HOW CAN PARTICIPATORY SOCIAL NETWORK ANALYSIS CONTRIBUTE TO COMMUNITY-LED NATURAL RESOURCES MANAGEMENT? A CASE STUDY FROM BUA PROVINCE, FIJI ISLANDS

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HOW CAN PARTICIPATORY SOCIAL NETWORK ANALYSIS CONTRIBUTE TO COMMUNITY-LED NATURAL RESOURCES MANAGEMENT? A CASE STUDY FROM BUA PROVINCE, FIJI ISLANDS

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Abstract

Adaptive co-management of natural resources requires a variety of stakeholders across different scales and sectors to communicate and collaborate effectively. Social network theory recognizes that stakeholders interact with each other through networks and that various network characteristics affect the way in which they function. Social relationships can be visualized through network mapping and their patterns systematically analyzed in a process known as social network analysis (SNA). Participatory SNA allows members of the network to be involved in the mapping or analysis process. Participants can then apply their knowledge of these relationships to build, improve, or better utilize their connections to increase desired outcomes. These actions are referred to as network interventions or network weaving.

In Bua Province in the Fiji Islands, the Wildlife Conservation Society and other partners are facilitating "ridge to reef" ecosystem-based management planning and are striving to build local capacity for natural resources governance and conservation. This study seeks to determine how participatory SNA might be used as a tool for enhancing community-led natural resources management. First it was necessary to develop methods for conducting participatory SNA research with rural Fijian communities. Network data was then gathered from eight Districts and fifty villages. Social network maps were presented back to community stakeholders for their interpretation and to elicit their ideas for improving their resource governance networks.

SNA was used to characterize and map patterns of information exchange and collaboration among stakeholders involved in natural resource management in Bua. Even without complete network data, several patterns emerged. These included: 1) Traditional decision-making networks that were more cohesive than information exchange networks, reflecting the importance of social hierarchies for decision making within rural Fijian communities and the need for resource governance to link into these structures. 2) All the District-level networks had a number of fragmented groups and more ties within than between communities. This highlights the challenge of getting communities to effectively collaborate at the District-level due to issues like distance between villages, conflicts, barriers to communication (e.g. no phone/internet), and clan-based (mataqali) land-ownership system. These issues suggest the need for innovative actions to help bridge these gaps and present an opportunity for network weaving. 3) Actor position analyses (indegree and outdegree) provided a list of opinion leaders and people who are good at reaching out to others. These individuals may be good candidates to receive network weaver trainings. These measures also highlighted individuals and groups that communities would like to work with in the future and who facilitators can help to connect.

Overall, these results indicate that SNA can be a valuable tool for better understanding relationships between actors involved in collaborative natural resource management, but its use in rural

settings can be limited by the challenges of collecting data in remote villages. The participatory process of evaluating networks with participants was beneficial since it helped communities recognize and discuss the strengths and weaknesses of their resource governance networks. This resulted in a list of recommended capacity-building activities (such as alternative livelihoods projects and special trainings for traditional leaders) based on their self-identified needs. However, the real potential benefits of this process will not be realized until the study results are applied, until network weaving and capacity building actually take place, and the process is evaluated to determine if any positive outcomes resulted for communities or conservation. This will require considerable commitment on the part of a network coordinator(s) to impart network concepts, facilitate network weaving activities, and in due course empower a transformation from the status quo to self-organizing, action-oriented conservation networks.

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Thank you to the staff at the Wildlife Conservation Society Fiji who made this study possible. Thank you to Dr. Stacy Jupiter for allowing me to undertake this project and for allocating the resources to make it happen, to Ged Acton for your tireless support and input, to Akinisi Cagi, Kini Koto, and Sirilo Dulunaqio for all your help and dedication in translating and facilitating, and to Sangeeta Mangubhai and all the other support staff who helped out at various stages of the project and who will continue to see it forward. WCS also secured the necessary permits we needed from the Fijian government for conducting research and working with "human subjects".

