

**BUILDING RESILIENCE THROUGH ADAPTIVE CO-MANAGEMENT: THE
ROLE OF ADAPTIVE GOVERNANCE IN THE FLMMA NETWORK, FIJI**

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Dedicated to my father, without whom, all this would not be possible

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Table of Contents

Abstract.....	5
1. Introduction.....	6
2. Literature review and defining concepts.....	10
2.1 Co- management	10
2.2 Adaptive Management	11
2.3 Adaptive co-management.....	12
2.4 Challenges of adaptive co-management.....	14
2.5 Moving forward: Adaptive governance	15
2.5.1 Social Capital, Trust and Networks.....	17
2.5.2 Social Memory, Local Knowledge and Leadership	18
2.5 Research Questions	20
3. Methodology.....	22
3.1 Introduction	22
3.2 Research Outline	22
3.3 Semi structured Interviews.....	23
3.4 Participant observation.....	24
4. The Fiji Locally Managed Marine Area Network (FLMMAN).....	26
4.1 The Marine Environment in Fiji	26
4.2 The Fiji Locally Managed Marine Areas Network (FLMMAN).....	28
4.2.1 History of FLMMAN	29
4.2.2 The current management regime	31
4.2.3 The FLMMMA approach.....	33
5. Key Findings and Analysis	35
5.1 Networks, Trust and Reciprocity	35
5.1.1 Local Networks	35
5.1.2 Learning networks	36
5.1.3 Bridging networks	38
5.1.4 Bridging Civil Society Networks	40
5.2 Processes, Local Knowledge and Leadership.....	41

5.2.1 Processes.....	41
5.2.2 Local Knowledge.....	43
5.2.3 Leadership	44
5.3 Limitations and barriers	45
5.3.1 Vision and Trust	46
5.3.2 Weak Leadership	47
5.3.3 Access.....	49
6. Discussion and conclusion.....	52
6.1 Importance of Leadership	53
6.2 The role of Shadow Epistemic Communities.....	54
6.3 FLMMAN as a bridging organisation.....	55
6.4 Concluding remarks	55
7. References.....	57
Appendices.....	67
Appendix 1: Acronyms and Fijian translations.....	68
Appendix 2: Interview Timetable	69
Appendix 3: Consent form.....	70

Abstract

Adaptive co-management is an emerging approach to natural resource management, which aims to create cross scale, collaborative schemes, that foster resilience in socio-ecological systems. However the social mechanisms and processes, which create and sustain adaptive co-management are under investigated and misunderstood. The objective of this study is to determine the social sources of resilience in a scheme of co-management in Fiji, called the Fiji Locally Managed Marine Areas Network (FLMMAN). Using the theoretical framework of adaptive governance to examine networks and linkages, this study aims to determine the adaptive social mechanisms and processes in the FLMMAN network which enable resilient outcomes. The study finds that strong leadership, the presence of shadow epistemic communities and the role of FLMMAN as a bridging organisation, have been crucial. However the adaptive capacity has been inhibited by cultural and political barriers.

1. Introduction

“Many men go fishing all of their lives without knowing that it is not fish they are after” - Henry David Thoreau – 1817 - 1862

Marine resource management continually struggles to overcome the multiplicity of threats, which deplete vital marine resources upon which communities and countries rely (Hughes, et al., 2005). Theories and approaches to marine natural resource management (NRM) have failed to cope with the uncertainties and complexities of the marine environment assuming that ecological systems are linear and steady state (Folke, et al., 2005). This has resulted in centralised, top down resource management that has been an antithesis to user participation and has often left dependent communities vulnerable (Berkes et al., 1998; Berkes, et al., 2003). Similarly failures of management have resulted in bureaucratic inability to anticipate changing non linear conditions. Clover (2004) in his book ‘The End of the Line’, illustrates quite majestically the consequences that such an approach has had on the world’s fisheries, limiting the response to changing conditions, often with catastrophic results.

Recognition of such management shortcomings have resulted in a significant paradigm shift from government to governance (Agrawal and Lemos, 2007), broadening the base of stakeholders involved and resulting in the emergence of collaborative management approaches, which prioritise deliberative and inclusive processes of decision making (Armitage et al, 2007a). Lessons from case studies and theoretical conjecture point to approaches, which assess and actively encourage resilience as a means to achieve sustainability in NRM (see Berkes, 1998; Berkes et al, 2003; Olsson et al, 2004a, Armitage et al, 2007a). Key to the success of such initiatives has been the role of adaptive structures of co-management which acknowledge uncertainty and actively and reflexively learn from ecological feedbacks, to create new, more appropriate development pathways (Dietz et al., 2003; Armitage, 2005; Folke et al., 2005).

The complexities and importance of these changes are under investigated and misunderstood. As Folke et al (2005) states ‘knowledge generation for understanding and managing periods of rapid change, the social sources of resilience required for reorganization following change, as well as the strategies for dealing with true uncertainty and surprise in this context are still in their infancy’ (p. 445) With this in mind, new initiatives provide interesting case studies with which to evaluate and understand the progression of social and political mechanisms that facilitate learning, and accept and navigate the uncertainties of social and ecological systems .Crucial to navigating a transition to positive and sustainable outcomes is the importance of adaptive notions of governance that navigate barriers through collaborative network mechanisms that initiate self organization (Boyd, 2008; Armitage et al, 2008).

In the Pacific, the marine environment is a vital resource complicit with sustaining livelihoods and symbolically connected with indigenous culture (Govan 2007). Coastal communities rely heavily on natural systems for goods and services and livelihoods are dependent on ecosystem function (Veitayaki, 1998; Govan 2007). The increasing pressures of modernity, wide scale political corruption and lack of recognition of indigenous rights have led to unregulated coastal development and hindered the protection of marine ecosystems (Pomeroy, 2007). Driven by increasing awareness, new, innovative, localised resource management initiatives have begun to coalesce built on unique regional features, and making use of community strengths in traditional knowledge and governance complemented by scientific methodologies (Govan et al, 2009).

In Fiji the success of collaborative initiatives has seen the establishment of a complex multi stakeholder process driven learning network. The *Fiji Locally Managed Marine Area network* (FLMMAN) was launched in 2001 as a result of the collaboration of conservation academics and practitioners with a number of small disparate community-based marine resource management schemes in Fiji and the Pacific (LMMA, 2004). Based on the principles of community participation, recognition of local knowledge in management practices and adaptive management, the network has since spread

throughout Fiji, to include over 200 communities (Aalbersberg et al, 2005). The network success precipitated its expansion and it now exists as the Locally Managed Marine Areas network LMMAN, which forms a collaborative group of communities and practitioners across Asia and the Pacific. The Fijian government has recognised the success of the network and consequently supported the initiative through their NRM policies. However, with increasing anthropogenic induced pressure and uncertainty of future ecological and social changes, co-management schemes in Fiji are vulnerable to internal and external perturbations (Grover et al, 2008).

The objective of this study is to understand the social sources of resilience in the FLMMA network, as well as the cultural and political impediments to adaptive capacity. Using the adaptive governance framework (Dietz et al, 2003; Folke et al, 2005; Blummer et al., 2005; Boyd 2008), as a theoretical and analytical lens, I will focus on the forms of collaboration, partnership and engagement which determine positive outcomes in resource governance structures. This will be a multi-scalar, investigation examining the development and transmission of knowledge and institutional linkages between the network stakeholders. There is a particular emphasis on the learning and the production of knowledge at the local level. Furthermore there will be an analysis of the local and national political and cultural tensions that restrict and hamper the networks ability to adapt sustainably to ecological changes.

The adaptive governance framework provides a fundamental basis for exploration of the linkages and networks, which both enable and enhance social learning and adaptive co-management (Boyd, 2008). Critical to investigating these processes is an acknowledgement of the structural barriers, which can inhibit such institutional arrangements. This holistic framework acknowledges that linkages and networks are mediated but at the same time constrained by the cultural and political environments within which they are constructed (Folke et al, 2005). The framework provides focus and a benchmark for future strategies to improve governance (Boyd, 2008). Using the case study of the FLMMA network I will also determine the usefulness of the adaptive governance in determining and understanding the social sources of resilience, which

contribute to sustainable forms of co-management.

The above issues raise questions such as, what are the social sources of resilience which have facilitated the emergence of the FLMMAN network? What structures are in place that facilitate adaptive co-management of coastal resources in Fiji? What are the factors which are hindering the network from being more adaptive? And finally what lessons can we take from this case study that can be applied to other schemes of co-management? To attempt to answer these questions in chapter two I will examine the merits of adaptive co-management to determine and show that a collaborative and adaptive mechanism for management is necessary in a changing environment. I will propose a framework of adaptive governance that incorporates social capital and social memory, to determine processes for multilevel development of adaptive co-management. In chapter three I present the research methodology. In section four I present the case study of the FLMMAN network and examine its current structures and processes. In chapter five I analyse the findings through the lens of adaptive governance and discuss the opportunities and barriers facilitating adaptive co-management in FLMMAN. In chapter six I will synthesis the key findings that are of importance to the research questions, and draw out key conclusions and theoretical insights which are of relevance to the literature on adaptive co-management.

2. Literature review and defining concepts

Through the literature review I show how the emergence of collaborative and resilience management have coalesced into adaptive co-management and the benefits and shortcomings of such an approach to resource management. I then define the framework of adaptive governance, through which I will analyse the FLMMA Network.

2.1 Co- management

The common property resource literature gives a multitude of examples of communities that have evolved new decentralised institutional arrangements to deal with the complexities of resource governance (Ostrom 1990, Ostrom 2002). The evolution of collaborative governance processes has typically resulted in more decentralised, devolved and community based natural resource management approaches (Agrawal and Gibson, 1999; Agrawal and Ostrom, 2001; Agrawal and Gibson, 2003) There is now a idealised narrative of collaborative management, that hails cooperation as a way to overcome conflicts, increase social capital and produce more effective decision making processes (Conley and Moote 2003).

From this co-management has emerged as a formalised management approach with the central premise that the responsibility for allocating and using resources is shared amongst multiple actors (Plummer & Armitage, 2007). This loose definition of co-management allows for a continuum of possible configurations in degrees of power sharing, with typical arrangements including government agencies, local communities and resource users, NGOs and other stakeholders (Carlsson & Berkes, 2005; Plummer & Fitzgibbon, 2004; Armitage et al. 2007b). Co-management has often been deemed a formal arrangement between governments and local groups. However this definition has evolved, and instead co-management may be viewed as a self organizing process for problem solving (Olsson et al, 2006), what Ruitenbeck and Cartier (2001) argue is self organizing from the bottom up, rather than legislated from the top down. In such an arrangement local knowledge and resource users are considered to have the same status

as experts, NGOs and government officials.

