aid money given to the government for developing local sanitation projects actually went into the pockets of government officials. Despite this, the government was still expected to deliver resources and there were no doubts raised about the ability of police to actually enforce rules. One participant told a story about a man in the village who had recently been released from jail after committing a crime unrelated to fisheries. It may be that this recent event has proved the presence of police to the community and that this may be why their enforcement abilities are not questioned.

Overall, the Act has potential to improve enforcement in a way that aligns with De Caro et al.'s (2017) recommendation for both internal and external mechanisms. However, this may be complicated by social dynamics of transition from customary to police enforcement, and by the likely limited capacity of police to respond to requests. If the government is able to meet demands for enforcement, then the Act does transition towards the recommendation for internal and external mechanisms. The relationship-related concerns over adding external enforcement may, however, be something to revisit when considering what adaptive governance looks like in places with active CMT systems in the Pacific.

4.1.5 Inclusive Participation

There is a broad call in adaptive governance research for inclusive, meaningful participation in decision making by those affected by decisions (Folke et al. 2005, Huitema et al.

2009, Chaffin et al. 2014, De Caro et al. 2017). Meaningful participation involves both broad participation from a variety of stakeholders, and broad capacity for these stakeholders to contribute within the process they have been invited into (Folke et al. 2005, De Caro etal. 2017). This is typically achieved through co-management or collaborative relationships between government and non-governmental entities including local communities (Huitema et al. 2009, De Caro et al. 2017). The co-management of marine resources is the primary method of formal (non-CMT) inshore fisheries and marine management in the Solomon Islands[11]. This is achieved primarily through partnerships between communities and environmental NGOs, although the CBRM unit within MFMR is also beginning to partner with communities[12] (Cohen et al. 2012). Additionally, a CBRM approach is formally encouraged as the means for meeting regional goals under the Coral Triangle Initiative through the Solomon Islands National Plan of Action; the prioritization of this approach is also seen in the recent creation of the CBRM unit within MFMR. It is from this context that the provision for plan submission under the FMA (2015) has emerged, and this has both positive and negative implications for how inclusive fisheries governance is likely to be under the Act.

The importance of engaging regularly with communities and including all stakeholders (young, old, women, men, etc.) in CBRM projects was a running theme across interviews with NGO participants. These NGOs were consulted at various points during the development of the Act, but participants did not explicitly state, or often times do not seem to remember, exactly which provisions they recommended for the Act. This is not too surprising as it has been a few years since the consultations for the Act were held—most were done in 2014. However, the text of the FMA (2015) appears to reflect the NGO practice of valuing and frequently engaging with communities. Consultation with customary rights holders is frequently mentioned in the text of the FMA (2015). It is explicitly stated that fisheries management plans must be approved by "a management committee representing the customary rights holders" regardless of whether the plan is initiated by the fisheries Director or submitted by a community (FMA (2015) Part 4, s.17(2)(c)). The requirement for community level committees of rights holders is a clear attempt at including those affected by decisions in decision making processes. However, it should also be noted that because the Constitution supports customary rights and because resources are

[11] Information from national level interviews.
[12] Information from national level interviews.

customarily owned, the government actually cannot make any decisions about these resources without the rights holders' consent; this is what likely drives the provision. Still, it is noteworthy that the customary context makes this participation aspect of adaptive governance essentially mandatory, and that the Act takes a clear stance on reinforcing deference to these CMT arrangements.

In addition to requiring local committees representative of rights holders, the Act articulates that plans must include the "written consent of the relevant customary rights holders" (Second Schedule (13)). This is interesting because it potentially means going beyond those who "own" the space to those who have a right to use it. It is unclear how the Act will draw the line here because rights are based on complex kinship relationships, and vary in strength based on strength of relational connections (Hviding and Baines 1994). For example, a grandchild would have stronger rights to use their grandparents' area than a cousin, though which grandparent's area they can access might depend on whether they are in a matrilineal or patrilineal tribe (the Southern part of Marovo Lagoon seemed to be matrilineal and patriarchal). NGO participants indicated that while in some cases they will document the primary owners of a tenure area, they do not typically try to document all of the rights-holders given the complexity of this system. Therefore, this provision seems to have some potential to ensure participation by those affected by decisions, but it is unclear how this inclusion will be achieved in practice.

While it appears that inclusive participation will be encouraged within each community that submits a plan, there are likely to be inequalities between communities that are or are not able to submit plans across the nation as a whole. All four environmental NGOs mentioned that they need to be selective about which communities they choose to work with; because communities who submit plans under the Act will likely need the help of NGOs and the government, this has serious implications for which communities will be able to do so. One of the most frequently mentioned criteria for choosing to work with a community was that the community needed to have strong, intact customary governance. The reason for this is tied to the desire of NGOs to be inclusive when working with communities. NGOs are often approached by individuals within communities who request assistance, often with preventing exploitation of their resources by foreign industry, but who do not necessarily represent the entire community. At times this can be because they seek individual gain from the funding and resources provided by NGOs, and at other times it can be because they genuinely want to improve the well-being of

their entire community. The former case causes obvious issues with the work of NGOs being accepted and welcome by a community; the latter can be an issue if the individual approaching an NGO comes from a fractured community where it will be difficult for NGOs to be welcomed in. This can happen, for example, with logging, where part of the community may seek the immediate economic benefits of logging royalties while other parts of the community fear the long term consequences of logging activities for their fishery and approach NGOs for help.

The need for NGOs to be prudent with funding and community engagement, and the fact that NGOs make up the majority of on-the-ground capacity to help communities, means that the Act seems more likely to help communities with strong governance than those with weak governance. The purpose of the Act is to strengthen customary systems where enforcement is needed, but it seems likely that it will end up selecting for communities that already have cohesive governance. This may imply that the Act will not be very able to help communities with weak governance seeking to improve enforcement of their rules against local fishers. The Act may therefore end up being used for communities seeking to exclude foreign industry, such as companies seeking to extract timber or baitfish. Several participants mentioned that this is the way they intend to use Section 18, and one government participant pointed out that a vocal local leader was intending to use the provision to stop logging companies from destroying his communities reef (Interview #13). However, this does not necessarily line up well with what Section 18 of the Act is meant to do, as a separate provision exists elsewhere in the Act to protect against unwanted foreign industry activities. This recognition of customary rights and the prohibition of commercial-scale infringements on these rights is made clear in section 21:

> Customary rights shall be fully recognized and respected in all activities falling within the scope of this Act. No person shall, without permission given by the relevant customary rights holders, use a vessel other than a vessel used for customary fishing, to—engage in fishing, otherwise enter, or directly or indirectly cause destruction to an area subject to customary rights. (Part 4, s.21 (1-3))

It therefore does not seem that the plans described in Section 18 are intended for dealing with excluding foreign industry, despite NGOs and at least one local leader seeming to see it this way. Section 18 seems instead to be designed for enforcing rules set up for local fishers both within and outside of a community. The specific criteria around describing a fishery, management goals, and penalties, along with the comments of

government participants, indicate this focus on enforcing day-to-day local management. If this is the case, and the Act is indeed aimed at strengthening local rules in communities with weak customary governance, it is problematic that the politics of NGO and government engagement with communities may cause communities with strong governance to benefit most from the Act, unintentionally excluding the communities that may most need assistance.

The FMA (2015) seems to improve or at least uphold the previously existing value for inclusive participation in local level fisheries governance in the Solomon Islands. The specific requirements for consultation with and consent from rights-holders may even improve the inclusiveness of governance, if it is well-implemented in practice. At a broader scale, the Act is likely to be less inclusive, in that not all communities that may need the help with enforcement provided by the Act are likely to be able to get through the process of registering their plans. However, given that there was previously no mechanism for any community rules to be included in national legislation, other than the general recognition of customary rights, the Act overall pushes the needle towards more inclusive participation.

4.1.6 Leadership

Folke et al. (2005) emphasize that collaboration in the governance of natural resources requires leadership, which is considered essential for "shaping change and reorganization by providing innovation in order to achieve the flexibility needed to deal with ecosystem dynamics" (Folke et al. 2005). This is thought to be especially true for co-management of fisheries (Gutierrez et al. 2011, Wamukota et al. 2012). A review of 130 co-managed fisheries in countries of varying ecosystems, degrees of development, fishing sectors, and resource type found that leadership as the most important attribute for successful fisheries management (Gutierrez et al. 2011). The story of the FMA (2015), and inshore fisheries more generally in the Solomon Islands, aligns with this literature—key leaders at the national level were important for the Act, while key leaders at the local level were important more generally.

Interviews with government and NGO professionals involved in, or familiar with, the process of developing the FMA (2015) pointed out that in such a small country, having a few key people to push legislation through makes a big difference. This leadership theme came up

frequently in interviews even though I did not ask any direct questions about it. The drafting of the Act took over a decade, in part due to changes in who was leading the process; the final push came when a key legal advisor was brought back into the process, and a yellow card from the European Union regarding the country failing to meet certain standards for the tuna industry. The drafting began under the leadership of a key legal advisor, but was abruptly halted when this individual unexpectedly passed away. The draft was then redone by consultants based outside of the country, but the new draft did not satisfy stakeholders back in the Solomon Islands. A key legal advisor that had helped with the earliest draft of the bill was then brought back into the process, and was able to hold multiple consultations with stakeholders and greatly assist with finalizing the draft. This advisor was frequently referenced as the person responsible for developing Section 18 and for generally ensuring CMT systems were considered within the bill. One government participant emphasized the importance of this person's role, stating, "If you haven't got a champion in the ministry who is going to keep [legislation] going…and [key advisor] was a *very* important part of that. No mistaking, [that advisor] feels ownership of that Act." Participants also frequently referenced this advisor as a key person leading the process for developing regulations and SOPs, and for interpreting parts of the Act that were considered confusing (e.g. plan approval process). It was clear that the successful passing of the Act was in large part due to the dedicated work of a few key leaders at various stages in its development.

Outside of the FMA (2015), but potentially relevant to the submission of plans, a few national level participants mentioned the importance of a local "champion" getting the government to assist communities with local level management issues. One NGO professional told the following story about a local leader from a very rural community:

> So [logging company is] digging up the corals and he wants to take them to court and all that. He's sort of, pushing ahead with trying to register their management plan…He isn't the chief directly but he is related to the chief, I think he is of the resource-owning tribe…But he's such a strong person, yah. I think that's, that was something that we found was key to successful CBRM was needing someone from the community who is really geared up by the cause, to lead. He's been back and forth to the ministry many times. He's a person that, when he opens the door like ohhhh no, you're bombarded with 'why are you not doing this!' And yah, everyone, he's famous in the ministries…But for me, I'm like good for him…He

> is someone who is still keen, and despite spending his own resources, he's still, he's still there. He's managed to get funding for his community.