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Chapter 1: Introduction

Fiji is a nation rich in terrestrial and marine resources which many Fijians rely on for their livelihoods (Department of Environment, 2011). These resources are being threatened by increasing population, climate change, and unsustainable development that has resulted in declining levels of biodiversity (UniQuest, 2009; Watling & Chape, 1992). Over the past 15 years, Fiji has become renowned for its widespread implementation of community-based natural resources management which has resulted in the designation of over 200 locally-managed marine protected areas (MPAs) (Sievanen, Gruby, & Campbell, 2013; Chandra, 2011, Govan et al., 2009). Community-based natural resources management refers to a variety of governance arrangements in which local peoples own, use, and make decisions about their resources, often with multiple goals such as sustainable development, poverty alleviation, and conservation (Berkes, 2004; Kellert, Mehta, Ebbin, & Litchenfeld, 2000). While Fiji's efforts deserve merit, some conservation practitioners have raised the concern that the local scale of these management efforts is too small to account for larger-scale ecosystem processes and that management needs to also take place at larger scales (Sievanen et al., 2013; Tawake, 2007). Despite some local successes, there are also concerns that meaningful conservation outcomes are still not being achieved despite the increasing number of MPAs (Keppel, Morrison, Watling, Tuiwawa, & Rounds, 2012; Lees & Siwatibau, 2009).

In 2011, Fiji adopted a national Integrated Coastal Management (ICM) framework to guide sustainable development and conservation planning across the islands (Department of Environment, 2011). However, new challenges have emerged as community-based management has attempted to be scaled up to include a wider range of stakeholders covering larger geographical regions (Sievanen et al., 2013; Hastings, Gruby, & Sievanen, 2012). One current dilemma stems from how to ensure that community priorities continue to be accounted for in higher level planning and how top-down policies can be translated into local management actions that not only have meaningful conservation outcomes, but also enhance local livelihoods (Keppel et al., 2012; Jupiter & Egli, 2010; Thaman, Robadue, & Ricci, 2005).

To meet this challenge, the Wildlife Conservation Society (WCS) Fiji Programme piloted a project in Bua Province, on the northern island of Vanua Levu, which engages communities within each district in ecosystem-based management planning. The district management plans are intended to lay the foundation for a Provincial ICM Plan. In order for this process to be successful, diverse stakeholders from government, NGOs, private sectors, and fifty-four rural villages must collaborate effectively throughout the planning process. Most importantly, the communities involved must feel ownership of the district plans, and be both willing and capable of implementing them.

As a Peace Corps Volunteer who lived in a village in Bua Province for four years, I was able to witness firsthand many of the issues faced by rural Fijian communities. Upon moving to my assigned village in 2011, community members shared with me some of the issues that they were facing: rising sea levels, decreasing numbers of fish and marine invertebrates, the disappearance of certain species that were previously abundant, less and less suitable and productive land available for agriculture, difficulty accessing markets to sell their harvests, and limited opportunities for economic development. Challenges vary between communities, but there remains a common need for effective and efficient means of dealing with these issues. Forty-five villages in Fiji have been earmarked for relocation due to rising sea levels (Chandra, 2015) and the first relocation has already taken place with two more in progress (Moceituba, 2015).

My primary goal as a Peace Corps Volunteer, and one of WCS's goals as an organization, was to present communities with tools they could use to make informed decisions about their current issues and to empower them to create more sustainable futures. One such tool whose use has been emerging within the field of natural resources management is social network analysis (SNA). SNA is a methodology that gathers relational data, diagrams or "maps" it, and then analyzes it for patterns (Borgatti, Everett, & Johnson, 2013; Hanneman & Riddle, 2005). It is essentially a way to map relationships. Applied SNA takes this methodology further, and attempts to use the information gained through this process to strategically improve the quality and quantity of relationships within the network (Holley, 2012).

By applying a social network perspective to the ICM planning process in Bua Province, we recognize that stakeholders interact with each other through social networks and that the characteristics of these networks affect the way the networks function (Holley, 2012; Bodin & Crona, 2009). Social network analysis has the potential to uncover strengths and weaknesses in the relations amongst stakeholders in Bua that could have important implications for governance and collaboration. Social network data may help stakeholders better understand their relationships and enable them to build new connections or make more informed decisions -- for example: when selecting representatives to participate on management committees or when designing capacity building activities (Valente, 2012; Vance-Borland & Holley, 2011; Prell, Hubacek, & Reed, 2009).