Plummer and Fitzgibbon (2004) highlight the benefits of such an approach in creating effective and equitable decision making, a legitimisation of resource management initiatives and increased organisational capacity. Co-management further aids in augmenting local technical and scientific expertise, enhances government effectiveness in response to local ecological changes, spreads the risks of management amongst involved parties and provides spaces of engagement to resolve conflict (Carlsson & Berkes, 2005). Collaborative schemes integrate local groups who have co-evolved with resource and ecosystem dynamics and have developed knowledge which accounts for ecosystem change and uncertainty (Olsson et al. 2004a). Decision making takes account of various modes of knowledge and creates an institutional environment in which expertise is overridden by negotiation and agreement among stakeholders. These arenas of learning bring co-management closer to the narrative of adaptive management (Armitage et al. 2007b).

2.2 Adaptive Management

Adaptive management is an '*approach to resource management that has developed from ecological theories of resilience*' (Holling 1978 cited in Gunderson and Light 2006). The theoretical basis of resilience was proposed by Holling (1973), and originally sat within the ecology literature. However more recent recognition of the interdependencies of ecology and society has facilitated its use in trans-disciplinary management of socio-ecological systems (Berkes et al. 1998). Resilience is defined as the capacity of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity and feedbacks (Walker et al. 2004). Carpenter et al (2001) identify three central features of resilience: (1) The ability of a system to absorb or buffer disturbances and still maintain its function; (2) the ability of a system to self organize; (3) the capacity for learning and adaptation. Emerging theories of resource management advocate managing for resilience. Catalyzed by complex systems theories,

resilience advocates processes that enable learning and self organization to maintain essential system function while undergoing change.

Within this prescribed framework of resilience, the capacity to adapt is important in sustaining the system function in response to perturbations (Olsson et al. 2004a). Termed adaptive capacity, this denotes the ability of the system to sustain and generate new outcomes through learning, knowledge generation and sharing and the response to feedbacks (Folke et al. 2003, Walker et al. 2004, Fabricius 2007). Armitage (2005) theorises that adaptive capacity is ‘largely a function of social and institutional relationships and the manner in which social actors mediate among contested interests to avoid potentially negative collective action outcomes.’ (p.706).

This complex system thinking refocuses management on monitoring, interpreting and responding to ecosystem feedback which has been called adaptive management (Berkes et al. 2003). Adaptive management acknowledges uncertainties and treats management decisions as experiments, learning through iterative application (Holling 1978, Berkes et al. 1998). The recognition that socio-ecological systems are changing and unstable, signifies an evolution in thought for dealing with commons management. In the context of this study, research reveals an urgent need to incorporate humans in studies of marine ecology and bridge the gap between the natural and social sciences (Castilla 1999). This holistic systems outlook allows for the entry of ecological complexity and uncertainty into decision making and a re-evaluation of the tools with which to strengthen our capacity to manage and sustain ecosystem services (Gunderson and Holling 2002).

2.3 Adaptive co-management

An emergent outcome of the development of these different approaches to NRM has been a combination of the linkages of co-management and the iterative learning of adaptive management into, adaptive co-management (ACM). There are a number of definitions of adaptive co-management systems (Folke et al 2002; Armitage 2008 et al) however within

this study it is defined as ‘flexible community based systems of resource management tailored to specific places and situations supported by and working with, various organisations at different levels’ (pg 75, Olsson et al. 2004a). Adaptive co-management combines the cross scale linkages and shared responsibility of co management (Carlsson & Berkes, 2005) with the learning dynamism of adaptive management (Holling 1978; Berkes 1998). It focuses on creating feedback loops between social and ecological systems and an institutionalisation of these links within participant organisations (Olsson et al. 2006). ACM is described by Folke et al. (2002) as ‘a process by which institutional arrangements and ecological knowledge are tested and revised in a dynamic, ongoing, self organised process of trial and error’ (p. 8). It relies on a diverse set of actors, operating at a multitude of levels (local, government civil society), and often in networks, sharing management power and collaborating on decisions. By drawing on a diverse set of information and knowledge and avoiding prescriptive management practices it is hoped that ACM can result in the creation of new, sustainable equilibriums of resource management (Folke et al. 2003; Olsson et al. 2006).

Olsson et al. (2004a) propose that ACM has the potential to build resilience in socio-ecological systems. They posit that several factors should be considered for co-management to be resilient, which include, building vision, leadership and trust, enabling legislation to create political opportunities, monitoring the environment, combining different kinds of knowledge and supporting collaborative learning. Several others augment and complement these findings. Cash et al (2006) surmise that the access to externally validated scientific knowledge at a multitude of levels can have the advantage of directing strategy and management plans in conflicts. In addition, Berkes (2006) proposes that cross scale co-management arrangements may be essential for handling the cross level dynamics of marine commons. This is supported by Fabricius et al (2007) who conclude that communities that have the social mechanisms and institutional capacity to adapt are able to build innovative solutions to improve livelihoods, navigating the plethora of problems such as conflicts and cultural barriers. Furthermore, Tompkins and Adger (2004) find that the multi level approach to management which ACM facilitates can result in new institutional arrangements which provide resilience to larger scale environmental

challenges such as climate change.

2.4 Challenges of adaptive co-management

Considerable rhetoric exists regarding the shortcomings of collaborative initiatives such as ACM (Conley and Moote 2003). Agrawal and Gibson (1999 cited in Kearney and Berkes, 2007, p. 191) question the perception of the community as a small, homogeneous unit ‘using locally evolved norms to manage resources sustainably and equitably’. This notion does not acknowledge the intricacies of the community and neglects societal tensions, competing interest groups and cultural pluralism. Kearney and Berkes (2007) also note the growing connectedness of communities and ecosystems to global processes, which makes them more vulnerable to pressures which may originate at different political and social levels. In this reductionist view a one size fits all model of ACM can lead to unsustainable outcomes. Cross scale linkages expose community groups to the risk that their efforts of co-management are co-opted by other interest groups for their own means (Adger et al. 2006), and that people outside the decision making circles are excluded from participation (Conley and Moore 2003).

Resource managers often take for granted the inequalities and power differentials in social institutions and through identifying the problems create management solutions, which solve the resource use problem, but failure to address the political and cultural root causes reinforces existing inequities (Nadasdy 2007). Doubleday (2007) observes that a lack acknowledgment of cultural dynamism in co-management schemes can cause an ignorance of the diversity and difference that increase resilience. This relates also to a lack of understanding of the asymmetries of power that impede co-management. In reference to Pritchard and Sanderson (2002, cited in Armitage 2007, p. 66) notes that key governance issues arise in cross scale governance initiatives, where changes in economic, social and cultural systems over time create problems of power and responsibility between centralised and decentralised agents. In support of this Armitage et al (2008) proposes that the learning processes in co-management are never politically neutral and connections are an outcome of power relations. Adger (2006) asserts that linkages made

in co-management may promote individual institutions without promoting the trust of overall management structures.

There is a wide range of literature which describes the best and worst, and the successes and failures of ACM schemes (for example see Agrawal and Gibson, 2003; Berkes et al, 2003; Armitage et al 2007a). However recognition of the benefits and shortcomings of ACM is not enough to understand how to create more resilient resource management outcomes. Instead we need to experiment with new analytical lenses, which help to reconceptualise and understand the social mechanisms which enable the transition to adaptive forms of collaborative management. Folke et al (2005) suggest that these social transitions can be accommodated by schemes of governance which provide the vision and directions to create institutional conditions for resilient management systems.

In section 2.5 below, I propose a framework of adaptive governance, which allows me to analyse the social mechanisms which expedite a transition to ACM. Developing the framework of adaptive governance proposed by Folke et al. (2005) I will show that social capital and social memory are crucial components for understanding social sources of resilience.

2.5 Moving forward: Adaptive governance

Institutional design principles for co-management and collective action are well understood (Ostrom, 2002). However what is less clear is the how to negotiate the challenges of collaborative learning and adaptation in cross scale institutional contexts of common property resource management in which dependent socio-ecological environments are strained by external and internal perturbations (Armitage, 2007). Thus the focus turns to understanding principles of institutional design which reorganize or evolve under challenging social and ecological situations, while maintaining positive collective action (Dietz 2003, Armitage, 2007). The framework of adaptive governance offers a novel method of conceptualising the networks and linkages that facilitate social

transitions to ACM and a means to assess the structural barriers to such transformations. Governance is defined here as the structures by which society shares power, shapes individuals and promotes collective action (Lebel, et al., 2006).

Adaptive governance is an increasingly emergent framework for conceptualising the social and political representation of adaptive capacity within socio-ecological systems (Dietz 2003, Folke et al 2005, Gunderson and Light, 2006). At a basic level adaptive governance refers to the social dimension of ecosystem management and focuses on the organizational and institutional flexibility for dealing with uncertainty and change (Dietz et al 2003, Folke et al. 2005). In relation to other frameworks adaptive governance provides a means to appraise the networks, linkages, learning and dynamic processes of change in NRM. It lends itself to the study of organisational change and learning feedbacks in ways that Political Ecology (Robbins, 1998) and Actor Network Theory (ANT) (Latour, 2005) may overlook, creating a more post modernist approach to analysis rather than poststructuralist, constructing new narratives as opposed to deconstructing old narratives. Such a framework allows me to explore the wider local, regional and national issues, which can limit the FLMMA network and identify the key areas which restrict its transition towards more adaptive forms of co-management.

Adaptive governance supports polycentric forms of social coordination, where actions are coordinated voluntarily by individuals and organisations with self organizing and self enforcing capabilities (Folke, 2005). Polycentric networks of governance encourage participation and the development of ecosystem knowledge and and cultivate reorganization at multiple scales. Learning within systems of adaptive governance must be formulated at multiple levels and between institutions and focus on multi and cross scale institutional linkages and the generation and sharing of knowledge. With regards to marine ecosystems, Hughes (2005) states that ‘developing multi-scale marine policy and managing natural resources requires multi-scale ecological and social information’ (p.381). Fabricius et al (2007) suggest that effective links to larger social networks and other levels of organization enable and support adaptive capacity and transitions and aid in generation of knowledge at different scales. When knowledge networks are formed

then, learning about ecosystem dynamics becomes even more effective.