The individual described here was unusual in his willingness to use his own money to solve a marine management issue, as many local residents felt this should be a job paid by the government. He was also unusually persistent, earning him the reputation mentioned amongst government professionals. There were a few other enthusiastic local leaders known at the national level, one of whom was the pastor from the village where I stayed. He was relatively new to the scene, but had made a point of making his concerns about how the government used money (or didn't) to help local communities. These sort of local leaders were sought after by NGOs doing CBRM, and, as in the story above, seem likely candidates for being able to push management plans through the approval process, perhaps even without the help of NGOs. In reflecting on what makes CBRM efforts successful, a researcher previously employed by an NGO recounted:

> We also tried to identify key people within communities who were sort of movers and shakers, and work with them as a facilitator of the processes…they weren't necessarily the village chief, always having to work through the village chief, but also working with the person who could facilitate the process.

Although these leaders are seen as important, it is difficult to know how common it is to be able to find such a leader. The village I visited did not seem to have anyone capable of leading the plan process, and national level participants implied that there are many places where they could not work because such leaders were lacking (or overwhelmed by internal conflicts). The Act itself seems unlikely to change this, unless having the option of getting outside enforcement becomes an incentive for communities to find a leader (internally or externally) so that they can take advantage of it. This will be dependent on communities actually learning about the Act, which at the moment only happens through infrequent workshops in easy-to-access communities. In the village I visited, having a workshop on the Act had certainly stirred interest, but seemed unlikely to catalyze action in the near future. Community leaders seemed more concerned with getting their village registered in general with the government before focusing on registering a marine area; that said, there was certainly interest and it seemed possible that the leaders might attempt to write a plan in the next few years.

When I asked local level residents what would be needed to successfully submit a plan under the Act, should they decide to do so, the importance of having a leader was emphasized. This was brought up seemingly without any awareness of the similar conversation happening at the national level. The village seemed to be genuinely wishing for a leader both to move fisheries rules into place and to unite the community more generally. The community seemed to be fragmented and participants frequently lamented the lack of ability for the community be of "one mind" (See Sec. 4.2.1: *Civic Epistemologies*). To solve this problem, several participants mentioned the need for a leader, but differed in their perspectives on who this leader should be—some felt it should be someone from outside the community, while most suggested it be someone internal. The village had a community chair, and some residents mentioned he may be someone to lead the process, but others seemed to ignore this possibility. This variation in perspectives is evident in the following quotes:

> "Our leaders in our community will do it…They will do it, because we only, well they already plan it, to do it." (Local resident)

> "Someone[13] who has the character that really attract people. By now, people will judging people, is a really big problem…The only thing is that that person who wants something to happen, he must be able to work with the young people, work with the elder people, so that they will support it. But if someone, who just really, isolating himself from people, they will not really support this program." (Local teacher)

In contrast, the following conversation with a local ranger indicated a preference for an outsider:

> Ranger: We are from one village, one community, they will not hear me. They will not like to follow me. Because I am a relative, they don't care about me. That's why we always say, we always need some people to come, and we just assist.
>
> Interviewer: From somewhere else.
>
> Ranger: Yah.

[13] When asked to clarify who this would be, this person indicated that it could be someone in Bili but they were not sure which individual as they were new to living in the village.

> Interviewer: Even if it was somewhere else in the Western Province, like what if somebody came from Chea[14], for example, they would listen to them more?
> Local fisher: No, not like that. People, say from Honiara, or Ghizo.
> Interviewer: From big cities.
> Local fisher: Yah. They come, and do awareness program, or workshop. Something like that, something that, the community, full whole community will come listen…that will be my time, to talk to them. I can speak to them, I can explain, what they don't want to listen at me…Like you people, because you are different color, they will respect you.

The difference in perspectives here may reflect differences in level of exposure to foreign researchers and NGO workshops. The ranger had attended NGO workshops in the past, and is a good example of how western ways of thinking are beginning to change this community. Although he speaks as though this is others' reaction to foreigners, it could very easily just be his own perspective, though it may also be representative others in the community who have had exposure to western culture. The introduction of scientific methods of managing fisheries is relatively new to the community (perhaps the last 20 years), and seems to be causing shifts in who is considered to have the knowledge and authority to manage resources (see Sec. 4.2.1: *Civic Epistemologies* for further discussion). It would not be surprising if this is also causing a shift in thinking about who should be responsible for leading management efforts.

Leadership was an important theme at the national level, in regard to both the submission of plans and the development of the FMA (2015) itself. NGO and government participants emphasized the importance of local "movers and shakers[15]" for any CBRM effort, including the submission of plans under the Act, and this aligned closely with the perspectives of village residents on what would be needed to successfully submit a plan. This reinforces suggestions about the importance of key leaders in governance literature, and suggests that while the FMA (2015) will not necessarily create new leaders, it may at least provide a means for existing leaders to achieve the management goals they hope for. Overall this can be considered a potential shift towards this prescription for AG, depending on how well leaders are actually able to submit plan as the Act starts to be implemented.

[14] Another village about an hour away in the same lagoon.
[15] Term used by an NGO professional during an interview.

4.1.7 Experimentation & Learning

Huitema et al. (2009) describe the importance of seeing management and policy as an experiment, because it is "always based on incomplete and uncertain information and consequently has a hypothetical character, and…can be seen as a kind of hypothesis testing." This is more or less synonymous with the concept of adaptive management (AM), in which the results of policies or interventions are constantly monitored to inform future actions. This is widely recognized as a preferred approach to resource management, and adaptive governance is seen as the governance context necessary for AM to survive and be relevant (Dietz et al. 2003, Chaffin et al. 2014). An enthusiasm for learning, and acceptance of failure as a necessary part of the learning process, and a general recognition of the importance of adaptive management were widespread amongst participants in this study.

Adaptive management is a well-known concept amongst NGO and government professionals in Honiara. I did not evaluate how well they actually implement it, but the idea of regular review, monitoring, and incremental improvement seemed well-accepted. An NGO professional reflected (emphasis added):

> We are issues, *we fail. Which is good*…then every three months, we agree to come back and revisit those rules and see if it works, uh, what they want to change, kind of thing yah…[our] approach, after all this learning, we often go back and sit down with them and revisit this rules, that make sense? Is it okay? And oftentimes, yah, there are gaps. (Interview 16)

NGO professionals like this one tended to emphasize that they have learned a lot and want the government to pick up on their lessons learned. Some government professionals mentioned that they need to learn by doing (testing the plan submission process) and also that they need more locally relevant sources of lessons learned. One such government professional explained:

> We have learned a lot from others, but there are our own, really own issues which, I've asked, nobody is able to answer me…like I've asked for case studies and things like that…I'm kind of aware of what our NGO partners are doing…I know that they have not really done that part as well, where communal resources are shared, how do they share them…because we are trying to progress…CBRM

> from, lessons learned from why other managed areas are failing. And this is one which is like really sticking out. (Interview 15)

This participant and others emphasized that the Solomon Islands are unique and that this requires that regional initiatives like CTI and the spread of CBRM approaches need to be tailored to this specific context. For this reason, they also tended to lament the degree to which Solomon Island students and professionals tend to be educated in other places, such as attending the University of the South Pacific in Fiji or travelling even further to places like Taiwan and Korea to learn about CBRM and best practices that may very well not be relevant to their context. One government professional had an idea about how to improve the sources of learning for Solomon Islander professionals:

> [NGOs] need to be better partners [to the CBRM unit], by better I'm saying more, there needs to be flow of information…it's a good network…they all go to the same meetings and they all talk to each other…but, things have changed a lot in CBRM…there just need to be some better ways of actually…absorbing the lessons. (Interview 8)

These concerns were shared by an NGO professional, who also had an idea about how to fix it:

> We're hoping to fund a person…to be seconded to the ministry…we're hoping that person will play a role to support the ministry in that work but also to bring lessons out. (Interview 13)

In addition to generally recognizing the importance of learning, and context-specific learning in particular, national level participants referred to the process of implementing the Act as a learning process in itself. A government professional explained:

> All the management plans that we have in the communities are still on the rough draft basis, and we haven't gone through any single plans yet…even with our partners, under this act yet. So, it will be like in 2018? Maybe in the years to come like, we could be learning from the process of all these. (Interview 14)

Inshore fisheries governance actors have clearly created an atmosphere that is supportive of learning and conducive to the process of adaptive management. However, there is some question of how well the Act will integrate into this context. It is unclear how an AM approach (i.e., regular review and adjustments) will be implemented through the FMA (2015). The widespread

understanding of AM made it possible to ask fairly directly about the concerns of aligning with an AM approach, resulting in conversations like this:

> Interviewer: If [communities] have a plan that is gazetted, what will they do if they want to change it?
>
> Government professional (Interview 6): That is also a concern for us. But it didn't really specify in the Act that a management plan should be for five years, or six years, but we are hoping that will be captured in the regulations.
>
> Interviewer: How often it needs to be revisited?
>
> Government professional: Yes.
>
> Interviewer: I see.
>
> Government professional: Because taking of the management plan to gazette is not an easy process.
>
> Interviewer: So once it goes through it's not something you want to do again?
>
> Government professional: Yes.
>
> Interviewer: What are some of the other concerns…
>
> Government professional: Or maybe, there is also a way, like amendment, like part of the plan could be amended.
>
> Interviewer: I see, and that's a little faster.
>
> Government professional: Yes.

This suggests that while AM may not be particularly well facilitated in the Act as it stands now, government professionals may be working to interpret the Act through regulations that may provide the space needed to do this. The amendment mentioned in this conversation is likely referring to where the revision of plans is mentioned in the Act:

> Fisheries Management Plans are to provide for the duration and periodic review of the Plan (FMA (2015), Second Schedule (14)).
>
> Subject to adoption by Provincial Assembly, the Director, in consultation with the relevant communities, may **amend** a Community Fisheries Management Plan by notice in the *Gazette* (Part 4, s.18 (8), bolded text added).
>
> Where assessment and review of any existing Community Fisheries Management Plan shows that any of the management measures, powers or authorities are sufficiently

> ineffective to secure management of the fisheries resources or compliance with management measures, the Director, Provincial Executive and relevant community shall consult with a view to revising the Plan. (FMA (2015), Second Schedule (15)).

These provisions suggest that the Director leads amendments, rather than the community, which may limit local leaders' ability to initiate AM. It does at least require that revisions be done in consultation with the community, but given the processes NGOs already have in place for revising plans in consultation with communities, it might be more ideal if this process could be initiated by local committees or at the very least NGO partners. It may be that the CBRM unit of MFMR may be able to initiate this; there was some mention that this unit will be responsible for processing plan approval on behalf of the Director, and if so it seems reasonable that they might also take the lead with revisions. This may help to facilitate AM, but especially given the limited capacity of the CBRM unit (five people), it still seems that devolving this to the local level would be more efficient. This would fit with the context of CMT, in which communities currently can change their rules as they see fit.