While a number of recent studies have documented the use of SNA in natural resource management (Mills et al., 2014; Guerrero, McAllister, Corcoran, & Wilson, 2013; Cohen, Evans, & Mills, 2012; Prell et al., 2009; etc), its participatory application has yet to be thoroughly evaluated. Vance-Borland and Holley (2011) highlighted a number of studies from fields such as public health and business that developed strategies for improving networks based on SNA and the positive outcomes they produced. They also noted that many of these interventions were top-down, although a few did encourage self-organized actions. By involving network members in the evaluation of their networks, an applied

methodology also becomes participatory and empowering. Participatory SNA presents network maps and data back to network members for their interpretation. Network members are then encouraged to use this information to develop strategies, called "network weaving" or "network interventions", for improving their network (Holly, 2012; Valente, 2012; Vance-Borland & Holley, 2011).

Participatory management processes and research methodologies stress the engagement of local peoples from project design through implementation and evaluation. Although this generally takes more time and effort, it is the fairest way for outsiders to conduct themselves and ensures communities are not only consulted but truly have input and control throughout the process. Additionally, participatory analysis can help to reduce any biases that the researcher might have when interpreting the data and may also help show how the same information can be interpreted differently from different perspectives (Schneider, 2011; St. Denis, 1992). To date, only three studies using applied SNA methods in NRM have been published (Beilin, Reichelt, King, Long, & Cam, 2013; Vance-Borland & Holley, 2011; Prell et al., 2009), none of which have taken place in the context of community-based NRM.

To contribute to filling this gap, this study seeks to address the question, "How can participatory social network analysis contribute to community-led natural resources management?" I propose that network maps and analyses can provide community members and NRM practitioners with useful information about social networks in Bua Province and that this information can be then used to develop strategies for improving these networks. To test this, data on six relationships was gathered and mapped for each of eight districts in Bua. These network maps were presented to two of these districts and community participants were able to provide their ideas about the patterns they depicted. They evaluated the strengths and weaknesses of their networks and suggested strategies for making improvements. This feedback was then used to recommend strategies and capacity-building activities for improving community-led NRM. Descriptive metrics were used to characterize the social networks in Bua, but these results were not presented back to communities as they are rather complex. A major outcome of this study is recommendations for conducting participatory SNA in cross-cultural community-based settings.

Thoughtfully-designed capacity building activities have been linked to a higher likelihood of successful management outcomes in community-based conservation initiatives (Brooks, Waylen, & Mulder, 2013). Since local capacity has been highlighted as a barrier to conservation success in Fiji (Lees & Siwatibau, 2009), this study seeks to test whether participatory SNA may be a new technique that can increase local capacity for NRM. This project collected and analyzed baseline social network data as an initial component of a longitudinal research project. Over the next few years, and beyond the scope of my involvement, WCS hopes to systematically document the effects of network interventions not only to changes in network structure but also to socio-ecological outcomes. This thesis is a first step toward bridging the research-implementation gap (Knight et al., 2008) in NRM social network research by

informing the design of network interventions that will hopefully result in meaningful outcomes for communities and conservation (Figure 1.1). The particular merits of this study lie in its ability to provide insight into the design of appropriate participatory social network research in the context of community-based conservation and to inspire future studies to build upon its findings.

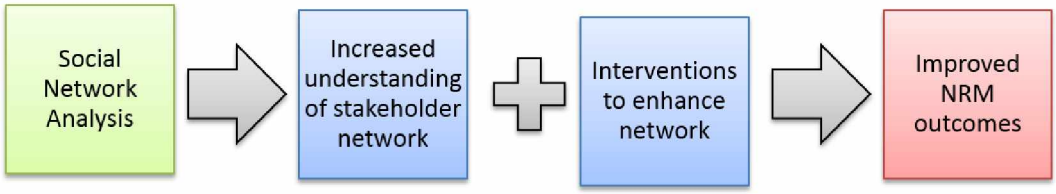

Figure 1.1. Conceptual Diagram of Applied SNA's Potential Ability to Improve NRM Outcomes

This thesis contains six additional chapters following the Introduction. Chapter 2 will review current literature related to the topic of this thesis and will highlight how this study might contribute to filling knowledge gaps in these areas. Chapter 3 will provide important background information on the cultural context of this work and the natural resource management planning processes being facilitated by WCS in Bua Province, Fiji. Chapter 4 will detail the methods used and Chapter 5 will present the results obtained. Chapter 6 will provide a discussion of these results and Chapter 7 will conclude this work.