Folke et al (2005) have expanded on the attributes of adaptive governance, and describe four dimensions:

- Build knowledge and understand resource and ecosystem dynamics;
- Feed ecological knowledge into adaptive management processes;
- Accept and be prepared for uncertainty and surprise;
- Support flexible institutions and multilevel governance systems through networks.

This framework recognises that social and political structures of co-management must also reflect and accept uncertainty and surprise in navigating complexity. Given the stated complexities of ecosystems and the uncertainty of large scale events, the maintenance of stability in ecosystem resilience requires social capacity to respond to variance. Social capital and social memory form the mechanisms which enable ecological learning and knowledge generation (Adger, 2003; Folke et al, 2005; Gunderson and Light, 2006). Folke, et al. (2005) propose that the adaptive capacity of these social institutions is determined by ‘social sources of resilience, such as social capital (including trust and social networks) and social memory (including experience for dealing with change)’ (p. 444).

2.5.1 Social Capital, Trust and Networks

For the purpose of this study social capital is defined as ‘the set of values, norms of reciprocity, and social relations embedded in the social structure of society that enable people to act collectively to achieve their desired goals’ (Sano 2008, p. 19). At the core of social capital is a description of the ‘relations of trust, reciprocity and exchange; the evolution of common rules; and the role of networks’ (Adger, 2003 p. 389). Of importance in schemes of adaptive co-mangement is social capital that focuses on the relationships within a resource user group and between resource user groups and external insitutions (e.g. state and NGOs). These are respectively termed by Adger (2003) as bonding and networking social capital. Bonding social capital, is based on kinship and

friendship in homogenous groups, whilst networking social capital is usually based on trust and reciprocity with outside actors (Sano 2008). Increased bonding and networking social capital can facilitate the flow of information and learning between stakeholders.

ACM requires the formation of social networks, formal or informal, which create spaces of collective action, engagement and learning. Social capital is both a catalyst and a product of these networks. As Folke et al (2005) observe 'social capital is built by investing in social relationships, and the networks that emerge can either focus on horizontal or vertical collaboration.'(p.452). Plummer and Fitzgibbon (2007) observe that social capital actualized through collaborative processes of knowledge generation, continues to contribute to evolving processes of joint problem solving as the processes become embedded in social norms. In this respect the presence of strong bonding, bridging and linking capital, exhibited through the presence of groups and networks in schemes of co-management should denote a cooperative framework which is complicit with adaptive governance.

2.5.2 Social Memory, Local Knowledge and Leadership

Social capital is important in enabling knowledge creation and sharing that can be facilitated through networks that utilise traditional community structures of governance. However governance systems must persistently and continually learn in order to generate new knowledge and avoid negative development trajectories (Folke, et al., 2005). Folke et al (2005) highlight the importance of processes in maintaining experiences of NRM and preparing the system for change. This has been called social memory and is defined as the 'arena in which captured experience with change and successful adaptation, embedded in a deeper level of values, is actualized through community debate and decision making processes into appropriate strategies for dealing with ongoing change' (Olsson, et al., 2004a, p. 453).

There are a number of mechanisms which can provide arenas for storing and processing social memory. With the study in mind, an important arena of experience is local

ecological knowledge (LEK) (Berkes, 2000). LEK is refers to a 'cumulative body of knowledge applied and developed by actors in a local context' (Olsson et al. 2004a, p. 76). Traditional modes of resource management can provide informal modes of monitoring and observation of resource and ecosystem dynamics. Further to this the literature suggests that linking traditional and customary practices into formal institutional frameworks is of importance in generating new opportunities for learning and experimentation in adaptive strategies (Berkes, 2000). Lack of the knowledge at higher scales can cause the implementation of policies, which reject communities adaptive capacity in management. Knowledge networks can provide key mechanisms for storing, drawing on, and sharing information on past experiences (Fabricius et al, 2007). These also provide access to new knowledge and ideas, and key organisations at different scales (Folke et al, 2005). Important in stimulating and administering this is the role of leadership.

Fabricius et al (2007) observe that leaders build trust, organize stakeholders to a common goal, create cohesion and prevent mismanagement. Leaders provide vision, strategy and decision making capabilities to steer management towards sustainable trajectories (Olsson et al. 2004a). Olsson et al. (2004b) surmise that 'individual actors serve as key players in institution building and organisational change in relation to ecosystem dynamics and facilitate horizontal and vertical linkages in the ACM process (p. 83). Within this study, the presence of strong social memory should be apparent in the integration of local knowledge in practices and the emergence of strong leadership, which stimulates knowledge generation and networks of engagement.

The twin processes of social capital and social memory form the basis of cooperation and social norms which constitute a system of self organization in complex adaptive systems, synonymous with resilience (Folke, 2007). Cooperation among communities, learning institutions, NGOs and governments can result in intricate governance systems that can manage dynamic ecosystems and seascapes (Olsson, et al, 2004). Olsson et al. (2006) suggest successful social transformations are often preceded by the emergence of informal networks which assist information flow, knowledge generation and create nodes

of expertise. Social norms are managed in the interplay between individuals (e.g. leadership, community groups), nested organisational structures, power relations and institutional processes that bind social networks and tighten feedback loops (Folke, 2007). The emergence of such governance systems is usually enabled by leadership (individuals, strategy), governments (legislation, economic incentives), networks of experts and bridging organisations that connect institutions across scales and provide capacity to deal with change (Ostrom, et al. 2002, Olsson, et al., 2004, Folke, et al., 2005, Cash, et al., 2006, Olsson, et al., 2006, Folke, 2007).

2.5 Research Questions

This study identifies and investigates the social processes (LEK, leadership) and mechanisms (networks) behind the creation and sustained operation, of a collaborative adaptive management scheme in Fiji, known as the Fiji Locally Managed Marine Areas Network (FLMMAN). I will use the conceptual framework of adaptive governance to identify and evaluate the enabling factors and restrictive barriers to resilience. In this framework, the network is conceptualised as a set of interdependent relationships, whereby the social, political and cultural do not exist independent of the ecological. This system wide conceptualisation of the governance structures of ACM allows me to focus on understanding political and cultural tensions which inhibit network linkages and feedbacks, and ascertain key attributes of its sustained operation. In so doing I will also determine the usefulness of the adaptive governance framework in determining social sources of resilience.

Research Question

What are the social sources of resilience which have facilitated the transition to adaptive co-management in the FLMMAN network?

Sub questions

1. What are the social sources of resilience that enable adaptive co-management in FLMMAN?

2. What are the political and cultural tensions which restrict adaptive co-management in FLMMAN?
3. How can adaptive governance be used to understand the opportunities and barriers to adaptive co-management?
4. What lessons can we take from this case study that can be applied to other schemes of co-management?

3. Methodology

3.1 Introduction

The research took place between the 1st July and the 4th August 2009 on the main island of Viti Levu in Fiji. Data for this study was generated through in depth key informant interviews, supplemented by participant observation, formal and informal community interviews and analysis of primary and secondary literature sources.

This study will be exploratory in nature using a case study (FLMMAN) to examine theoretical conjectures. Case studies can provide an invaluable source of information for practitioners who can utilise its findings in their own context. The complexity of the topic meant I chose to use qualitative data analysis, the main component of which was key informant interviews. Through this I was able to construct knowledge through the meaning and experience of people. Qualitative data collection also allowed me to be flexible in research methods and approach and refine research questions throughout the process (Cresswell, 2003).

Of particular importance was an understanding of the social and cultural impediments to key adaptive processes in resource management governance structures. In order to understand such localised tensions the research had to accommodate an ethnographic approach to contextualise and triangulate the information obtained in the key informant interviews. The observations gained in the community are also complemented by my previous experiences living and working in Fiji as a marine researcher on the island of Gau.

3.2 Research Outline

Field work was conducted on the island of Viti Levu. The study was undertaken in the capital city Suva, where the majority of the chosen key informants reside, and in one

community, Tavua, where a localised example of the application of the mechanisms and processes of FLMMAN was identified. Tavua, located in the North West is one of the oldest sites in the network.

My research was accommodated by the Institute of Applied Sciences (IAS) at the University of the South Pacific (USP), a member of the FLMMMA network. Access to FLMMAN was obtained following acceptance of my research proposals by all members of the FLMMAN Executive Committee (EC). Access to the community was gained through the site liaison officer (SLO) at FLMMAN.

3.3 Semi structured Interviews

In depth semi structured interviews with open ended questions (Cloke, 2004) were conducted with 19 individuals within the network (see Appendix 2). The goal was to capture the experience and the knowledge of the interviewees and understand the development and mechanisms of the management approach in the FLMMMA network.

Interview subjects were chosen for their experience, knowledge and position within the network and the wider conservation community in Fiji so as to best understand the problem and answer the research question (Creswell, 2003). Contact details of key members of the organisation were acquired from a gatekeeper at IAS. Meetings were then established via email correspondence, before the field work commenced, and by telephone conversations once in the field. Once a few key contacts had been made, additional contacts were made through snowballing (Flowerdew and Martin, 2005).

All interviews were semi structured, informal and of varying duration. Semi structured interviews gave participants more freedom in answering the questions, leading to interesting insights, and the informality engaged respondents into conversation, facilitating interaction (Valentine, 2005). In exploring deeper processes in the creation and governance of the network, such an approach allowed me greater flexibility and reflexivity (Whatmore, 2003) not found in more rigid methodologies. Tensions and

interesting points were highlighted and followed up. An extensive review of other information sources was conducted to complement the interviews. These included annual reports, academic papers, consultancy reports, website releases, project documents and site management plans.

From these interviews I was then able to develop meaning and knowledge from the experience of others, the completeness of that knowledge is dependent on being active in my listening. Using a tape recorder allowed me to be more active and participatory in the process. The legitimisation and facilitation of my research by FLMMAN, meant subjects were aware of the study and understood the purpose of the interview. This was complemented by consent forms (see appendix 3), which outlined the aim of the research, the research questions and allowed subjects to outline their level of participation and representation in the results.