Overall, there is a supportive atmosphere for experimentation in inshore fisheries governance, but it is unclear how well the Act will fit into this. If the provisions for amendments within the Act are implemented in a way that allows this to be done easily, ideally by those responsible for implementing the plan at the local level, the Act will not change the degree of experimentation and AM practiced in this context. If this isn't the case, the Act may actually decrease the ability of actors to practice AM, making inshore fisheries governance less adaptive overall.

4.1.8 Inclusion of Multiple Types of Knowledge

This recommendation for adaptive governance draws on past research on LEK and recognizes the value of combining these knowledge systems with Western scientific approaches. Folke et al. (2005) cite case studies where this has been done with some success, including a case involving conservation of the bumphead parrotfish in the Solomon Islands (i.e., Aswani and Hamilton 2004). Folke (2006) includes this as one of four "essential parts" of adaptive governance, writing that governance should include "developing management practices that combine different ecological knowledge systems to interpret and respond to ecosystem feedback and continuously learn." This links back to the recommendation for experimentation and learning discussed in the previous section; the idea here is that learning and adaptive

management will be better carried out if actors are willing and able to draw not only on science but also on local and practice-based knowledge. A substantial amount of the research on the integration of science and LEK has been done in the context of the Pacific and even in the Solomon Islands, particularly with regard to how to integrate CMT with ecosystem-based approaches to resource management (e.g. Foale and Manele 2004, Cinner and Aswani 2007, Aswani 2011, Bennett 2012). Researchers who work on these topics are frequently involved in CBRM in the Solomon Islands as partners to NGOs and as policy advisors, which seems to help integrate this perspective into inshore fisheries governance. Participants at the national level showed a striking openness to the idea of combining LEK with Western forms of science, with several participants indicating awareness of academic discourse on the value of and challenges with incorporating multiple types of knowledge into decision making processes. A few NGO professionals had contributed or even led the publishing of papers on this topic.

The majority of participants at the national level suggested that both LEK and Western approaches to science are valuable and necessary for successful management. When asked about how they approach LEK, many NGO participants brought up participatory mapping as one way to draw on local knowledge. Others mentioned using it as a starting point for where to survey for certain species (e.g. dugong), or where to set up a protected area for spawning fish. One NGO professional eagerly described this process:

> In science…I'm almost throwing up my master's thesis. In science and ecological knowledge…I make them run parallel, so they…cross each other through ground-truthing, or through maps, or like I might conduct a surfvey, that's local ecological knowledge. Do you have dugongs here?...when was the last time you saw it?...And then you run a survey. You run a ground-truthing survey. Or you look at sat images. That's when you know that, yah the same dugong, which they said they saw, around this time…scientifically that's when it does it's breeding. (Interview 9)

In addition to using LEK to inform their efforts, NGOs and researchers pointed out that science in turn can supplement local communities' knowledge in order to improve their management practices. One example that was frequently mentioned was fish spawning, as described by this NGO professional:

> This is what communities, again the science part of they don't understand…They just see it every, for them it's every new moon I'll go there and I'll catch ten fish and, but…because of commercial, when it went commercial side of things that's what's made it really…so live fish trade is banned here. (Interview 10)

This participant proceeded to recount a story in which local communities had let foreign industries know where fish aggregated for spawning, and had allowed these companies to take all the fish because they did not understand that this is when they were reproducing. Several other NGOs and researchers touched on this or similar stories, emphasizing that explaining breeding was an important component of workshops they held at the local level.

The narrative regarding how LEK and science are combined in resource management in the Solomon Islands was surprisingly consistent between the local level and the national level. A local fisher described, for example, how science was added to their community's existing knowledge of fish spawning aggregations:

> In our areas, we normally see the school of fish…It's the season to, they grouping, go in group. So by the time we saw that one, we still go and kill it…we enjoy harvesting when they come into group. Man, we kill a lot of them...without realizing that, [workshop] give us demonstration about the breeding matters…so now, when we look fish in group, we just ignore them, we just make sure they can breed a lot. (Interview B3)

In both Honiara and the Marovo Lagoon village, discussion of combining science and LEK focused in on a few topics in particular: spawning aggregations, ecosystem connections, size of sexual maturity in reef fish, habitat protection, and the benefits of rotational closures of reef areas to fishing. These narratives became the focus of the KG analysis, which enables a more nuanced conversation of "openness to different types of knowledge" in this context. Before jumping into this part of the analysis, the overall potential of the FMA (2015) to catalyze a shift towards AG is summarized in the next section.

4.1.9 Summary of Adaptive Governance Elements

It is difficult to predict the extent to which the FMA (2015) will enable adaptive governance because so much depends on the nuances of how it is implemented. However, the

analysis here shows several areas where inshore fisheries governance is beginning to reflect some elements of adaptive governance. A summary of each element is provided below:

- **Bioregional Fit:** There is no immediate change to bioregional fit brought about by the Act. Some improvement to fit could be brought about if adjacent communities are able to register plans for their tenure areas such that their collective areas encompass key aspects of the marine ecosystem (e.g. adult fish habitat *and* mangrove nursery areas are registered).
- **Boundaries:** The Act increases the clarity of boundaries for locally managed marine areas, but it is unclear whether or not that will increase or decrease adaptiveness in this context. It may make it more difficult for some communities to come to consensus than if clear boundaries were not required.
- **Nested Polycentricity:** The Act indicates a slight shift towards increased polycentricity by formalizing the role of local councils in management decisions. Plans will still need to be approved at the national level, indicating that a fair degree of centrality is retained. However, this comes along with interview comments from government staff indicating an interest in expanding the CBRM unit and the role of MFMR as a coordinating body for government and NGO CBRM projects. The suggestion for polycentricity recognizes a need to balance bottom-up decentralized approaches with centralized coordination; inshore fisheries governance seems to be towards the centralized end of the spectrum at the moment, but with the help of the Act and the growth of the CBRM unit, it may be starting to move towards a more decentralized approach.
- **Enforcement and Conflict Resolution:** The Act reflects this suggestion for AG because it provides a mechanism for internal and external enforcement and conflict resolution. The community committees provide an internal mechanism that fits with existing governance arrangements in most communities, while registering community rules as a bylaw allows for external support through the government police and court system. The social impacts of adding this external source of enforcement within a customary system should be monitored carefully to determine whether this actually increases adaptiveness or in fact decreases it by damaging intra- or inter- community relationships.
- **Inclusive Participation:** The requirement for local committees indicates recognition within the Act of the importance of including local decision-makers in nationally-

enforced fisheries management. This does not inherently indicate a value for participation because it is essentially mandatory under the Constitution (i.e.: recognition of the rights of tenure holders over their resources). However, the explicit attention to including a local governance structure and the mention of the need for consultation for both plan creation and revision does suggest intentional emphasis on participation. At broader geographic scales, it is likely that only communities with strong governance will be able to benefit from the Act. Overall, there is a slight shift towards inclusive participation, but this would be better realized if mechanisms for supporting communities with weaker governance were included. Alternatively, other options outside of the Act may need to be developed for these communities.

- **Leadership:** Key leaders present at both the national and local level reinforce the suggestion that individual leaders play an important role in adaptive governance. The FMA (2015) will not necessarily increase the number of key leaders at the local level, but it does provide a new option for existing leaders to improve reef management. If these leaders are able to successfully improve management through submitting plans under the Act, this may inspire other community leaders to take action. Overall, this element of adaptive governance is supported and potentially improved by the introduction of the FMA (2015).
- **Experimentation and Learning:** Governance actors are generally very supportive of an AM approach and frequently mentioned the importance of lessons learned from CBRM. The extent to which the Act enables or hinders this positive stance towards AM is dependent on how the regulations and SOPs for the Act are developed. Therefore the Act overall has potential to increase the degree to which inshore governance reflects this principle of AG.
- **Inclusion of Multiple Types of Knowledge:** Actors in this SES are open to the use of multiple types of knowledge, especially in terms of using LEK to find focus areas for conservation and management. Participants frequently mentioned scientific assessments are used to confirm information provided through locals' LEK. The Act requires information about tenure boundaries and rights (part of LEK) and also habitat assessments and regular monitoring (science). In this initial assessment, this suggests that

the Act reflects this suggestion for AG because plans will be inclusive of both types of knowledge, but this will be explored more deeply in the next section.

From the above summary, the elements of AG most likely to emerge through implementation of the Act, and through the continued work of inshore fisheries governance actors more broadly, are enforcement, participation, leadership, experimentation, and openness to multiple types of knowledge. The regulations and SOPs will be critical to the successful realization of these potential elements of AG. Continuing to assess the Act with specific attention to these elements could provide an opportunity to witness the emergence of adaptive governance, or to better understand the barriers that prevent its emergence. The next section provides some insight into potential barriers to watch for in regard to the AG suggestion for the inclusion of multiple types of knowledge.

4.2 Knowledge Governance Arrangements

This section provides an empirical analysis of knowledge governance in the context of inshore fisheries governance and the FMA (2015) in particular. The knowledge governance framework was developed to consider how specific knowledge-to-action interventions fit into the broader cultural context where they are implemented; this allows researchers to "examine whether interventions conform with existing knowledge governance arrangements, or challenge them, and consider the implications of this in relation to their goals" (van Kerkhoff and Pilbeam 2017). Here, the "intervention" is the FMA (2015), and more specifically the management plans that can be submitted to the government under this act. The goal of this intervention, as indicated within interviews, is to improve enforcement of local fisheries rules by allowing communities to call on the government for assistance, specifically through police and court systems. The broader cultural context of inshore fisheries governance explored through the civic epistemologies lens includes the hybrid system of local-level CMT alongside the western-style MFMR. The knowledge system is defined by (van Kerkhoff and Szlezak 2016) as the network of actors that combines knowledge with action and learning (see Sec. 3.4: *Frameworks for Data Analysis*). Here this includes local tribes and leaders, the MFMR and MECCDM, and the various NGOs that work with the government to manage marine resources.

In this analysis, I focus on the implications of the text describing the substantive and procedural requirements for the submission of community plans under the Act (i.e., Section 17-18, and the Second Schedule) and supplement this with data gathered through the interviews at the national and local level. This analysis is organized into three sections, reflecting the KG "layers" of civic epistemologies, knowledge systems, and interventions described by van Kerkhoff and Pilbeam (2017). Interviews, especially those at the local level but inclusive of those at the national level, formed the bulk of the data used to describe the civic epistemology that underlies inshore fisheries governance, and the knowledge systems that structure knowledge-action interactions within these governance arrangements. The text of the Act, supplemented with interview information from those who contributed to drafting the Act, is the primary data used to investigate the Act, to specifically determine how the local fisheries management plans might align with existing KG arrangements.