Chapter 2: Review of Current Investigations

Assessing the potential of participatory social network analysis to contribute to enhancing community-based natural resources management processes requires a thorough understanding of key themes in the relevant literature. This chapter examines current investigations to demonstrate the rationale behind studying and using social networks within natural resources management contexts. It also provides an introduction to social network analysis, explores the history of its use in natural resources management, and highlights current gaps in knowledge and application. This review, when paired with the important background information about the study site found in Chapter 3, provides justification for this research and its methods.

Systems theory and non-equilibrium ecology have had great impacts on conservation concepts by helping shift the lens from viewing humans and nature as separate entities to viewing them as dynamic and complex social-ecological systems which respond and adapt to uncertain and changing conditions (Chapin et al., 2010; Olsson, Folke, & Berkes, 2004). Principles of adaptive co-management have been widely promoted as a way to foster more resilient management processes and governance structures (Cinner et al., 2012; Folke, Hahn, Olsson, & Norberg, 2005; Berkes, 2004). However, great principles do not magically translate into great outcomes and conservation outcomes still aren't meeting their marks. Knight et al., (2008) state that "two-thirds of conservation assessments published in peer reviewed scientific literature never result in conservation action". Suggestions for increasing the effectiveness of conservation include: using a systematic process for multi-scale management planning (Mills. 2014; Bottrill & Pressey, 2012), bridging the divide between conservation science-application and incorporating evidence-based evaluations of outcomes (Margoluis et al., 2013; Laurance et al., 2012; Knight et al., 2008), taking a bio-cultural approach to conservation (Gavin et al., 2015; Keppel et al., 2012; Maffi, 2007; Berkes, 2004), and building the capacity of local communities for governance (Brooks et al., 2013; Keppel et al., 2012; Lees & Siwatibau, 2009) among others.

For adaptive co-management to be effective it requires commitment to a long-term collaborative process commonly involving diverse stakeholders across nested ecological and political scales (Folke et al., 2005; Berkes, 2004). The greater the understanding of these complex systems, the more potential that will exist to design effective management strategies (Ban et al., 2013; Keppel et al., 2012; Turnbull, 2004) – and that goes for social systems as well as natural ones. Social network theory, which has close ties to social capital (Pretty & Ward, 2001), is comparable to a systems approach for social systems. It purports that people do not exist in isolation and that the relationships they have with others greatly influence such things as the resources or information that they have access to, which can in turn affect the decisions they make and the actions they can take (Bodin, Ramirez-Sanchez, Ernstson, & Prell, 2011; Lin, 1999). A network perspective recognizes that actors are connected through relationships and that the

characteristics of these relationships affect the way networks, or presumably in the case of this study -- how communities, function (Borgatti et al., 2013; Holly, 2012; Bodin & Prell, 2011). Some of these characteristics and their effects will be described below.

Social network analysis (SNA) refers to the systematic study of relationships between a group of actors (individuals or organizations), and the patterns and implications of these relationships (Borgatti et al., 2013; Wasserman & Faust, 1994). The relationships in question can take any form and will depend on the focus of the research. One could study who trusts whom, who works with whom, who gets advice from whom, who shares X resource with whom, etc. The social-relational data of interest is typically gathered through a questionnaire or interview and can be visualized using diagrams, or network "maps". On a network map actors are depicted as "nodes" with lines between them representing "ties" or relationships (see Figure 2.1 for an example). Node and relationship attributes can be distinguished through the use of varied colors, shapes, or sizes. Borgatti et al. (2013) provide a thorough introduction to the design of social network research and the variety of ways networks can be analyzed at different levels, although several similar resources exist (Prell, 2011; Hanneman & Riddle, 2005; etc). Common measures used to describe network structure include cohesion, centralization, homophily, modularity, tie strength, and fragmentation (Borgatti et al., 2013; Prell et al., 2009; Bodin, Crona, & Ernstson, 2006). The network measures employed in this study will be described in Chapter 4: Methods.