In the community the issue of positionality was considered as problems of language and perceived expertise may cause a distancing of researcher and subject (Valentine, 2005). In such a short research period this was difficult to overcome. In designing my research questions and directions of enquiry I was careful to simplify the questions and subtract from conversations expansive conceptual explanations. For some interviews a translator was used which caused a loss of intricacies of the language and expressions used (Davies et al. 2001). Data from interviews was coded to reflect themes, sub-themes and examples that were consistent with the theoretical framework proposed (Flowerdew and Martin, 2005). Names of respondents have been changed and a letter, date and place of interview has been used to identify individuals to the researcher, though protecting their anonymity

3.4 Participant observation

Aside from conducting key informant interviews within the community, ethnographic research consisting of participant observation was also conducted. Ethnographic research is concerned with understanding the '*world-views and ways of life of actual people in the contexts of their everyday lived experiences*' (Crang & Cook 2007, p. 37). Participant

observation is the key means by which to do this. Participant observation aims to be actor orientated and present reality from the point of view of the subjects (Brockington & Sullivan, 2003). In this context I was interested in talking to individuals and groups involved in site governance and resource use in the area. This included fishermen, the *qoli qoli*¹ committee, community groups, fish wardens and the community leaders. In accessing the community consideration was given as to the role which I was playing in the community, the way that I represented the study and the responsibility that I have in presenting the results. So a broad and encompassing outline of the project aims and objectives was given to the SLO, which was relayed to the community representative (CR).

In the community I was assisted by the CR in all my data collection. The CR acted as mediator, translator, interpreter and coordinator. Once I had indicated the people that I would like to see and the information that I wanted to collect he directed me to the appropriate individuals and arranged the meetings. As a member of the chiefly *mataqali*² he also was given privileged access to ceremonies and important members of the community. This allowed me to have informal and formal conversations with people involved in all the key processes of the FLMMA network. Where appropriate a tape recorder was used to record conversations. However in more informal settings I often considered the tape recorder as inappropriate. Instead notes were taken throughout the day when given the opportunity, or at the end of the day.

¹ Traditional fishing ground

² Clan or family group

4. The Fiji Locally Managed Marine Area Network (FLMMAN)

In the next section I will discuss the case study of the FLMMAN network, giving the background to the establishment of the network and the current governance and management structures. This will include an account of the context within which FLMMAN was instigated, the historical transition of the network and the current processes and procedures that define the mechanisms of site establishment and site management.

4.1 The Marine Environment in Fiji

Fiji is an archipelagic state situated in the Western Pacific, which comprises more than 300 islands, of which more than 100 are inhabited. More than half of the population in Fiji live in rural communities and rely on subsistence or small scale fisheries for both livelihoods and daily protein (Aarlesberg et al. 2005). The vast majority of communities' proximity to the sea and an ancestral connectedness with the marine environment is visible throughout the islands, and the coastal environment is vital to their livelihoods. Rural Fijian communities still maintain traditional ways of life and live in defined social groups, with a chiefly system, which is respected by the community. However the traditional way of life is increasingly threatened by globalisation, urbanisation and rapid population growth, which is placing pressure on marine resources (Grover et al, 2008).

Fijian communities are rapidly embracing new technologies, with a resultant loss of traditional knowledge and practices. Fiji has weak environmental policy and legislation hindered by a lack of capacity and poor implementation, and as a result there has been increasing degradation of environmental resources (Grover, et al., 2008). Within the context of this study, it is worth noting that as the majority of development and activities take place on the coasts, then the greatest environmental pressures occur on the inshore waters, the coastal strip and the estuarine environment. The failure of state led

management approaches to co-ordinate fishing efforts and restrain fishing capacity, has led to the decreasing fish stocks and depletion of reef ecosystems (Veitayaki, 1998). Lane (2006) citing Levett et al. (2004) notes that '*being small ecosystems, the Fiji islands exhibit minimal ecological resilience*' (p. 2). In this respect the resilience afforded by AC is brought sharply into focus in tropical coastal ecosystems and their related human systems (Tompkins and Adger, 2004)

Historically the use of marine resources and fishing grounds (*qoli qoli*) was governed by customary law and traditional ecological knowledge (Techera and Troniak, 2009). Traditional tools of management include no take zones or *tabu*, temporary or seasonal bans and gear bans. During the colonial period customary law was subordinated by the introduced legal system and local people stripped of their marine tenure (Techera and Troniak, 2009). Despite this customary law has continued to play an important part in management of marine resources. Customary laws, and traditional methods of management have persisted throughout the upheaval, which have characterised Fijian political history and this has '*provided the setting for the growth of the community conservation seed*' (Techera and Troniak, 2009, p. 12). More recently, marine environmental governance in Fiji has largely been the responsibility of the government and based on top down, scientifically defined models (Grover et al, 2008). But because of the centralisation of government infrastructure in urban areas, conservation in rural areas has been neglected (Grover et al. 2008). National legislation, such as the Fisheries Act, has failed to recognise the value of resource management and has instead focussed on regulation and licensing (Minter 2008). Given the pressing needs for effective management of inshore fisheries and the scarcity of resources in Fiji, alternative modes of management have been proposed to strengthen rather than weaken the traditional approach (Govan et al, 2006b).

Community based collaborative approaches are argued to be best aligned with the social and cultural institutional context of Fiji (Tawake et al. 2001). This has led to a growing interest in working with communities in Fiji to manage dwindling marine resources (Veitayaki, et al., 2003). In recent years there has been a propagation of community based

projects, in partnership with a number of NGOs and academic institutions. Collaboration and partnership of the different institutions and stakeholders concerned with community resource management and development work has led to the inception of a country wide network of community based project and practitioners.

4.2 The Fiji Locally Managed Marine Areas Network (FLMMAN)

The FLMMAN Network was established, to link communities, researchers, government officials and conservation practitioners, and to provide communities with training and tools to manage resources sustainably (Veitayaki, et al. 2003). This network has since grown to a collaborative effort across Asia and the Pacific known as the Locally Managed Marine Areas (LMMA) network (LMMA, 2004b).

Members of the network employ a community-based and participatory method of managing coastal resource designed to create resource conservation and sustain livelihoods (Govan, et al., 2006a). This approach is realised through the merger of contemporary marine protection efforts with traditional conservation practices through a process described as Community Based Adaptive Management (CBAM) (Govan et al, 2006a). The outcome is termed locally managed marine areas (LMMA). CBAM is not to be confused with Community Based Natural Resource Management, as Govan et al (2006a) outline, management is conducted with a major role played by the communities, but with the inclusion and assistance of local stakeholders, relevant user groups, and also nationally relevant institutions and private interests.

Govan et al (2006a) defines a locally managed marine area as:

‘An area of near-shore waters and coastal resources that is largely or wholly managed at a local level by the coastal communities, land owning groups, partner organisations and/or collaborative government representatives who reside or are based in the immediate area.’

FLMMAN is described as a learning network, meaning that participating projects use a common strategy and evaluation process to learn about under which the LMMA approach works (LMMA 2004a). It should be noted that the LMMA approach differs from Marine Protected Areas (MPA's) in being 'bottom up' rather than 'top down' (LMMA 2004b). Key components of the portfolio are community based projects in which practitioners and community groups have utilised the principles of adaptive management to achieve goal specific goals (LMMA, 2004b). In order to facilitate the communication of data and information, within a common language, the network has established a Learning Framework (LF) which standardises the data sharing initiatives and provides the basis for comparative work and learning (LMMA 2004b). This learning approach seeks to institutionalise conceptual ideas about adaptive resource management and encourage the development of a knowledge network in seeking and sharing information about optimal resource management strategies (Govan et al. 2006a).

4.2.1 History of FLMMAN

During the 1990's the Ucunivanua Village in the Verata district, Fiji, became aware that the kaikoso, or clam, their food staple, main source of income, and symbolic animal was in decline (Aarlbersberg, et al., 2005) . the son of a high chief who was attending the University of the South Pacific approached teachers to aid in developing plan to better sustain their resources.

Led by an Interviewee D (from now on known as ID), scientists from the Institute of Applied Science (IAS) at USP worked with the community, to implement a 24 hectare no take area. The team from USP experimented with participatory approaches, which engaged the community in developing the management plan. The team worked within traditional management methods and hierarchies, recruiting the paramount chiefs and elders of the village to hold a traditional ceremony declaring the area *tabu* for 3 years. The researchers consulted with the community to establish a monitoring methodology which would be simple enough for them to use. Monitoring data gathered between 1997

and 2004, reported dramatic increases in the number and sizes of the clams in the and adjacent to the no take area (see Aarlbjerg et al. 2005). As these results were reported in the media, villages throughout Fiji, facing similar declines in inshore fisheries approached USP for help in managing their qoli qoli areas.

At the same time there were a number of other such initiatives taking place in Fiji, Foundations for the People of the South Pacific (FSPI) were working in the Cuvu District and WWF were working in Ono in the Kadavu group. All were using variations of the basic LMMA strategy to see if they could contribute to conservation and livelihoods. The success of the work at Ucinivanua was presented to the Fijian government Fisheries Department by ID. The department were keen to promote community based initiatives and encouraged ID to establish a network of conservation practitioners and communities engaged in similar work. According to ID he then visited various government departments and NGOs, including WWF, to get their 'buy in'. An agreement was reached that together they would conduct joint planning workshops in communities, working with participatory methodologies which they had been developing with academics and practitioners across Asia and the Pacific.

This was the beginning of the Fiji Locally Managed Marine Areas network. It has since grown to include 217 community LMMA sites, NGOs, learning institutions, government agencies and researchers. The national government has adopted the strategy and the Fisheries department has formally designated a division to promote inshore fishery management. In December 2004 FLMMA was registered as a charitable trust under the Charitable Trusts Act of Fiji making it the first country network to obtain NGO status (LMMA 2004a).

FLMMAN's success has been recognised in the Pacific region and further afield. The early work was recognised by a number of foundations who have funded the

establishment of an Asia – Pacific LMMA network The Pacific Biodiversity Roundtable³ chose FLMMAN as an example of innovation in nature conservation (Veitayaki, 2003). The United Nations International Coral Reef Action Network (ICRAN) chose FLMMAN as a demonstration site for its new projects (Veitayaki et al, 2003). At the World Summit on Sustainable Development, FLMMAN was awarded the UNDP's Equator Initiative (Veitayaki, 2003).⁴

4.2.2 The current management regime

The FLMMAN network consists of representatives of the communities where the different conservation projects are initiated, the Ministry of Fisheries and Forests, the Ministry of Fijian Affairs, the Department of Environment and the Ministry of Tourism, WWF, World Conservation Society (WCS), Conservation International (CI) and the University of the South Pacific (USP) as well as other groups shown below in Figure 1. Figure 1 shows the organizational structure of the FLMMAN network.