4.2.1 Civic Epistemologies

This section addresses the KG question "what are the deep-seated patterns that structure the governance of knowledge?" The left two columns of Table 2 guided the questions for analysis for this section, bringing the focus to dominant styles of knowledge making, public accountability, foundations for expertise, demonstrations of effectiveness, transparency, and practices for securing objectivity. Here I step back from the FMA (2015) and allow the broader context in which decisions are made about inshore fisheries to become the subject of analysis. This includes past actions by the government and NGOs working in co-management relationships with communities, as well as how communities operate on their own via customary management systems. This draws on data from interviews with actors at both levels, and on limited participant observation from time spent at national conferences and in one local village. It does touch on the specifics of the Act at times, because one way to identify norms was to ask questions about the barriers and catalysts for registering a plan under the Act. This section offers a basic, limited understanding of the norms around knowledge use in the Solomon Islands capital city and in one village with a particularly high level of exposure to western culture; it does not try to paint a comprehensive picture of all the nuances of Solomon Islands culture, which is incredibly diverse and would require significantly more time in the field at multiple villages with

varying levels of exposure to western influences. It does, however, provide some insight into the value of utilizing the KG framework within an AG analysis in a non-western setting.

The first element of civic epistemologies framework, "dominant styles of knowledge-making," considers which types of knowledge are chosen for use in management actions, with an emphasis on the *process* by which this occurs. Here a major theme that arose was 'consensus.' At the local level, participants frequently emphasized the need to be of "one mind" when asked what was required to successfully register a plan, or to regulate fisheries in general. Similar to the findings of van Kerkhoff and Pilbeam (2017) in Palau, consensus was key to making decisions about fisheries or any other subject affecting the community. When asked about barriers to submitting a plan, or putting rules in place in any form, community participants lamented the lack of ability to form consensus around decisions. One local fisher emphasized, "looking at this community, they are not really one…some people they want something to benefit their future generations, some people they just don't interested in that" (Interview B4). Another fisher, in discussing the desired state for community fisheries, stated "…we want to keep [our sea]. And replant the stone again, and everything like that…so our communities will be one, and manage our place again" (B5). Here, the use of the word "keep" essentially means sustain, and "replant the stone" is referring to the need to restore coral habitats. Across many interviews this theme of needing to come together was brought up, with many blaming the fragmentation in the community on the younger generation. Regardless of why this fragmentation is occurring, that this was so frequently mentioned as a critical issue indicates a strong desire for consensus in decision making. This resonates with the previous discussion of NGOs refusing to work with communities that did not appear to be in agreement about the desire for NGO engagement or that were involved in disputes over tenure area boundaries (see Sec. 4.1.2: *Boundaries*). Communities and NGOs seem well aware that consensus is the prominent mode of decision making and that management interventions that do not take this into account will likely fail.

At both the national and local level, consultation with the entire community was considered essential to making any viable decision about marine resources. This relates to the KG element of "transparency," and fits naturally with the consensus approach to decision making. This aspect of civic epistemologies focuses on the visibility of experts and the expectations around how the public is involved in knowledge-making and decision making.

When asked to describe their process for engaging with communities, all four of the environmental NGOs operating in the country identified multiple consultations with communities as key for success. One NGO professional stated, "in my own experience working with fisheries in the rural community, it only works well when there was…transparency. Open up and, is inclusive. You don't pick his own members from his own family kind of thing." In other words, consultations had to be done with all of the community in order for a community to view the process as transparent, and to thereby be willing to come to consensus around management practices.

The importance of consultation was also emphasized by local participants in discussing how decisions are made outside of NGO or government co-management situations; these participants live in a village without these arrangements. When local community members were asked how decisions are made in the community for any topic, including fisheries, they described meeting as a group, having individuals suggest ideas to the group, and then voting on desired outcomes. The importance of making collective decisions involving consultation with all members of the community arose in initial interviews when I naively attempted to ask who the "decision-makers" were in the community. Participants, especially community leaders, recoiled from the label "decision-maker." One leader used the example of someone from a different village requesting to use the communities' resources by writing a letter:

> Local leader (Interview B1): I take the letter and read to the community and explain to the community what is in the letter. And if the community agree, because the community can either disagree or agree. I explain to them that they will decide, and okay we agree, or no no no no, we do not agree.
>
> Interviewer: Okay…so you're the spokesperson, but you do it with everyone, get everyone's permission.
>
> Local leader: Not a decision-maker, no.

This leader was adamant that I not refer to them as a decision-maker, which made them visibly uncomfortable. Descriptions of community meetings by local participants consistently described decisions as collective, with no one ever saying anything other than "the community decides," no matter how carefully I asked if there were specific people who made decisions. The most detailed information I was given was that if a few community members, perhaps five or less, disagreed with a point, they were usually ignored and the decision was made anyway, but if

larger groups disagreed the decision would not be made. I was not able to compare this to my own observations because no community meetings occurred while I was living in the village, or at least none that I was made aware of—most participants indicated that community meetings happened rarely. Though I was only able to draw from interviews, consultation is clearly seen by both NGO professionals and community residents as the process necessary to verify that all relevant stakeholders were included and to create transparency, which was considered critical for reaching consensus.

More general observations from participating in daily life in this village suggest that while this insistence on an inclusive, consultative process is considered a general best practice in the Solomon Islands, it may be particularly emphasized in this village because of the status of their customary system. Informal conversations and some responses within interviews indicated that the chief of the village had lost the respect of the community relatively recently, perhaps in the last thirty years. This seemed to have to do with community members perceiving the chief as greedy because he had taken the bulk of new money brought in by foreign industry (e.g. live fish trade) and possibly by conservation organizations. I did not probe this extensively to verify all the details during interviews because it was a very sensitive topic, but given that the introduction of a cash economy has been documented as a cause of conflict, jealousy, and the decline of customary systems in other parts of the Solomon Islands (e.g. Johannes 1978, Ruddle et al. 1992, Hviding and Baines 1994, MacIntyre and Foale 2004), it is not surprising that this seems to have occurred in a village with easy access to a ferry port and therefore extensive exposure to processes of westernization. As a result of this conflict with the chief, the community is now governed by a community council led by an elected chairperson, but this arrangement is new and it was unclear whether all members of the community endorsed it. The community was described as fragmented both by local residents and by foreign researchers who had worked there in the past. One researcher noted that the strongest leadership at the time they worked there came from a women's group within the church, but that it took more than a year for this group to speak openly even though (or perhaps because) this researcher was from their province (Interview #16). Although I encountered this group they did not seem to have participated in workshops relevant to the FMA (2015) and were quite hesitant to interact with me. Overall, the governance dynamics of this community were quite complex and seemingly in a period of transition; I do not claim here to have a complete understanding but do think that this has a bearing on the civic

epistemology within the village. Specifically, the decline of the chief's power and rise of a new democratic governance arrangement may be leading local participants to de-emphasize the power of individuals in decision making, and instead emphasize the importance of inclusiveness and transparency more than they would have otherwise.

The collective, "community decides" mantra raises questions about who might be seen as an expert in the community and what roles these experts have in decision making. Pertaining to Jasanoff's (2005) "foundations for expertise," at the local level there seemed to be disagreement and uncertainty around who serves as an expert in the community, but seeming agreement that no one person, even an expert, would be responsible for making decisions about the fishery. Contrary to situations where customary governance is still strong, there did not seem to be many widely-respected elders in the community who were seen to hold substantial knowledge about fisheries, with the exception of one or two fishers. These fishers were primarily respected for their ability to find and catch specific species of fish, rather than for their knowledge of management practices. There did, however, seem to be relatively widespread respect for foreign experts who had come in either through NGOs or MFMR to give workshops on fishing and management best practices. Many participants noted that information like the size of fish to catch to ensure reproduction, and the need for sufficient coral and mangrove habitat to support fish populations, was useful, but no rules have been put in place in the community that would bring this knowledge to action. Overall, the community seems to be in a transition towards more western concepts of scientists as experts, but there is still some residual respect for the few knowledgeable fishers in the community.

The means by which locals might attempt to discern who deserves the title of *expert* relate closely to two the other civic epistemology themes of *public accountability* and *demonstration practices*. Public accountability has to do with how knowledge is tested by the public and deemed trustworthy, while demonstration practices relate to how the outcomes of the application of knowledge are shown to the public. In this context, the two combine—knowledge is tested in practice and deemed trustworthy if it produces the benefits it claims to provide. This is illustrated by a participant asked to reflect on whether or not workshop content was true: "we use [workshop information], then we can find out, oh it's true, oh, it's not work, it's not true. We can feel it, and we can know it, we can see" (Interview B2). In other words, knowledge must be tested directly by the public rather than presented by experts or tested through experiments;

something is true if it is experienced first-hand. This aspect of epistemology underlies how science and LEK are deemed credible, as discussed in the *Knowledge Systems* section.

The final theme of "securing objectivity" manifested much differently in this context than in the western contexts to which Jasanoff (2005) first applied it (e.g. U.S.). Objectivity here is the idea that "knowledge looks the same from every standpoint in society; it is untainted by bias and independent of the claimant's subjective preferences" (Jasanoff 2005). Jasanoff (2005) described states as seeking to secure objectivity, or at least the appearance of objectivity, in their knowledge claims; van Kerkhoff and Pilbeam (2017), however, found that objectivity was not valued at the local level in Palau except for use in communicating to external, international audiences. In Bili village, local residents were concerned with objectivity in the sense that the consensus process meant that everyone's voice needed to be considered, even those who disagreed with recommended best practices for fisheries management. Overall they seemed less concerned with whether knowledge itself was subject to bias, and more concerned with who would benefit from its use (does it serve the preferences of the claimant?). Although none of the participants indicated disagreement with ideas discussed in workshops (e.g., not fishing during spawning aggregations), one local participant (Interview B13) mentioned that others would sometimes disagree with these recommendations: "some maybe not believe, 'ah no, the fish will, you know one fish, deliver so much thousand eggs…how come will the fish will getting finished,' they said." This difference in opinion between community members appears to be what is keeping them from coming to consensus around fisheries rules, which seems to indicate a value for objectivity in the sense that there is enough respect for diverging views for the community to avoid making a decision.

4.2.2 Knowledge Systems

This section represents the second nested layer in van Kerkhoff and Pilbeam's (2017) framework, which has been slightly modified here to ask "how do institutional arrangements shape the boundary between science and LEK, and decision making?" (Figure 2). The knowledge systems layer of the KG framework considers networks of actors that compose the knowledge system(s), and examines how these actors work to present knowledge as credible, legitimate, and salient to the concerns of decision-makers. This is influenced by the civic epistemology just described, with many points of connection between different aspects of

epistemology and elements of knowledge systems (van Kerkhoff and Pilbeam 2017). For instance, credibility within the knowledge systems concept is closely related to public accountability and expertise. While civic epistemology focuses on broad patterns within society, the knowledge systems part of the framework focuses on how scientific information (or, in this case, any type of knowledge) is perceived as a result of these underlying epistemologies. This framework was previously applied to the use of science by a specific boundary institution, a protected area network (van Kerkhoff and Pilbeam 2017), but in this study I apply it to the more informal network of local communities, NGOs, and government ministries responsible for inshore fisheries in the Solomon Islands. I evaluate how these actors navigate between science and LEK when working with local communities, including the village I stayed in. This analysis is primarily limited to the perspectives of NGO and government participants, because it was not feasible to travel to do interviews in all the places where these actors engage. Interviews conducted in Bili village offer at least some sense of a local perspective but are not representative of all villages given the diversity of tribal cultures across the archipelago.