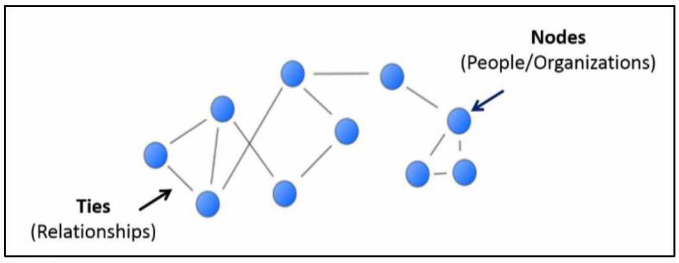

Figure 2.1 Simple Network Map

Networks can be categorized in many different ways (e.g. ego or two-mode networks) and these different types of networks often have different means of analysis (Borgatti et al., 2013). However, June Holley (2012) chooses to divide networks into two simple categories: intentional and informal. Formal or intentional networks are networks in which actors have a shared purpose or common vision paired with some type of organizational structure or membership. SNA is particularly useful in that it also helps uncover informal relationship networks that underlay or extend beyond these formalized structures (Holly, 2012). An example of members of a formal network could be everyone who is employed by X company and works together in X department. One could map such relationships as collaboration or communication on a daily/weekly/monthly basis. An example of an informal network could be whom those same people consider to be their friends or whom they trust.

SNA has been widely used throughout the social sciences (Borgatti, Mehra, Brass, & Labianca, 2009) and is now emerging as an important tool for studying natural resource governance (Guerrero et al., 2013; Bodin & Prell, 2011). Network studies have been utilized in a variety of NRM contexts including fisheries (Marin & Berkes, 2010; Sandström & Rova, 2010; Bodin & Crona, 2009; Ramirez-Sanchez & Pinkerton, 2009), agroforestry (García-Amado et al., 2012; Isaac, Erickson, Quashie-Sam, & Timmer, 2007), coastal and marine management (Alexander & Armitage, 2015; Cohen et al., 2012), and protected areas management (Prell et al., 2009; Ernstson, Sörlin, & Elmqvist, 2008) among others.

Bodin et al. (2011) group network studies from within the field of NRM into three levels or categories: 1) binary metaphorical – study of the presence or absence of networks, 2) descriptive -- distinguishes certain network characteristics but lacks empirical analysis, and 3) structurally explicit -- systematic data collection and analysis of network structure that relates structural characteristics to governance outcomes. Studies from this latter category have begun to uncover the variety of network structures that may have positive outcomes for natural resource governance (Bodin & Crona, 2009; Bodin et al., 2006). Table 2.1 highlights some of the network characteristics observed in these studies that have been suggested to contribute to positive natural resource outcomes.

Table 2.1 Network Structures with Possible Contribution to NRM

Characteristic	Outcome(s)	References
Densely connected groups	Efficient sharing of information and resources; productive collaboration; dispersed leadership and influence	Bodin & Crona, 2009; Bodin et al., 2006; Sandström & Rova, 2010
Actors or groups with diverse expertise	Ability to address multiple issues; solve problems more effectively	Bodin & Crona, 2009; Ernstson et al., 2008; Bodin et al., 2006; Sandström & Rova 2010
Bridging ties between subgroups	Sharing knowledge and expertise; decreased conflict	Bodin & Crona, 2009; Ernstson et al., 2008; Bodin et al., 2006; Sandström & Rova, 2010
Core-periphery structure	Access to additional knowledge and resources when the need arises; respond to changing conditions	Ernstson et al., 2008; Bodin & Crona, 2009

In addition to various network characteristics, previous studies show SNA to be useful for stakeholder identification and engagement (Prell et al., 2009), understanding resource and knowledge flow (Newig, Günther, & Pahl-Wostl, 2010; Bodin & Crona, 2009, Isaac et al., 2007), understanding power relations (Weiss, Hamann, Kinney, & Marsh, 2012; Crona & Bodin, 2010), and overcoming scale mismatches (Guerrero et al., 2013). According to Guerrero et al. (2013), "the problem of scale mismatch occurs when the planning for and implementation of conservation actions is at a scale that does not reflect the scale of the conservation problem" – a concern that has been raised in Fiji.