³ The Pacific Biodiversity Roundtable is a group of international NGO representatives, donors and conservation practitioners who meet annually to consider progress in the implementation of the Pacific Nature Conservation Action Plan

⁴ The innovative Partnership Awards for Sustainable Development and specifically for best practices on the theme of biodiversity conservation and poverty reduction.

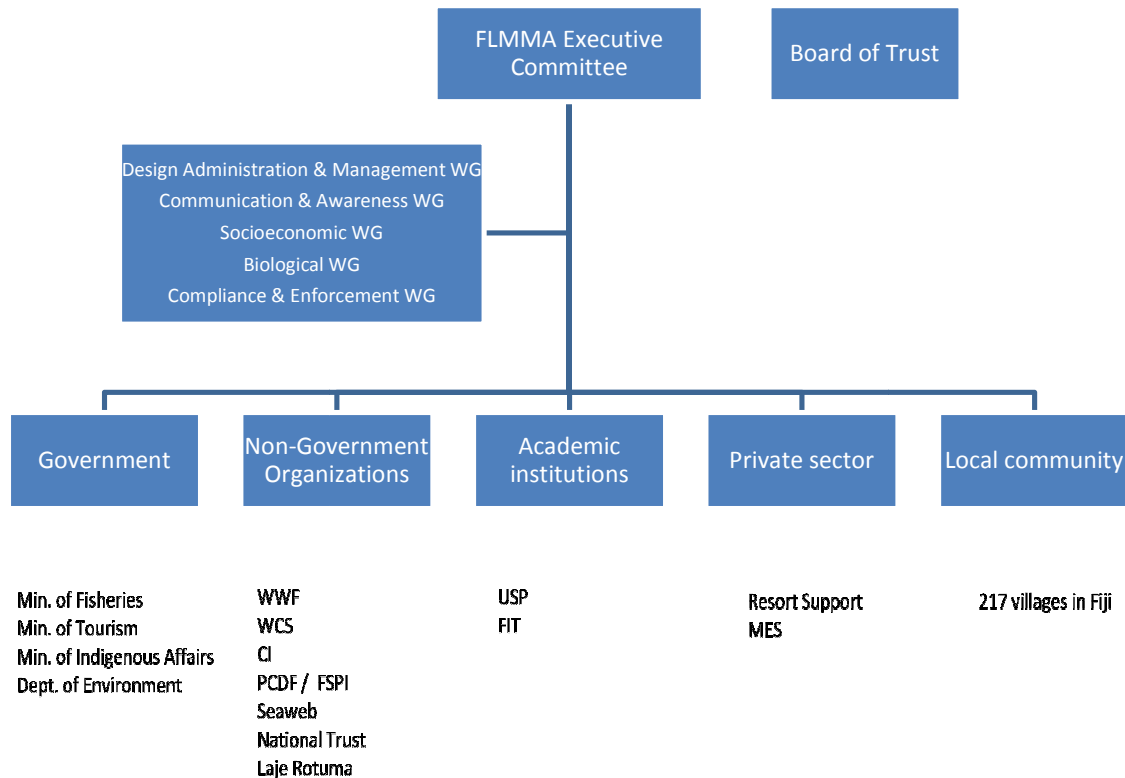


Figure 1: Organisational structure of FLMMA network

The coordination of the network is conducted by the Executive committee (EC), which is made up of representatives from the partner organisations and communities. The EC is supported by four committees that focus on the following areas (1) Design Administration and Management; (2) communications and awareness; (3) socio-economic; (4) biological and (5) compliance and enforcement. There is a country coordinator (CC) who acts as a direct link between the country wide projects and the regional LMMA Network. At a local level each of the project sites works with a SLO who links the communities with the country network and acts as their representative at country level meetings.

The FLMMA Network provides training to members in a variety of key skills in resource management including project design, monitoring, analysis and communication (Govan, et al 2006a). Crucially, the network also links groups in the region with similar

management problems or circumstances so that they can share knowledge and experiences with others in the field. This is encouraged through cross site visits, workshops and other communication and data sharing initiatives. Members collaborate on the basis of a social contract, a non-legally binding document, which sets out that in order to maintain membership status projects must adhere to a common set of values. Financially, FLMMAN is supported through grants and is working on establishing Trust funds and exploring investment options for award monies, to make itself self sustainable in 5 - 10 years time (LMMA, 2004a)

4.2.3 The FLMMMA approach

Key to the success of the network has been the unique approaches that they have used to engage communities in conservation activities. The network does not actively seek members, but instead potential project members, must approach the country team and express interest in joining. FLMMAN members use the Participatory Learning and Action (PLA) method to involve local people in the decision making process (Veitayaki, 2003). The workshops are usually conducted at the management level, so for instance if a fishing ground is shared between six villages then representative's from each of those villages will attend.

Initiatives are set in motion usually consisting of a set of workshops which establish the goals and expectations of the projects, build capacity in biological and socio-economic monitoring and establish plans of resource management, all agreed upon by the communities involved (Veitayaki, et al.,2003). During the management workshops, people are asked what problems they face and to reflect on ways in which they might solve them, and list the activities that they would undertake to do so. Through negotiation and advice from the FLMMAN member they then prioritise problems and activities, which becomes their management plan and outlines the management actions that the people agree to undertake. Workshops are usually not attended by all the relevant population, so representatives act as conduits of information, reporting back to village groups as to what actions they must take, the same applies to NGOs involved.

The communities and their FLMMAN partners are then responsible for supervising the achievement of the management plan (Veitayaki et al , 2003). Follow up, monitoring and training workshops are held to maintain interest and contact. Monitoring training workshops are organized, to give communities the tools to measure changes for themselves. People are asked to choose their own indicator species and FLMMAN provides the information, tools and techniques to implement basic monitoring plans and assess changes in populations. One person from the group which have conducted the workshops is then assigned as the Site Liaison Officer (SLO). This individual maintains contact with an equivalent member of the area who, the community representative (CR) who coordinates activities at a local level and reports to the FLMMAN committee through the SLO.

5. Key Findings and Analysis

Having described the development of the network and the learning processes involved from the community to the national level, in the following section I will outline and analysis the key findings of research in FLMMAN, with relevance to the adaptive governance framework. Through each of the preceding sub sections I shall show how FLMMAN has created adaptive structures of governance which have aided in the learning and management process across scales. The findings will be illustrated with key quotes from interviews, observations and examples from primary and secondary FLMMAN literature sources and grounded by relevant theory. This departure from outlining results and then discussion is appropriate in this case as serves to more fluidly outline the relevance of the processes and structures in FLMMAN to the framework.

5.1 Networks, Trust and Reciprocity

In the subsequent section I demonstrate, with examples, that the basis of the success and spread of the FLMMA network has been the inception of strong social capital, through the formation of networks, which have complemented and supplemented the traditional governance systems.

5.1.1 Local Networks

In FLMMAN the important component of the network has been complementing and augmenting the local networks and kinship groups. In this respect FLMMAN's acknowledgement of the traditional community structures, has stimulated greater knowledge, information sharing, and nodes of innovation. In Tavua, one of the biggest problems for their qoli qoli is poaching and dynamite fishing. Encouraged by the FLMMAN workshops, the devolution of responsibility has resulted in the establishment of a group of Fish wardens, who actively patrol and enforce the permit system in the LMMA. Calling themselves the 'Tavua Navy Seal', and instigated and lead by the FLMMAN community representative this group has become self governed, even independently acquiring 2 boats through soliciting for funds from international donors. This example also demonstrates that the network has enabled effective user participation and problem solving at the local level (Berkes, 2007).

Multi level structures of management with greater independence at a local level create localised institutional opportunities, ameliorating barriers to monitoring and tightening feedbacks (Lebel et al 2006). In 2007, FLMMAN reported that they were building localised capacity through decentralisation scheme aimed at creating provincial sub networks (LMMA 2007). One interviewee outlined that an acknowledgement of the need to increase localised capacity in training in distant islands, lead to the formation of local training teams. Named as *qoli qoli* management support teams they are comprised of local government officers and other stakeholders. Facilitated through the provincial government, community workshops are conducted jointly with experienced FLMMAN practitioners, until they are comfortable with the processes and methodology. In Kadavu district this has been extremely successful, where in three years with no funds, they have established 52 LMMA's.

5.1.2 Learning networks

FLMMAN describes itself as a learning network. A network of stakeholders increases the knowledge base, and creates new awareness about the key processes, policies and institutional threats and risk. According the Fabricius et al. (2007) citing Olsson (2006), *'learning becomes even more effective when knowledge networks are formed, which enable adaptive actors working at different levels to share information'* (p. 6). This knowledge network links and amalgamates findings from across Fiji and the Pacific to provide national and local decision makers with the tools to make more informed decisions. In FLMMAN the access to the other LMMA members across the Pacific and the facilitation of knowledge exchange through the learning framework means that communities can in essence learn from other people's mistakes. This is done through cross site visit, district and provincial meetings in which CR's report on changes through storytelling and presentations (LMMA, 2005).

The FLMMAN learning network expands and links communities own networks to larger regional and international bodies, such as the LMMA network and the members' own individual networks (Tompkins and Adger, 2004). The membership is made up of a

number of large global NGOs who are conducting their own large scale research projects, in the Pacific and elsewhere. As an example CI is conducting a large scale investigation of Marine Protected Areas (MPA) worldwide and FSPI is conducting livelihood projects in other Pacific Island nations. Both acknowledged that they feed data back into the network. The presence of research institutions in the network also provides international technical capacity. As explained in one interview;

‘So at every meeting we get communities to come up with some of their concerns, some of the questions that they need answering from rigorous scientific studies and then when the researchers come in we try and give them this list of questions’ (Interviewee M, Suva, July 21, 2009)

In access to a wider network of knowledge they are able to understand and interpret uncertain ecological phenomena and gain technical and financial resources. For example, one of the FLMMAN members, IAS, has received reports from sites of rising sea levels, coastal erosion and changes in weather patterns, symptoms synonymous with climate change. With such an impending threat the IAS has established a ‘climate change unit’ to evaluate and assess the threats to communities and construct and implement adaptation strategies. They have secured funding and technical capabilities and have begun building sea defences and water tanks in prioritised areas. A further example of this is the facilitation of new members to the network, which supplements technical resources. In recent years there have been the additions of new NGOs including Coral Cay and the US Peace Corps, who have added their own individual capabilities to the project sites. Their access to the sites is enabled by their inclusion in FLMMAN and the trust and reciprocity that has been formulated between communities and FLMMAN.