In the context of inshore fisheries governance, and the community plans aspect of the Act in particular, there are two distinct bodies of decision-makers to consider when analyzing knowledge systems: local level leaders and committees, and national level government professionals (Figure 2). To create a community fisheries management plan that meets the criteria set forth in the Act, both local committees and government professionals responsible for approving plans will need to see the content of the plans as salient, credible, and legitimate. It is likely that the actors at the boundary between these decision making bodies will be environmental NGOs, who are experienced with navigating the boundary between local communities and international funders. The growing role of the MFMR CBRM unit in hands-on, local level work likely means that they will share this role with NGOs during the implementation of the FMA (2015). One NGO participant described this role of moving knowledge across the boundary between local and national or international decision-makers quite directly:

> You have science there, to satisfy this part of the world [pointing at donors in a self-drawn diagram], so they are seeing that you have science. You make and show those alignments and linkages with local and cultural knowledge. Which makes this part of the world view it [pointing at communities on diagram]. That

has been one of my selling points…I communicate complex knowledge, across this belt. (Interview 9)

This confirms the role of NGOs as boundary organizations operating between communities at the local scale and donors at the international scale. It also has implications for how knowledge is established as credible between these audiences, which is discussed in the next section.

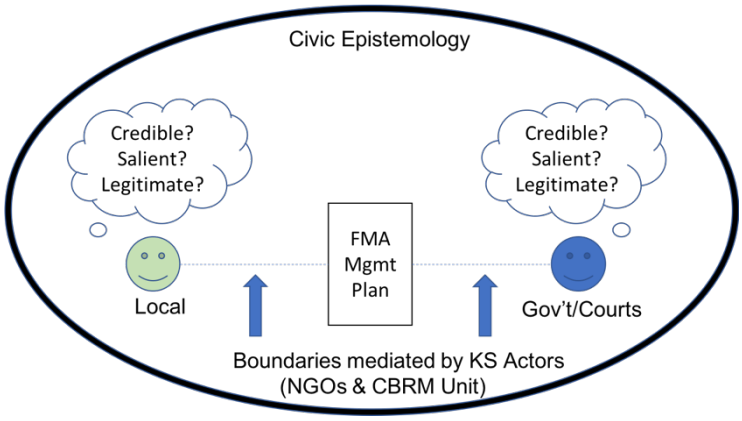

Figure 2. Visualization of knowledge systems and boundary work by NGOs.

This relationship between decision-makers, plans, and NGO actors along with the CBRM Unit is depicted in Figure 3. Several NGOs have also gained experience operating at the boundary between communities and government professionals when crafting plans to register under the PAA (2010). At this stage only a couple of plans have been submitted under the FMA(2015), and the government is still finalizing processes for approving them, therefore these previous instances of boundary work by NGOs will be the focus of analysis here. Given the similarities between the PAA (2010) and the FMA (2015), along with the similarities in the types of information desired by the MFMR and by international funders (e.g. monitoring data, amount of area under protection or active management), this analysis should be able to provide some insight into how these NGOs might navigate this boundary when submitting plans under the FMA (2015).

4.2.2.1 Credibility

The discussion of public accountability and demonstration practices in the *Civic Epistemologies* section has immediate bearing on how different types of knowledge are determined to be credible in a local setting. Cash et al. (2003) defined credibility as "the scientific adequacy of the technical evidence and arguments." This definition was used in sustainability science research and therefore was specifically interested in science; by

incorporating the civic epistemologies lens here, the knowledge governance approach asks a broader question of how any evidence or knowledge is considered to be reliable or sound (van Kerkhoff and Pilbeam 2017), rather than assuming that this soundness comes from being "scientifically adequate" (Cash et al. 2003). In this context, there is an emphasis on the need for knowledge to be produced by individuals themselves, which makes the credibility and legitimacy of knowledge in the eyes of local residents closely interrelated. In this section I focus on credibility, but this is linked to the section on legitimacy because both aspects of the knowledge system relate closely to the concept of participation.

Interviews with NGO professionals indicated that NGOs have needed to bring science to communities in a way that allows community members to test this knowledge through their own experience. NGO and government participants frequently mentioned the importance of training communities on monitoring and management practices, so that they could do this independent from outside help. Though this seems motivated in part by a need to expand capacity beyond the limited resources of these actors, it has the effect of giving local residents an opportunity for hands-on learning that brings them directly into the knowledge-making process. Community level participants frequently commented on this. One local leader emphasized:

> In our culture…people want to see first. People want to prove and people want to see first, still working, or no…This is one type of our culture. Our black people have this type…they want to prove. And if they prove…okay, register it.
> (Interview B6)

In the above quote, the leader is discussing the information provided through workshops, such as suggestions to try a rotational closure or introduce catch size limits. This participant emphasizes the importance of "proving" through seeing how well a recommendation works before finalizing it in a plan to be submitted under the Act. This relates back to the concepts of *public accountability* and *demonstration practices*, which underlie this use of experience for establishing the credibility of knowledge. Rather than evaluating knowledge based on whether it follows a certain approach (e.g. scientific method), credibility is about whether or not it generates the benefits it claims to deliver, as determined by an individual directly.

An example of credible knowledge came from a narrative that emerged about a particular elderly fisher who was considered to be one of the few with expert knowledge on the habits of fish and the best means of catching different species. This story emerged from an interview with

this fisher and comments by two others on this individual's role in the community. The fisher demonstrated deep knowledge of fishing garnered over time from older family members. This individual would secure buoys on the reef to indicate to other fishers where to go for certain kinds of fish. From this fisher's perspective, the problems the community experienced with lower catches were in part the result of not knowing how to fish well, rather than there just not being enough fish:

> [Fish populations] not as different [as before]. All those people who just go out fishing, they find it hard…because they don't know where to, to catch at this time…or they don't know so for them it's hard. But yah, not like before…before you go out fishing, every time you catch. Now you really need to be specializing …then you can catch. (Interview B14)

A younger fisher mentioned the usefulness of these buoys (Interview B5), while another community member criticized the elderly fisher for doing this on the grounds that it leads to depletion of the fish stock (Interview B13). This latter fisher complained:

> The moon small they say 'oh, one, this type of fish, they will heap (spawn) at this spot, then all the small kids, they go and catch the fish…so, I think that elder people should stop doing that…so that they, so that nobody knows, then the fish will put more eggs in. (Interview B13)

Regardless of these differing positions, these participants indicated obvious belief that the LEK possessed by this fisher leads to increased catches and is therefore credible.

Another way of gaining credibility, mentioned by two participants (one NGO and one local resident), was the use of visuals and particularly showing videos of successful management practices in similar contexts, such as other Pacific islands. The local resident, a teacher, commented, "show [the community] the clip, the poster…some people, when they talk, they never believe, but when they show in reality…to show the lifestyle, or the cycle of the fish, and the type of benefits…so that we can get the good benefit" (Interview B3). This format of sharing information seems as close as someone can get to personal experience without actually getting it, which would fit into the experience-based aspect of the epistemology of the village. In summary, NGOs build credibility at the local scale by allowing individuals to test knowledge themselves, and by showing videos that demonstrate how management practices have worked in other settings.

Building credibility at the national scale seems to require a different approach to presenting knowledge; this could be detected in a conversation that emerged around the purpose of reef monitoring and of training communities to do this. NGOs and government participants emphasized the need to find monitoring methods that produce quality data but also are easy for communities to carry out. However, there were differences between interviewees at the national level regarding which of these two goals for training communities is important, and this is one place where differences in how credibility is established between the local and national scale came out. The study participants concerned with establishing credibility at the local scale emphasized the value of hands-on participation for building trust in management practices, while most others, especially government professionals, were more concerned with the need to measure progress using the data that trained local residents could produce. This seems to indicate a concern for establishing the credibility of management efforts in the eyes of decision-makers at the national scale. This difference in emphasis around monitoring came out in discussions of how to measure the success of periodically closed areas or bans on fishing certain species of fish. One government professional explained:

> The importance of monitoring is to really find out whether their management plan is working or not…if their reefs are improving or their ecosystems are improving or not. Based on the baseline surveys and the trend of the information, the data that is collected. (Interview 6)

An NGO professional agreed with this, though they emphasized that the data was meant for communities:

> We'll help train and stuff…how can we get the communities to monitor…not for us, but monitor their own progress using their management plans. (Interview 10)

In contrast, a researcher noted:

> All of the monitoring is really just…the benefits of it are about participation, getting people engaged, in physically doing things in the environment. Rather than just holding meetings, and talking about it… (Interview 3)

The first two participants appear to be interested in establishing credibility at the national scale, while the latter is concerned with the local scale; participation was viewed as necessary for building credibility locally, while sufficient data was needed for building credibility in the eyes of government professionals at the national level. The second quote, by the NGO participant, is

interesting because suggesting monitoring is for communities, and not NGOs or government, assumes that this is the sort of knowledge communities consider to be a credible way to know if progress is being made. This does not seem to align with the focus on testing through experience (e.g., do fishers think they catch more fish after a rotational closure), but does point towards what may be a bit of a shift or at least a dichotomy in how actors at the local level are testing knowledge. There were a few participants at the local level who mentioned that monitoring could be used to track the success of a management method; these tended to be individuals who had participated in the work of NGOs in the past. One leader mentioned "we close this mpa area…we put the baseline here, we pull the tape measure, just see" (Interview B6). This may indicate that NGO emphasis on monitoring during engagement with communities may be starting to shift the community towards seeing monitoring as a method for building credible knowledge.

4.2.2.2 Legitimacy

Legitimacy is defined by Cash et al. (2003) as "the perception that the production of information and technology has been respectful of stakeholders' divergent values and beliefs, unbiased in its conduct, and fair in its treatment of opposing views and interests." This element of knowledge systems is difficult to tease out from credibility in a context where, at the local level at least, knowledge is considered credible based in part on the process by which it was produced (participatory). In essence, there is a dual purpose for participation in knowledge creation and testing at the local level. Regarding credibility, participation is meant to give individuals the opportunity to test knowledge. Regarding legitimacy, participation is about demonstrating that the right individuals are included in the process, so that local residents feel that knowledge in being generated and used in a way that is respectful of the community. This latter purpose is the focus for discussion here.

The concept of legitimacy brings attention to the process for how NGOs and researchers engage with communities overall, in addition to the specific methods of knowledge-making they employ. The ability to even engage with a community in the Solomon Islands has to do with whether or not communities view the overall projects of NGOs or researchers as legitimate. Van Kerkhoff and Pilbeam (2017) operationalize legitimacy by looking at whose version of the "desired outcome" dominates and why, which brings attention to why NGOs and researchers

engage with communities in the first place—do they engage to bring about the outcomes desired by communities, or the outcomes desired by their donors or organization? This is a very sensitive topic in this context due to past conflicts between NGOs and communities regarding whether biodiversity conservation or improved livelihoods should be prioritized (Walter and Hamilton 2014). There has recently been an apparent shift towards more intentionally serving the needs of communities, for instance by seeking to directly improve livelihoods (Walter and Hamilton 2014). There were two keys for establishing the legitimacy of a project (and therefore its overall success) in the eyes of community residents. First, projects needed to demonstrate that they would bring tangible benefits to communities; this was mentioned by all four NGOs and by government professionals. One NGO professional recounted:

> Two other instances, one that is driven by science, one that is driven by community. Science in fact…like places spawning aggregation site. It is science-driven. So if I go and tell them, oh your place very important, that's a spawning aggregation site…they don't *care*. Biodiversity, people in the community they don't care about it. Even, even if you tell them how special their place is…but if, if it is initiated by them, if they see that it is, oh, it is important, and they inclusive of not only, not only just reefs, but include, all that sort of other part of livelihood, include, it resonates. It resonates. (Interview 11)

In other words, the engagement of this NGO resonated (i.e. was seen as legitimate) when the desired outcomes of the community (e.g. livelihood improvement) were emphasized rather than the desired outcome of the NGO and its donors (e.g. biodiversity conservation). In discussing similar work by the government, a local leader pointed out:

> When we talk about natural resources, very important because the only thing that we benefits. You know? So when the government was bring some laws or policy to the local people, they will be closing the other areas that the local people continue to get the money to pay, fees for their children…So when we come to close it mpa area. Or we doing other things that we close everything…is stop me to harvesting, then where…I go to bring, to bring the income, you know? (Interview B6)

The need to transition from a conservation focus to a livelihood focus has been reported to some extent in the literature (e.g. Schwarz et al. 2011, Walter and Hamilton 2014) and was a prominent theme at both the national and local level.

The second key to establishing legitimacy was that NGOs needed to enter communities through the right people, and ensure that their approaches were inclusive and not seen to benefit any one family or sector of the village more than others. The importance of entering communities with no strings attached, for instance, without particular ties to specific individuals within the community, was discussed in the early analysis of AG elements (see Sec. 4.1.5: *Inclusive Participation* for a more detailed discussion). This emphasizes the tie between the AG suggestion for inclusive participation and the establishment of legitimacy within knowledge systems at the local level. Local actors seem to determine whether or not the production of knowledge is considered unbiased (and therefore legitimate) in its conduct based on if they were involved in creating it, as this entails that their interests are being fairly considered. As discussed earlier, the relatively recent shift towards a more democratic system of community-level governance in Bili Village may have increased residents' emphasis on broad participation in knowledge processes as especially necessary for establishing legitimacy. Nonetheless, interviews with NGOs who had worked across multiple communities indicated that this value for inclusion was commonly held at the local level (see 4.1.5: *Inclusive Participation*).

The importance of entering a community in the right way is an ethic reflected in national legislation that requires that researchers, including myself, must seek permission to do research not only from the national government but also from the leader of the relevant village. My position as a researcher provided a unique opportunity for reflexive observations of how I myself navigated the process of establishing legitimacy. As a researcher, the legitimacy of my own project was challenged by local residents who wanted to know what my project would do for them (or who had suggestions on what they wanted out of it); this came up in at least four interviews, usually with local leaders. One leader wanted to make sure my results would be reported back to the government (which they will be), and another wanted to know what the community would get directly (e.g. a summary sheet of results). It appeared that some research had been done there in the past with little follow up from researchers (though there were also cases where researchers had followed up). One leader refused to interview with me until he had asked me a series of questions about what motivates my research, and then took a week to think

about my consent form before agreeing to participate. In all cases it was critical to be clear about how my project would or would not benefit them, and also about how it would benefit me (e.g. getting a degree). My own experiences clearly reflected the experiences of interview participants regarding the importance of recognizing the priorities of communities, and of entering into a community through local leaders but also through being completely open and transparent with all members of the community.

Overall, legitimacy of knowledge at the local level comes not only from how a project is carried out (e.g. through participatory monitoring), but also how a project is initiated in the first place. Although NGOs must meet the goals of their donors, which often have more to do with biodiversity, the importance of delivering tangible benefits to communities, especially for big NGO projects, was emphasized at the national level and echoed at the local level. However, even when information was considered to be credible and legitimate at the local level, it did not always appear to be salient.

4.2.2.3 Salience

The salience of knowledge has to do with its relevance to the needs of decision-makers. The questions I modified from van Kerkhoff and Pilbeam's (2017) framework revolve around how visible decision-makers needs are to knowledge-producers, what processes enable this visibility, and whose interests are included or excluded during that process. One way to get at the salience of knowledge is to consider whose knowledge wins out when a conflict arises between science and LEK. In van Kerkhoff and Pilbeam's (2017) study of Palau, a conflict around how mangroves are managed revealed that even though available science suggests retaining mangroves is better for coastal ecosystems, locals would frequently cut them down to provide channels for their boats. At the local level in the Marovo Lagoon, a similar phenomenon seemed to occur in relation to whether or not certain marine areas were closed to fishing on a rotational basis—this is where salience can be examined more closely.

The village I lived in once had a protected area for a spawning aggregation, and two marine managed areas with a rotational closure schedule that had been established with assistance from a university researcher and partner NGO. Most village residents remembered this set up, and confirmed not only that rotational closures aligned with their customary systems, but also that they believed this was a reliable way to manage resources. Despite this, there were no

areas actively managed while I was there, except for a small and poorly enforced protected area in a satellite village, and there seemed to be skepticism around whether the village could manage to reach agreement on revitalizing these management areas. At the same time, when asked what strategy they would employ if they could convince the rest of the village to comply, almost every local participant suggested they would try a rotational area, with some suggesting that they would add catch size limits as well. There is therefore a clear gap between what local residents know will work, and what they are actually doing—in day-to-day life, they fish anywhere for both subsistence and market purposes. In this case, it may be that while there is agreement on the legitimacy of the management technique, a difference is arising regarding whether or not the information is regarded as salient by those seeking different "desired outcomes." In the *Civic Epistemologies* section I discussed local concerns that the community is not of "one mind." Some actors at the local level want fisheries managed, while they report that others just want to fish—it appears that those with the latter goal are currently dominating action in this village. Additional interviews are needed to better understand if this is because these actors do not find scientific or even LEK-based recommendations for rotational closures to be credible, or if it is just not considered to be relevant enough to their goals.

A second story related to salience comes out of observations from participation in the coral farming project. Scientific research has provided the basic understanding that although corals look like rocks, they are actually relatively fragile colonies of animals that collectively build the calcium carbonate structures that give them their rock-like appearance. This understanding has driven environmental education efforts in places like Hawaii that instruct snorkelers and swimmers not to stand on coral; in places heavily frequently by snorkelers, the tops of coral heads are typically flat and dead because many people stand on them to take a break from swimming, crushing the calcium carbonate structures. In Marovo Lagoon, coral was frequently referred to as "rock," and islanders did not hesitate to stand on them even when I repeatedly tried to explain why that was a bad idea. They either laughed at the suggestion or just ignored me completely; this occurred even with rangers who had been trained in conservation and basic marine biology by NGOs. This is a clear instance where scientific information draws a different conclusion than local knowledge, and as with van Kerkhoff and Pilbeam's (2017) mangrove example, local knowledge, or at least the desire to take a break from swimming, appears to win.

In the cases of both the managed areas and standing on coral, local residents are, for the most part, aware of scientific information (and LEK/CMT, in the case of rotational closures) but do not follow it. It is, however, difficult to parse out whether this is because the scientific information itself is not considered salient, or because decisions are being made for a different reason altogether (e.g. the need for cash outweighs the need to manage for long-term outcomes). Perhaps the decision to not close an area or to step on coral is based on users seeking a desired outcome (e.g. marketable fish, a break from swimming), regardless of what available information suggests about the best option for marine management. If this is the case, it does not seem possible that any scientific information or LEK crafted with the goal of marine management could be considered salient—what would be relevant is research that is seen to have a direct link to improved livelihoods and well-being.

The category of salience within the KG framework includes consideration of the visibility of the knowledge needs of decision-makers. It seems evident from the conversations at the national level around how science and LEK are used together that the knowledge needs of community residents are relatively well-known, but also that to some degree these gaps are identified by national level actors rather than by local actors themselves. This seems evident in the sort of "show them things they do not otherwise see" language of science filling gaps in LEK (e.g. Interview 10), such as with information on fish reproduction and habitat connectivity. This seems to imply a sense of national actors wanting to impart certain knowledge, rather than wanting to deliver requested knowledge, thus resulting in available information not being salient enough to translate into use. On the other hand, while fishers in the village seemed to be ignoring management recommendations, many local level participants mentioned an appreciation for workshops and a desire for more information about fishing practices from the national level. It is possible that this was mentioned because it is what participants thought I would want to hear as a foreigner, but most requests seemed to be honest. This may indicate that these particular individuals might see scientific research as more salient than others in the community. It is noteworthy that these requests for further workshops were perhaps coming from those with a higher level of education or at least a greater amount of experience with past NGO conservation efforts. I conducted interviews in English, and although participants could choose to respond in pijin, this likely skewed my sample towards more educated residents or at least those with a greater exposure to (and therefore comfort with) foreigners and their ideas. Given this, it may be

that I happened to interview residents who see research as more salient, but who do not have the social power (despite many of them being leaders) to convince the rest of the community of this.

To the limited extent that this community can be taken to represent concerns at the local level, it appears that while scientific research may be done in a way that is considered both credible and legitimate, its salience to local level concerns seems to vary. Shifts in how knowledge is viewed as salient, and even credible, seem to be occurring in the village I visited and likely in other places that have been exposed to NGOs. Future research might look at how both exposure to western conservation practice and level of education affects the way knowledge is received in this context.

4.2.3 Intervention: Community marine management plans within the FMA (2015)

Van Kerkhoff and Pilbeam (2017) posit that an "empirical understanding of socio-cultural practices, power and institutions is necessary to achieve interventions that can operate effectively towards a specific goal." To be successful, actors carrying out a conservation intervention might either align their action with the KG arrangements of the context, or be explicitly aware of the KG arrangements being challenged and of how the intervention may be seeking to change them. In this section the FMA (2015) is considered as an intervention, and is evaluated in terms of the degree to which it might align with the knowledge systems and underlying civic epistemology described in the previous sections. This section is guided by the questions in the far left column of Table 2 (see Sec. 3.4.2: *Characterizing Knowledge Governance*). The provision for the submission of plans described in Section 18 and the associated Second Schedule of the Act is the focus for analysis.