The utilisation of the Learning Framework Tool allows a common language in which to share experiences amongst network members (LMMA, 2004b). Monitoring a standardized criterion of socio-economic and biological data allows comparisons amongst sites. In 2004 a database of information collected was instigated for storing and analysing data and allows practitioners to carry out larger meta analysis to understand the

consequences and outcomes of management decisions (LMMA, 2004a). This has been expanded more recently to include a Catch per unit effort database (the biggest of its kind in the region).

A weekly radio show on marine conservation has been established in Fiji which has peaked interest in FLMMAN sites. As one SLO, outlined initial interest from the chief of Tavua had been raised when he listened to the radio show about the success of other FLMMAN sites. This is soon to be supplemented by a television show. In addition one of the FLMMAN partners is a communications advisory, which has conducted community leader training workshops in how to write press releases and highlight stories to journalists. The wider LMMA network also has a website through which they disseminate information and annual reports. The annual reports on the network also give members an overview of the continuing work in other countries in the network.

Members also provide communities with vital policy, economic and legal information. One interviewee gave an important example of this, explaining that:

‘one of the things that we are doing is creating a FLMMA handbook which has sections about the acts of government that are related to the communities. These are made simple to understand, clarified and translated into Fijian and given to the communities’. (Interviewee M, Suva, July 21, 2009)

These findings complement the findings of Young and Lipton (2006) who deduce that the role of external actors in assisting, adjudication, policy translation and technical expertise is important in adaptive capacity for resource governance. Furthermore, Charles (2007) identifies that a suitable knowledge base is one of four paramount factors in ACM.

5.1.3 Bridging networks

The multi stakeholder approach which has been forged by FLMMAN has given

important impetus not only to the creation of social capital at a local level, but also cross scale or bridging social capital, which has been instrumental in fostering collaboration, trust building and learning at the regional and national level. The cross scale collaboration with government agencies, NGOs and practitioners has stimulated the emergence of political adaptive processes in FLMMAN (Folke et al. 2005). Folke et al (2005) citing Schneider et al. (2003) states that in these networks ‘...diverse policy actors are knitted together to focus on common problems, but these multilevel networks can stimulate collaboration, build trust, provide information, and encourage the development of common perspectives on policy issues’ (p.450).

The government’s enthusiasm for the project and the determination of civil sector has seen the fisheries department become actively involved in the FLMMAN EC. They currently host the FLMMAN secretariat and are restructuring their governance operations to become more closely aligned with the needs of the LMMA sites. One interviewee described how the Fisheries Department has recently undergone a restructuring with proposed new management units dedicated to inshore enforcement.

Through FLMMAN, communities have been strengthened in their endeavours for local centric legislation and policy (Fabricius et al, 2007). As a result of the Fisheries Department being a key member of the network, ‘community input will continue to guide and inform government policies’ (LMMA 2007, p. 14). In response to community pressure the MoF has implemented policies to keep foreign fishing vessels away from inshore fisheries areas.

Nested institutional relationships at the regional and national level will be important for monitoring policy implementation and defining new policy which is more appropriate and locally defined (Young and Lipton 2006). The qoli qoli training teams have now become embedded within the provincial government .Termed by FLMMAN as Yambula Management Support Teams (YMST), these groups have been placed in provincial government departments and support FLMMAN training activities at the district level. Although they do not yet have a direct role in policy formulation, their contact with

communities and provincial governments mean that they have provided new information to FLMMAN members, who have then been able to approach the national government and propose changes to legislation or policy.

Another key example of the capacity for cross scale knowledge exchange enabled by FLMMAN is demonstrated in the instigation of the Integrated Coastal Management (ICM) group. Using the same participatory approaches to problem solving as had been developed in the communities, and involving many of the key FLMMAN members. The objectives of this group is to establish more high level strategy for integrated resource management, which goes beyond just the communities and tackles other sources of environmental pressure.

As evidence of this one interviewee explained how a private enterprise involved in the live rock trade⁵, had 'hacked' away a third of the reef in front of one community. The ICM committee was called together and with the private enterprise and communities conducted a FLMMAN based participatory appraisal. This resulted in a peaceful resolution of the matter, with the enterprise agreeing to plant more coral. The interviewee explained how this showed not only the strength of FLMMAN processes but also the empowerment of communities who have FLMMAN management plans, which help them to understand the consequences of actions and give them access to a plethora of networks and experts.

5.1.4 Bridging Civil Society Networks

Folke et al (2005) assert that for self organized governance systems to emerge it is pertinent to have a strong civil society with equivalent levels of social capital. In conversation with the Director of one of the large NGOs, they affirmed that one of the crucial elements of the network was the great bond that existed between the different NGOs practitioners and academics.

⁵ Live rock trade

One NGO member, who manages projects in the Pacific region, commented that:

‘In Fiji, NGOs are actively involved in the network investing time, money and resources, so the level of commitment in Fiji is much stronger than in other countries in the Pacific’. (Interviewee C, Suva, July 8, 2009)

This relationship is mediated by the social contract, which outlines certain obligations which each member must fulfil (Veitayaki et al, 2003). Although non-binding this provides a framework in which learning and the adaptive strategies of governance can be operationalised. As one NGO interviewee explained:

‘We do contribute every year to the annual reports, submitting information about the sites we work in. We sit on the executive committee and approve and make decisions. We sit on different working groups of FLMMMA, Members of our office actually sit on the different working groups such as biological, socio-economic and enforcement groups and through these we supply information and feedback’. (Interviewee F, Suva, July 9, 2009)

5.2 Processes, Local Knowledge and Leadership

In the subsequent section I will demonstrate that social memory has been sustained in the FLMMAN network through the unique processes and tools of FLMMAN, which have reinvigorated traditional forms of management. To supplement this, vision and strategies employed by the FLMMAN leadership have resulted in new modes of knowledge generation and cohesion in social networks.

5.2.1 Processes

In conducting management planning workshops FLMMAN requires the participation of a

cross section of the community. This includes representatives from all the institutions, including the youth and women's groups. Engaging wide participation broadens the range of interests and issues to be considered, and taps into new nodes of knowledge and experience in constructing management plans. Young and Lipton (2006) state that 'a critical aspect to the analysis of adaptive capacity for environmental decision making is the assessment of the institutions that people are engaged in with consideration to the historical, familial and community contexts within which they operate' (p.78).

In Fijian communities all members belong to a formal or informal institution. Typical institutions include the Woman's Group, Youth Group and the Church Group. This was validated in conversations and interviews with community members in Tavua where individuals claimed to be part of at least one of the community groups. In particular I observed some community members attending church meetings at least once a day. Participation in communal institutions is invaluable not only for the individual but also for the community, and for resource management and enforcement. These institutions operate out of a commitment to shared goals and values. Interviewees explained that within the groups they attended they shared information and raised any issues that they have. Through these groups knowledge of changes and placement of new rules for the LMMA site can be encouraged and adapted (Ostrom et al, 2002).

Strong social capital and spaces of engagement to engender collective learning are capacitated by regional and national meetings. Annual meetings host all representative members of the communities, to discuss and demonstrate the processes and problems that they have experienced at their sites. As a member of IAS explained:

'we have national meetings and that's when they come and share with everyone what is happening, what works, what doesn't work, what works well, some of the threats and their distribution across the network. If similar problems are occurring across the network then we will try and solve this wider thing at the national level and also try and address it locally at different sites and hopefully it will solve the bigger problem' (Interviewee M,

Suva, July 21, 2009).

This space of deliberation allows for the mobilisation of new knowledge and discussion of new issues, which can augment current experience and approaches (Lebel et al.2006).

FLMMAN sites construct monitoring programmes which are locally specific, simplistic and easily applied by community members. Through contextual monitoring and the integration of local knowledge, communities are better able to understand and react to negative feedbacks and crisis events (Lebel et al, 2006). In Tavua the monitoring programme focuses on four fish, two of which are economically important. One interviewee furthered this by explaining that community representatives are also trained in basic ecological analysis, giving them the ability to monitor, analyse and act on the outcomes.

5.2.2 Local Knowledge

Grover et al. (2008) concludes that with help from FLMMAN, indigenous Fijian communities have managed to combine their rich tradition of natural resource management with scientific methodologies monitoring and increased participation and collaboration in planning and implementing management regimes. It is noted by Veitayaki (1997), that traditional modes of management such as the *tabu* area and quota restrictions have been used in Fiji and the Pacific extensively in the past and are part of their LEK, and are therefore well known to members of the community. During the management planning stage local knowledge is taken account of in determining the course of action. The community identifies the problem, the solution, the management action and the scheme of monitoring. As an interviewee involved in establishing sites explained:

'the communities are always told it is their choice, if we think it may not be optimal they explain why, but highlight it's their choice, but whatever you

decide, lets monitor it and rather than guessing, lets find out'. (Interviewee D, Suva July 8, 2009)

Further to this interviewees attribute the success of the LMMA sites and the MPA's that have been implemented, to the use of a traditional system of resource management. The establishment of areas of no take or MPA's parallels traditional practices of establishing a *tabua* area. The closure of certain areas has always been part of Fijian cultures, and part of ceremonial rituals. As one NGO member illustrates:

'when a chief dies we protect the fishing ground for 100 nights, where the chief has domain over'. (Interviewee M, Suva, 21 July, 2009)

The FLMMAN approach has been to take this traditional means of protecting areas and apply it for a longer period of time, and with the benefit of the creation of the area being constituted by the knowledge of the local community members. This mode of management is complemented by traditional customs and as such people do not need to remember new rules and regulations, but are just practising traditions (Berkes et al, 2000). This finding complements the findings of Berkes et al (2000), who surmise that traditional systems of management based on LEK are more adaptive to ecological changes.

5.2.3 Leadership

In maintaining processes of learning and networks of knowledge, leadership is a key component (Folke et al 2005). In the context of the FLMMAN network the importance of individual leadership is clearly evident at the local and national scale. The key and critical constituent to the establishment of the network was the work of one individual at IAS, in having the vision and foresight to establish the first LMMA site, utilise new participatory tools, present the results to the government and generate the cooperation of the other NGOs and stakeholders. This is not to detract from the influences of other involved, for example the role of the government in legitimating the process was also important as was the cooperation of WWF and other large NGOs .Further leadership has been sustained by

the IAS at USP. The IAS hosts training workshops for local and regional, community members and government officials (LMMA 2007). It also hosts regional MSc students who research topics relevant to site advancement, and in some cases act as SLO's.

At the local level the successful implementation of the sites has relied on the role of key individuals. In Tavua the site is maintained by the CR, who coordinates the local enforcement team, issues licenses for access to the qoli qoli, maintains correspondence with the SLO, and attends group, district and provincial meetings to disseminate information about the site and management activities. As observed by one fish warden:

'All the decisions that are made come from (the CR), cause he is the leader and knows where everything is going to be changed and we have a meeting and this is where we find out the changes'

This is complemented by the use of the traditional systems of governance, which maintain social memory. For instance in Tavua the chiefly system is still intact and the districts listen to the authority of the chief. Interviewees acknowledge that the role of chiefs has been important in the success of the management plans instigated at sites.

The FLMMAN leadership itself is an important example of network vision. For example they are currently developing a 5 year strategic action plans. As revealed by one of the working group leaders, recent expansion in the network has meant the need to align their objectives and vision. FLMMAN representatives have attended 8 provincial meetings in attempts to engage the 217 community members in the planning process. At the meetings they have discussed with community representatives the 'blockages' hindering their management plans. Observations and suggestions have then been amalgamated into what will become the 5 year strategic plan.

5.3 Limitations and barriers

In exploring the networks and linkages which have constructed the adaptive forms of co-management in the FLMMAN network, challenges emerge such as the social barriers

which limit social capital and social memory. Political, social and cultural dynamics cause tensions and affect the processes of learning that cause a fragmented or false generation of knowledge about ecological changes at different scales.

5.3.1 Vision and Trust

In FLMMAN there are a number of underlying tensions which present potential barriers to social capital and the exchange of knowledge and learning processes. In examples of failed schemes of AC, a lack of cohesion and conflict between stakeholders involved resulted in collapse of the social institutions and failure of the management plans (see Ayles et al, 2007).

Disparity exists between FLMMAN members as to the ‘vision’ of what the FLMMAN network and processes should be used for. Interviewees from the membership organisations acknowledge that there is contention in the EC as to whether FLMMAN focus should on conservation or community development. As commented by one interviewee:

...that's my concern with some of the other BINGOs that are in Fiji and because they are conservation orientated and are spending huge sums of money designing on a computer screen, networks of protected areas, that they are never going to mean anything on the ground'(Interviewee R, Suva, 23 July, 2009)

This is further compromised by the aspirations of certain members who have used the network as an access to communities to pursue their own agendas, driven by the global narratives of their respective organisations. As mentioned by several interviewees the inclusion of one international NGO and their conservation driven methods had caused tensions between members of the EC. There have since been some major efforts to bridge the gap. Critically, the EC and network provided a space for conflict resolution which allowed members to discuss differences in approaches and resolve issues of contention.

However this has not always been the case. The civil society social capital has also been compromised by designation of FLMMAN as an NGO in 2004. This was not well received by some members of the network, who saw this as a direct threat to their sovereignty and compromised their data and funding. In one particular case the FLMMAN EC member removed themselves from the network. Parallel to this is confusion as to who members represent, their own organisation or FLMMAN.

Incoherence of vision between partners and different organisations causes a lack of direction and threatens network cohesion, knowledge generation, and may result in a lack of understanding of when windows of opportunities present themselves to create new development trajectories.

5.3.2 Weak Leadership

The reliance on the traditional structures of governance can be both an advantage and a hindrance. To quote one interviewee, the success of management plans;

‘depends on how well people respect the traditional authority with a strong high chief who can make sensible decisions and whether people respect them. If you do then they can lead the community through difficult times, if not, if there has been a break down in traditional authority, especially in the urban environments and the government doesn’t step in then again you have a situation which can lead to more chaotic circumstances’ (Interview C, Suva, July 8, 2009).

We also observed this in the village of Tavua, where the chief has recently passed away. This had left the village without a headman, as the successor will not take up the position until one year following his death. This has left a gap, which has been exploited by some fishermen, who realise that without a senior authority enforcement is weakened. This is an example where the reliance on the traditional structures can hinder the process. A chief who is not complicit with the FLMMAN vision, may see no need to maintain the

management plan. There are examples across Fiji of the *tabu* area being opened once increased fish stocks have been recognised (LMMA 2008). However in recognition of this it was highlighted during an interview that FLMMAN has now developed a leadership programme which is being administered in districts to engender environmental leadership in chiefs.

The lack of supporting legislation signifies a lack government leadership and is often cited by interviewees as a continuing pressure to the FLMMMA network. As one interviewee commented although the network has made conservation more visible, but the Fisheries Department view their work as being done through the partnership with FLMMAN.

Although the government recognises the areas by their actions they still emphasis resource utilisation and provide assistance to fishers rather than those that want to conserve (Lane 2006). This is supported in a recent publication commissioned by WWF which highlights the divide between the governments stated marine protected areas policy and the legislative framework Techera and Troniak (2009). This is supported by the Young and Lipton (2006) who deduce that policies and legislation that do not take account of biophysical and resource use systems restrict adaptive capacity.

This highlights that although the linkages are there, sometimes they are not used. The lack of legislative progress illustrates disconnect between what is happening at the community level and how that is translated at the government level. In Fiji the lack of government support is a hindrance to the learning and self organising capabilities of the FLMMMA network. For example as outlined by one interviewee, the current permit system instigated under the Fisheries Act (1941) which is being enforced in the FLMMAN managed *qoli qoli* areas, such as Tavua, is problematic. The permit issued to subsistence fishermen is not legally binding. Although perceived by the communities as being so in fact the police are very limited in the extent to which they can prosecute offenders. This is parallel to longer term issues of government and traditional ownership of *qoli qoli* which constrains management practices (Lane, 2006).

However in a recent study commissioned by IUCN, it was highlighted that although not explicit, there are conditions in the fisheries Act to enforce *tabu* areas through permits and licenses. However the mechanisms for enforcement need to be addressed (see Minter 2008). This legislation and policy divide threatens informal networks at local and national levels and creates problems of legitimacy and official ways to manage conflicts.

5.3.3 Access

The processes of participation, which denote the success of the collaborative schemes are difficult to ascertain in the case of FLMMA. Access to, and participation in, wider decision making is critical to extracting new knowledge and engendering innovation and creativity (Adger 2004). As Lebel et al. (2007) clarifies ‘public participation allows differences in interests and interactions with other issues to be brought forward for scrutiny’ (p.4). Although the procedural protocol denotes that a cross section of the community is engaged in the inception and establishment of the network, it was questioned by some key figures during interviews as to how truly engaged community members were. One academic commented that community engagement means different things to different organisations, and participatory techniques and strategies may not be as widely consultative as is hoped.

‘...these are the types of things that FLMMA needs to improve on. One is the involvement of non-indigenous communities, two is involving more women and three is involving youths.’ (Interviewee M, Suva, July 21, 2009)

Indigenous Fijians living outside of urban areas live in well-defined social units (Grover et al, 2008). However nearly 50 % of the population of Fiji is settled by Indo-Fijians. In Tavua the Indo- Fijian population lives in small communities outside the main villages of the district. In conversations with Indian fishermen they claimed to have not been consulted in the management planning process of the LMMA. They also have no

representation in the *qoli qoli* committee, concomitant with their lack of land rights⁶. In addition to this Indian fishermen are paying much inflated sums for fishing licenses, compared to Fijian members of the district. This is an illustration of larger scale racial tensions which exist in Fiji. As one interviewee observed:

'With non-indigenous people they are rarely invited to the community meetings. It is something that we have been learning.' (Interviewee M, Suva, July 21, 2009)

Despite procedures which stipulate the involvement of all sectors of communities and districts it is often just the men who are involved in the management planning and decision making. Despite women and youths role in the fisheries they are excluded from decision making processes. FLMMAN has highlighted this as a hindrance to the longevity of their processes and has instigated a youth and gender programme to engage both more fully in the processes. In addition, in a yet unpublished study, it has been determined that although community members may attend and participate in management meetings, there is a critical failure to return the information and management decisions to the interested parties in the communities (Veitayaki n.d.).

This failure to integrate can hinder people's awareness of processes. A constraints of the FLMMAN sites and a restriction to adaptive social capabilities, has been the lack of awareness of fishermen and villagers, as to where the LMMA sites are, or what the purpose of the sites is. One NGO director explained that at one of the sites that they were managing they had asked fishermen where they fish and given them maps to point to the areas which they were fishing in. In some cases the fishermen had in fact been fishing in the protected areas. Further to this they explained that:

'people have reported that they have been fishing in the MPA's so that may be due to a lack of awareness or it may be due to the fact that they don't care or respect the traditional authority of the boundaries'. (Interviewee F, Suva,

⁶ Non indigenous Fijians and land rights

July 9, 2009)

Wider questions exist as to the access that the communities have to the decision making hierarchy of the FLMMAN network. On paper they have equal representation in the FLMMAN EC, however their geographical remoteness from the EC and their lack of capacity often mean that views are underrepresented. However as an example of FLMMAN's learning approach to resource governance the network membership has been adapted to include representatives of the communities. This is illustrated by one of the interviewees:

'For our 217 villages that we work with, they are represented on the working committee through three individuals. The whole of Fiji is separated into three confederacies, which is a collection of provinces. These people get all the issues from their communities and represent them in the Executive committee. We fund these three people to attend all the executive meetings.' (Interviewee M, Suva, July 21, 2009)

6. Discussion and conclusion

This study has set out to explore the social mechanisms which contribute to adaptive co-management in FLMMAN. By examining the FLMMAN through the lens of adaptive governance, I have considered a number of factors which have led to the emergence of adaptive strategies, and factors which are hindering the adaptive capabilities of the network and its members. In essence the outcomes of the study have been two-fold, giving insight to certain factors which are of consideration for FLMMAN governance and contributing to the knowledge base of adaptive co-management, and the role of adaptive governance in guiding resilient outcomes to resource management.