To evaluate the alignment of Section 18 with KG arrangements, attention must be given to both the substance of the plans and the process for their development and approval. The substantive requirements for plans is taken here as an indication of what information will be considered credible, legitimate, and salient by government decision-makers responsible for approving plans.

As described in the Second Schedule, community management plans must include information about the following: the boundaries of any relevant area, the fisheries, the status of the fishery resource, a risk assessment of immediate or potential environmental, economic, social, or cultural threats, a description of the fisheries habitat and ecosystem, any customary

rights, and the regional and international context of the area (3(a-g)). The plans must take into account any other national, provincial or community plans that have been approved or that are in development, and must ensure consistency with any areas that have been registered under the PAA (2010). Finally, the plans must identify management measures and penalties for violating them, indicators for whether or not these measures are effective, requirements for monitoring and assessing progress towards these indicators, and who will be responsible for enforcing these measures. These requirements identify the information that will be considered salient to government decision-makers, and embedded within this are assumptions about what will make a plan credible.

The earlier discussed comments by NGO and government participants regarding the integration of science and LEK makes it immediately obvious that local communities are unlikely to possess the knowledge required for these plans. For instance, being able to describe an ecosystem requires knowing what an ecosystem is; similarly, developing indicators and a monitoring plan implies an understanding of AM. As previously mentioned, things like fish spawning, habitat connectivity, and monitoring processes, among other scientific practices and perspectives, are the focus of environmental education efforts by NGOs and the CBRM Unit, implying that communities otherwise do not have this information and do not utilize practices like habitat surveys or risk assessments. In regard to threats, one government staff member mentioned a situation where something communities considered to be a risk was not found to be a risk during assessment:

> [The communities] come up with the assessment then we guide them, like oh this, that's not really true in your case. We learned that yah, they kind of…they think that a lot of things will disturb their resources, but that specific context, might not even go through. Like for example we just went to one of our sites…when they do reef assessment for some of the species they say that oh, sedimentation will spoil, there is potential risk on sedimentation, there is potential risk from logging, and etcetera, but according to our baseline surveys, they really don't have that threat…They also preserve their forest so there is no such thing like that. There is very good current system there…so their main risk or their threat actually is from their own, they are throwing rubbish in the reef. (Interview 15)

Here, a government survey was used to debunk local perspectives; given that this was a conversation with someone likely involved in approving plans, it seems unlikely that a community plan that contains a risk assessment not validated through surveys is going to pass approval at the national level. As discussed earlier, the use of baseline surveys and regular monitoring by NGOs and the CBRM unit when working with communities suggests that this will be the case not only for risk assessments but also for other content like the description of the fishery and its habitat. All in all, the criteria that plans must meet to be deemed credible at the national level does not seem to account for what local level communities consider to be credible or salient. A comparison to how NGOs have approached plans in the past indicates that not only are there tensions between knowledge systems here, but also that the stringent requirements of the plans may significantly impede the ability of NGOs and the CBRM unit to navigate the boundary between these systems effectively.

Professionals within all four NGOs consistently reported that they had learned to write plans that are no longer than one to two pages. This allows them to create something easily understood by communities, and that can simply be posted on a community billboard. This strategy came after past attempts at more extensive plans were found to be too cumbersome for communities, as explained by a participant with previous NGO experience:

> We [NGOs] all move away from those…when we started we had that long list of criteria, and again it was, it was too complex, for communities themselves. They don't need all that information…we all moved to these one page management plans which, had sort of the key information for the community. Because communities can, of course, do management, they don't need the Act. (Interview 8)

Another NGO professional echoed this when reflecting on an instance where a detailed plan had been attempted:

> Reflecting back on the forms of management plans that we have now, that was the thickest. So it depended on what the community wanted to have in the management plan…for them they wanted everything, like the tribes, the, sort of background information, and then it lead to what the management rules were. And

> penal—so the enforcement section. But a lot of people don't read, so we sort of then went on to just one pagers…it was just like posters. (Interview 13)

The two things prominent in these statement are that 1) plans must be simple, and 2) plans must be about what the *communities* want. This was relatively well accepted, even by government staff responsible for approving plans, and yet the requirements under the Act they helped to write are not aligned with these priorities. One government professional discussed this directly, stating:

> So in the management plan they are going to write everything down. We are going to capture everything, what we are trying to do now is capture everything in the management plan. At first we thought the management plan would be just a very like, one page, two page. But we think ahead and we said oh no, we also have to consider this in the management plan, it should be a document. (Interview 6)

When asked to clarify what was meant by document, this participant confirmed that this would be longer than one or two pages. While NGOs seem to have learned to make plans more relevant to communities by making them shorter, there will now be no choice but to have them be longer. The substantive requirements of the plans suggests that NGOs or the CBRM unit will need to engage with communities to help them produce information that will be considered salient and credible at the national level. This is even acknowledged in the Second Schedule, which reads:

> A community fisheries management plan may provide for the technical assistance if any, to be provided to the applicants by the Director, Provincial Executive and, where appropriate, any competent non-government organization or other such body. (9)

Although the Act invites the participation of NGOs, the requirement for detailed plans simultaneously impedes their strategy of mediating the boundary between the local and national scales by creating simple documents. This seems similar to what happened under the PAA(2010), where the strict criteria at the national level has led to the need for multiple revisions that have been extensive enough that only one plan (for the Arnavons) has actually made it through the registration process.

Looking beyond the substance of plans to the process for their development, the criteria are initially more promising. As discussed in the AG analysis, plans must include the consent of relevant customary rights holders, and must be developed and revised in consultation with these rights holders. This aligns well with established processes of engaging communities in

knowledge-making in order to establish credibility and build legitimacy with communities. At the same time, the second point emphasized in the quotes above indicates that this may not be enough. NGO participants emphasized that the goal of this engagement needs to be about what communities want, which relates back to idea that legitimacy is established not only by engaging the relevant leaders, but also by indicating that communities will reap tangible benefits from NGO or government engagement. Although the Act (2015) is clearly supportive of communities' customary rights, it does not account well for their priorities. The effort to make plans that are salient and credible at the national level is likely to come at the cost of establishing legitimacy at the local level.

This tension between knowledge systems could potentially be better understood if re-conceptualized as a conflict between the epistemology that underlies village society and the epistemology of the formal government enforcement mechanisms (e.g. police, courts) that the plans must adhere to. This is discussed further in the next section.

4.2.4 Modifying the Knowledge Governance Approach to Evaluate Policy

Considering a society as consisting of two different civic epistemologies is different than the earlier depiction of civic epistemology as something that surrounds both the local and national actors (Figure 2), and instead envisions that these two groups of actors are operating within different paradigms with differing epistemologies (Figure 3).

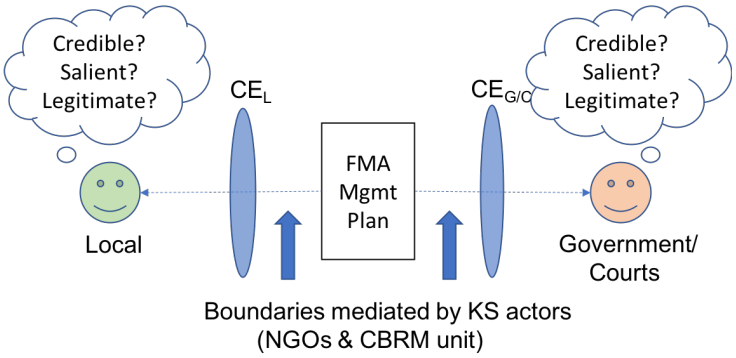

Figure 3. Re-conceptualizing knowledge governance arrangements.

This perspective seems appropriate in a context where governance is a hybrid of a western parliamentary system and a Melanesian customary system. Jasanoff (2005) developed

the civic epistemologies concept to compare the epistemologies of different western nations, where she cautions her readers that the categorization she uses (e.g. expertise, objectivity, etc) "offers conceptual clarity but at enormous risk of reductionism." She goes on to note that civic epistemology can change, and the framework is meant only to outline deep-seated patterns "to which the practices of ruling institutions and actors continually return, in part because they are held in place through time-honored legal, political, and bureaucratic practices." Finally, Jasanoff (2005) writes:

> Like any aspects of culture, the attributes of civic epistemology have to be performed and reperformed to maintain their hold as living, breathing instruments. It follows that radical breaks and disjunctures can always occur in theory, but shocks of exceptional severity may be needed to precipitate them.

Here I am proposing that the Solomon Islands may represent a situation where there are no "time-honored" bureaucratic structures, and where the process of colonialization and de-colonization through gaining independence may have created a "shock of exceptional severity" to the pre-existing customary systems of Melanesia. While the risk of reductionism has been acknowledged, it might be slightly lessened by recognizing policy creation in customary contexts as a space where the civic epistemologies of two countries collide (in this case, Britain and the Solomon Islands), rather than by trying to evaluate the nation as having a single civic epistemology as I have done in this analysis. A future analysis could give more attention to describing the civic epistemology that underlies court procedures and government enforcement mechanisms more broadly, and then compare that to the sort of analysis of the civic epistemology of local residents carried out here. The results of such analysis could show where a policy sits on a spectrum between aligning with one civic epistemology versus the other (Figure 4).

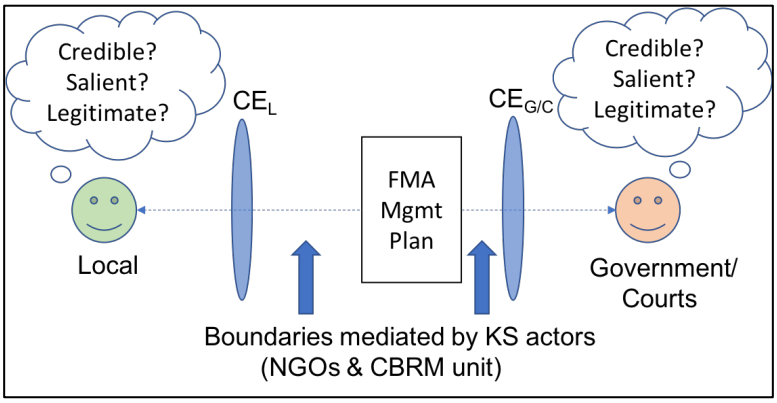

Figure 4. Hypothetical results of a modified KG analysis.

This idea relates closely to van Kerkhoff and Pilbeam's (2017) discussion of a "bifurcation of knowledge governance" between local actors and external, western actors, referred to as "audiences." As in Palau, a dichotomy has arisen between "audiences," but the dichotomy is slightly different here due to focusing analysis on a policy, rather than on an intervention like the Palau Protected Area Network (PAN). In Palau, the PAN operated at the boundary between the Western-styled KG arrangements of international actors and the KG arrangements of local Palauans (van Kerkhoff and Pilbeam 2017). In the Solomon Islands, NGOs and the CBRM Unit must similarly navigate between the KG arrangements of local villages and the KG arrangements of formal government enforcement mechanisms, but their actions at this boundary are restricted by the substantive and procedural requirements for plans submitted under the FMA(2015). Hypothetically, describing the two separate civic epistemologies at play here could take the conversation beyond the discussion about the need to communicate different messages to satisfy the KG arrangements of each audience, to a conversation about how to craft policies that provide the space necessary to bridge these audiences. Although the analysis here does not fully do that, the discussion of the Act as an intervention suggests that the current fisheries policy has been crafted to match the civic epistemology and broader KG arrangements of formal government without much consideration of the KG arrangements at the local scale. Attention to the differences in these epistemologies in combination with an analysis of boundary work being done between knowledge systems could perhaps guide future fisheries policy or the SOPs and regulations associated with the current policy that will be flexible enough to accommodate boundary work. This is one way that a KG approach can potentially contribute to a broader analysis of AG, as discussed in the next section.

4.3 Summary of Knowledge Governance Arrangements

This KG analysis framed the FMA (2015) as an intervention in inshore fisheries governance occurring within the broader cultural context of the Solomon Islands. The civic epistemology of Solomon Islands society included consensus as a *dominant style of knowledge-making*. Interview participants at the national and local level emphasized the importance of *transparent* processes of generating knowledge and the need for decisions to be collective and inclusive of all members of the community. The inclusion of differing perspectives was an important part of establishing *objectivity*, to such an extent that the community preferred to avoid

a decision if all residents were not present and in agreement. Investigating the themes of *expertise*, *public accountability*, and *demonstration practices* revealed that knowledge is tested by individuals, rather than external experts, through applying recommendations and seeing whether or not promised wellbeing and livelihood benefits are realized.

The knowledge systems layer of analysis reflected this aspect of the civic epistemology in that the participation of community members in knowledge-making and testing was critical for establishing both the credibility and legitimacy of knowledge. Individuals trusted their own experience most in determining whether the information provided was sound (i.e. credible), and did not trust NGO projects or researchers that did not enter communities transparently and with permission of leaders and the acceptance of the community overall. The investigation of salience revealed differing perspectives amongst community residents that may indicate either a shift or split in local perspectives on the salience of western science vs LEK at this scale. Most interview participants indicated a value for monitoring, rotational areas, and other scientific concepts, especially those that aligned with LEK, but the fact that this did not lead to the implementation of the recommendations in practice suggests that this information was not considered salient to all members of the community.

The intervention of the FMA (2015) within this context does not align particularly well with existing knowledge governance arrangements. The procedural requirements for the development of plans seem to honor local processes for establishing legitimacy, such as by recognizing customary rights and requiring consultations with rights-holders at key decision points. However, the substantive requirements for plans indicate differing perceptions of what knowledge is salient and credible at the national level versus the local level. Specifically, scientifically-grounded information is required at the national level and this does not align with experience-based approach to validating knowledge at the local level. This raises the suggestion discussed above regarding the need for future research to consider the possibility that legislation like the FMA (2015) exists at a boundary between public ways of knowing and the formal, western-style epistemology of government enforcement systems (i.e., police and courts).

5 CONCLUSIONS: Reflections on the Utility of a Combined Analysis and Avenues for Future Research

The results of this research provide a first attempt at an analysis that explicitly focuses on the suggestion that multiple types of knowledge be included in decision making within an emerging adaptive governance regime. Specifically, the goal of this research was to investigate the utility of a knowledge governance approach for evaluating: (1) the extent to which multiple types of knowledge are incorporated into decision making around inshore fisheries in the Solomon Islands; and (2) what the norms and rules around how LEK and science are valued may indicate about who is included in this process, which relates to the suggestion for inclusiveness and considerations of good governance within an emerging adaptive governance regime.

Interview data and the national and regional institutional context of the FMA (2015) made it immediately obvious that LEK and science are frequently drawn upon during the governance of inshore fisheries in the Solomon Islands. This is facilitated by a CBRM-focused approach to inshore fisheries that connects local level work all the way up to conservation and resource management priorities for the region (e.g. CTI). The governance analysis revealed that the FMA (2015) includes and seems to value some, but not all, of the key elements for AG. There is a particular focus on the AG suggestions for inclusive participation, learning, and the facilitation of adaptive management. These are considered keys to successful community work, and have to some degree been accounted for in the FMA (2015). Participants spoke frequently of the value of both LEK and science in decision making, often in terms of LEK being a useful starting point for identifying conservation and management priorities and science being useful to validate this information and guide assessments of progress towards community-directed fisheries management goals. This apparent openness to different types of knowledge was investigated more deeply using the lens of knowledge governance.

The analysis of the knowledge governance arrangements brought a focus to the work of boundary organizations in navigating between LEK and science, and the limitations that the FMA (2015) may place on this work. Consideration of the civic epistemology underlying Solomon Islands society, especially at the local scale, indicated that NGOs and the MFMR CBRM Unit must adjust their conservation and management efforts to fit islanders' consensus-style, experience-based approach to incorporating knowledge into decision making. These

institutions navigate between differing standards at the local versus national (or international) scale for establishing knowledge as credible, salient, and legitimate. At the local level institutions establish legitimacy by finding the right entry point (key individuals) into the community, and by including residents in knowledge-making processes. These institutions make knowledge salient by choosing goals that are relevant to livelihoods. Establishing credibility has to do with who was producing knowledge—credible knowledge must come from individuals themselves. This relates closely to how legitimacy is established. Individuals must be able to create and test knowledge directly, or at least be able to see relevant visuals of the results it has led to in other places, before perceiving the creation or testing of knowledge as legitimate. Credibility was a complicated topic at the local level because there seems to be a shift, or at least disagreement between community factions, related to whose knowledge is considered sound (e.g. local fishers (i.e. themselves), or foreign experts), illustrating divergence between individual perspectives rather than homogeneity at the local level. At the national or international level, credibility, salience, and legitimacy had much more to do with the processes of scientific monitoring and validation that are more familiar in Western settings. Understanding these nuances allows for some tentative conclusions around the barriers that may arise to the further emergence of AG in the Solomon Islands, despite the FMA (2015) seeming to reflect some of the necessary elements of AG.

NGO and government professionals seemed to understand differences in national versus local level knowledge systems, and accordingly do their best to adapt the way knowledge is presented at the local and national level. Their ability to do this when submitting plans under the FMA (2015), however, may be restricted. A specific barrier that may arise is that the criteria required for plans under the Act may cause a tension between establishing saliency and credibility at the local versus national scales. The more Western-style civic epistemology underlying the Act may limit boundary institutions' ability to adjust plans to align with knowledge processes at the local scale, causing a gridlock during the plan development stage. This initial analysis of KG arrangements suggests that when considering policy as an intervention, a KG analysis might be more useful if structured to account for the possibility that multiple civic epistemologies are interacting within a single society. Although this is likely the case in any nation, it may be particularly relevant in contexts where the interaction of customary

systems with Western systems like English Common Law is ongoing, with neither system clearly dominating knowledge processes.

Broadly, assessing KG arrangements within an analysis of AG can foster a more nuanced conversation around how knowledge types are being integrated in decision making. Consideration of knowledge systems and civic epistemologies brings attention to the relevance conversations within LEK literature about knowledge and power, while also, in the context of analyzing a policy, illustrates the importance of accounting for interactions between customary law and Western systems of law. Current research in AG is already beginning to focus on identifying legal elements for AG (e.g. De Caro et al. 2017); the KG angle suggests a need for future research on how the legal aspects of AG may be substantially different in non-Western contexts where customary law is also at play. The KG approach also draws attention to the significance of the interaction between formal laws and informal institutions like customs and norms.

Employing the KG approach additionally spurs reflection on the assumptions that underlie the broader suggestions for adaptive governance. For instance, the KG analysis suggests that the requirement for monitoring within adaptive management is now situated within Western ways of knowing. Similarly, strategies related to bioregional fit, such as ecosystem-based management, are based on attention to habitat and ecosystem-connections that do not seem to be incorporated into local ways of knowing and local approaches to resource management. On the other hand, a spin-off of the science-LEK literature in the Solomon Islands (and Pacific region) has involved a conversation around reframing customary practices as principles for adaptation (e.g. Aswani et al. 2007). The KG approach brings attention to this literature and suggests that future work in AG could draw more heavily on this body of research to explore ways of expanding or adjusting suggestions for what AG looks like in non-Western contexts. Specifically, it may be useful to conduct a theoretical investigation of how the underlying epistemology of resilience thinking and adaptive governance might limit application of the theory in customary contexts. Such an analysis might additionally benefit from consideration of the extensive body of literature on CMT (e.g. Hviding 1998, Aswani 2011) and the interaction of customary and western legal systems (e.g. Pulea 1993), along with attention to the more limited literature on the adaptive capacity of customary systems (e.g. Aswani et al. 2007).

As a final point of reflection, further work is needed to structure analyses that can better streamline the use of the KG framework within an analysis of AG. It is worth considering which aspects of KG are most immediately relevant to AG and what that implies for developing an integrated framework, rather than the sort of parallel analysis that was conducted here. In regard to analyzing policies like the FMA (2015), one way to do this may be to bring a more explicit focus to how policy will affect boundary institutions and organizations operating in a given system; questions about the specifics of how these institutions will be able (or unable) to present knowledge to different audiences could bring immediate attention to how legal and institutional structures need to accommodate, rather than limit, their ability to do this work effectively. Another relatively straightforward way to incorporate KG could be to consider when differences between the civic epistemology of Western-style government enforcement and that of the broader society might indicate that legislation is just not the right tool, and that other options should be pursued for catalyzing the emergence of adaptive governance.

In this thesis I have drawn on multiple streams of scholarship to explore the role of knowledge in adaptive governance, including: environmental governance, sustainability science, "local ecological knowledge" (LEK), and context-specific research in the Solomon Islands on topics including customary systems and community-based resource management (CBRM). Bringing together multiple streams of research in this way risks not doing justice to all of the concerns of each stream, but keeping these conversations separate has the greater risk of failing to explicitly recognize the links between knowledge and power. Recognition of these links can identify ethical concerns around who is or is not included in governing natural resources, while also drawing attention to how the inclusion different types of knowledge might improve decision making. This study illustrates how a marine policy might align or conflict with existing knowledge governance arrangements, drawing attention to areas where interactions between knowledge systems might facilitate or hinder the emergence of adaptive governance. The results of this study suggest that while actors may be at least partially open to the use of different types of knowledge in decision-making, a lack of explicit attention to knowledge governance norms may lead to the exclusion of some actors (e.g. communities unable to create management plans that meet the criteria of the Act) during the implementation of the FMA (2015). This research provides a starting point for further developing an explicit awareness of knowledge-related issues during transitions in environmental governance.

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