Key to the resilience of FLMMAN has been the use of a diversity of networks to create spaces of collective action, within which individuals and groups can engage, share knowledge and learn about ecosystem dynamics. Through these networks individuals and groups have created linkages and partnerships which have facilitated new mechanisms for self organisation, that have impacted environmental policy, legislation and augmented technical and financial capacity at a local and national level. These networks have been mediated by key individuals and groups that have recognised changes in the socio-ecological system and provided appropriate vision and strategy to navigate to new outcomes. Such leadership has also been instrumental in instigating new processes of management which have incorporated local ecological knowledge. Furthermore the acknowledgement of traditional governance structures has reinforced local social capital.

Yet there are a number of barriers to be overcome. The ability of the network to cope with external and internal perturbations is inhibited by issues which restrict the trust and social capital of members. Incoherence of vision and confusion over objectives can cause a lack of clear direction in reacting to ecological changes. The disconnect between government rhetoric and action is a fundamental gap which can cause a loss of local trust for government institutions. Furthermore it can inhibit participation and self organisation,

if local efforts are not reflected by national level action. The reliance on traditional governance can be restrictive if sentiments of management are not shared. Cultural issues regarding race and gender are barriers to creation of nodes of innovation and production of full ecosystem knowledge.

The lens of adaptive governance has been important in highlighting linkages and gaps in this polycentric network. Such an approach has helped in understanding mechanisms which enable adaptive capacity, such as networks, processes of knowledge generation and how this should be linked across multiple scales in schemes of ACM. The system wide conceptualisation has been of use in understanding how the political and cultural relate to sustaining ecological mechanisms. However limitations have been evident in developing clear mechanisms to deconstruct the processes taking place in ACM. Armitage et al (2008) points out that more attention needs to be paid to the type of learning which takes places in co-management. Just implementing learning mechanisms is not enough, and we need to be careful of how learning takes place and who the learning is benefitting. Furthermore the lens of adaptive governance fails to deconstruct the deeper meaning of political and cultural barriers to ACM, or give a clear indication of how to tackle these problems.

However in moving forward, there are a number of key conclusions that can be drawn from this case study, which complement and extend the current theoretical basis of ACM.

6.1 Importance of Leadership

The fundamental enabling and debilitating factors of the FLMMAN network can be attributed to the leadership or lack of leadership of individuals, organisations and the government. In FLMMAN the transition to polycentric scheme of co-management was expedited by the role of a key individual. Although he did not act alone he initiated key processes, linked actors, developed strategy and vision to create networks drawing on new sources of information. His position in the IAS at USP also helped in having the capacity, expertise and the networks establish the first of the LMMA sites. This indicates

the importance of leadership in initiating processes which can lead to building resilient schemes of co-management. But recognising the window of opportunity with which to use these assets at his disposal was also vital (Olsson et al. 2004b, Olsson et al. 2006). This led to cross and vertical scale linkages being made.

The problems for the network and for co-management in Fiji have come from the lack of leadership from the government (Lane 2006). As Olsson et al. (2004a) discern ‘to enable local people to be participants in ecosystem management rather than managed as subjects, governments should transfer power to local authorities and other local decision makers’ (p.83). This indicates the importance of government leadership in sustaining such schemes.

6.2 The role of Shadow Epistemic Communities

Successful modes of ACM in the FLMMAN network have been facilitated by the role of communities of individuals who have formulated new ideas and strategies in the face of changing environmental and social pressures (Hass, 1992, Olsson, et al., 2006). These have been termed shadow epistemic communities by Olsson et al (2006) and provide ‘new knowledge critical for developing alternative approaches and moving towards adaptive co-management’ (p.13, Olsson et al. 2006). We see evidence of this in the formation of climate change group to explicitly research and develop a strategy for FLMMAN communities.

It is hypothesised that new groups can be synthesised from such arrangements, and the shadow epistemic communities provide a basis of trust and social capital which enable collective action (Olsson et al, 2006). The role of epistemic communities in FLMMAN is evidenced in the emergence of the ICM group. This also provides an example of how such groups can be of use in linking institutional and organizational structures. The ICM group was formulated from social networks which existed within FLMMAN..

Of importance in the case study has been the way in which FLMMAN has formalised

shadow epistemic communities within its governance structure, as exemplified by the working groups. When presented with problems, the working groups act as nodes of innovation, tasked with researching key problems such as gender or local governance issues and formulating new approaches and monitoring the outcomes. When institutionally embedded these shadow communities can also become points of policy innovation. An example of this is the role of FLMMAN within the Fisheries Department.

6.3 FLMMAN as a bridging organisation

One of the key outcomes of this study has been highlighting the role of FLMMAN in mediating the co-production of knowledge at different scales (Cash et al. 2006). This scale challenge is addressed by what Cash et al (2006) refer to as bridging organisations. FLMMAN has formed a link between the government and communities and played a role in exchanging and interpreting knowledge between the two parties. An example of this is found in the government's role in the network and their policy changes which have acknowledged the local level management schemes. Further to this FLMMAN has acted to configure links between communities and other organisations. Through connections to wider networks they have access to new knowledge and experiences which can aid in coping with new challenges.

Moving beyond the arguments of Cash et al (2006), FLMMAN also provides an example not only of a bridging organisation which can link knowledge at different levels but also one which can link processes. To illustrate this point I refer again to the example of the ICM group which used the processes and networks of FLMMAN to formulate new strategies. This provides an interesting area of further research when considering how small island states might use co-management schemes to cope with wider environmental problems such as climate change (Tompkins and Adger 2004).

6.4 Concluding remarks

To conclude the instigation of the FLMMAN network has led to the creation of

collaborative polycentric forms of governance which have had the effect both of creating localised self organising and learning centred processes as well as national level political implications. The FLMMAN approach has the potential and the processes in place to allow for a more holistic and integrated resource management using the tools and relationships which it has in place. Further research and strategy should focus on how the network and tools can be used to tackle wider livelihood problems, not solely related to the marine environment. Working within the culture and values of FLMMAN, communities can do much more than manage their marine environment, they can exercise leadership, manage change and contribute to sustainable livelihoods and shape policy at both local and national levels.

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Appendices

Appendix 1: Acronyms and Fijian translations

Acronyms

CBNRM – Community based natural Resource Management

NRM - Natural Resource Management

ACM – Adaptive Co-management

FLMMA - Fiji Locally Managed Marine Areas

FLMMAN – Fiji Locally Managed Marine Areas Network

LMMA – Locally Managed Marine Areas

LEK –Local Ecological Knowledge

CBAM - Community Based Adaptive Management

SLO - Site Liaison Officer

EC – Executive Committee

CPUE – Catch Per Unit Effort

ACM – Adaptive Co-management

SLO – Site Liason Officer

CR – Community representative

USP – University of the South Pacific

IAS – Institute of Applied sciences

LF – Learning Framework

Fijian translations

Qoli qoli – Fishing ground

Tabua – no take area

Mataqali – family group or clan

Appendix 2: Interview Timetable

Interview code	Interview Date	Location
A	July 6, 2009	Suva
B	July 7, 2009	Suva
C	July 8, 2009	Suva
D	July 8, 2009	Suva
E	July 8, 2009	Suva
F	July 9, 2009	Suva
G	July 14, 2009	Tavua
H	July 15, 2009	Tavua
I	July 16, 2009	Tavua
J	July 16, 2009	Tavua
K	July 17, 2009	Tavua
L	July 18, 2009	Tavua
M	July 21, 2009	Suva
N	July 21, 2009	Suva
O	July 22, 2009	Suva
P	July 22, 2009	Suva
Q	July 22, 2009	Suva
R	July 23, 2009	Suva
S	July 23, 2009	Suva

Appendix 3: Consent form
MASTERS DISSERTATION RESEARCH CONSENT FORM

July 2009

Dear Participant,

You are invited to participate in a study, entitled “Tides of Change: Adaptive co-management and the role of adaptive governance in the LMMA network, Fiji” The project involves researchers from The School of Geography and the Environment at Oxford University (Mr. Nicholas Moss) in collaboration with the FLMMA network and partners.

The aim of the study is to analyze the transition of the FLMMA network in developing adaptive processes and what these processes will mean in defining the social resilience of the network to climate change. Using historical records, interviews, and participatory observation, we will investigate :1) the processes, actors and institutions that stimulated and sustained the creation and transformation of the FLMMA network 2) the kinds of changes that occurred and who has benefitted from these changes 3) the potential barriers to transformation to a more resilient socio-ecological system at local, regional and national scales 4) the strategies and policy recommendations for overcoming these barriers, and if there have been lock in/traps.

The results of this study will be used for my MSc dissertation and potentially synthesized in reports for the FLMMA network. The results will be shared with participating local communities, FLMMA network members, relevant stakeholders, and in publications. Individual and/or group interviews will be conducted at a place where individuals feel comfortable.

Your signature indicates that you have read and understand this form and agree to take part in this study. Please understand that by signing, you are not waiving any legal claims, rights or remedies. In addition:

1. The researcher will not record any information you do not want recorded. You may also restrict access to your recordings. If you agree to be audio-or video-tape recorded or photographed, copies of the original photographs, recordings and transcripts will be held by researchers at Oxford University for at least three years. We will keep your interview confidential if you wish. We protect your confidentiality by coding the interview materials with pseudonyms such that your identity is not directly linked to your words in transcripts or publications. You may also request to read and edit transcripts before they are finalized.
2. The researcher(s) may use the information collected from this interview to produce academic articles and/or books. In cases of doubt, the researchers will try to check interpretations and conclusions with you, but will acknowledge their responsibility for any errors.
3. You understand that participation is voluntary. You may either refuse to participate or withdraw from the study at any time.
4. You understand that your information may be used in future publications.
5. You understand that you will be given a copy of this Informed Consent Form.

If you have questions about the study itself, please contact Mr Nicholas Moss, nick.j.moss@hotmail.co.uk, +447948641213 (UK).

_____Date _____
Participant signature

Please indicate consent by initialing each statement below.

I agree to participate in this study by _____ being interviewed.
_____being audio- or video-tape recorded.
_____being photographed.

Please circle the appropriate answer.

I would / would not like to be identified by name in publications.

I would like the materials to be deposited at _____ (indicate where).

State conditions under which material related to your interview could or could not be released:

As researcher, I agree to abide by your wishes as outlined on this form.

_____Date _____