However, one gap that exists within the natural resources literature are studies documenting the application of social network analysis or evidence that its application can indeed improve desired outcomes (Vance-Borland & Holley, 2011). Only a few exceptions have begun to bridge this research-implementation gap: 1) a study done by Prell et al. (2009) that used SNA to help select stakeholders for participation on a management committee, 2) a study by Vance-Borland and Holley (2011) that presented network data back to conservation practitioners working in Coastal Oregon and stimulated a series of new self-organized collaborations between members, and 3) Beilin et al. (2013) who presented SNA data back to collaborators in a multi-scale "Landcare" program in Australia and found the process to be useful for facilitating dialogue about enhancing collaboration. However, in fields such as public health and business there is a stronger legacy of applied social network research where SNA has actually been used to inform network "interventions" that have resulted in positive outcomes (see Vance-Borland and Holley, 2011; p279 for examples).

A network intervention, as defined by Valente (2012), is "the process of using social network data to accelerate behavior change or improve organizational performance." For example, Flodgren et al. (2011) conducted an evidence-based review of the effectiveness of using "opinion leaders" identified via SNA to influence others to adopt improved health practices. Their findings note that intervention success rates were highly varied, but that overall engagement of opinion leaders resulted in an average 12% increase in compliance with desired practices.

Examples such as these are beginning to illustrate how networks are not just a phenomenon to be studied, but that networks can actually be strategically used to reach desired outcomes. Natural resources management could possibly benefit from more SNA application that could also contribute to establishing a more robust body of evidence linking interventions to outcomes. More research is needed on this and a primary objective of this thesis is to begin to help fill this gap.

Research aside, if the rationale behind moving toward adaptive co-management is to transform static, top-down governance, then adopting a network approach may very well help facilitate a transformation to a more participatory process. Holley (2012) lists four ways an applied network approach can bring change to a system: by "improving the quantity and quality of relationships, mobilizing more leadership, providing a framework for effective intentional networks, and generating more actions that lead to breakthroughs." To elicit these kinds of results, individuals within the network must adopt a network mindset, meaning that they must understand network concepts and be willing to take initiative to build new relationships and try new ideas. A facilitator trained in network concepts and who has network leadership experience is often needed to guide this process (Holly, 2012). This can be a barrier for groups who do not have the resources to hire a formal network facilitator or where one may not be available. While great self-guided resources like Holley's (2012) *Network Weavers Handbook* are

available and allow individuals or groups to learn about networks on their own, ample motivation and commitment are truly required. These types of resources may not be accessible for some groups, especially in rural or non-English speaking locations.

During a true participatory network approach, network members should be involved in a self-assessment of their network. While this can be done without the use of network maps, network maps have the ability to increase awareness of unseen relationships or dynamics and can be a tangible starting point for further discussion of the network's strengths and weaknesses (Holly, 2012). Network maps can either be produced using network mapping software or be hand-drawn, and the process can involve formal SNA methods or a simple participatory mapping exercise (Holly, 2012). Ethical considerations must be taken into account when choosing any network mapping methodology. Network maps depict relationships and show actors' "positions" within the network. This information should be treated with sensitivity, especially in formal organized networks, networks with power asymmetries, networks where a history of conflict exists between members, or where information may reflect poorly back on the actor (Borgatti & Molina, 2005). While network maps can easily be prepared without labeling actors' names, network members are nevertheless able to apply their personal knowledge of the network and can still often identify themselves and other actors. Despite the care needed in presenting network data back to network participants, several studies have shown it worthwhile for fueling discussions and designing interventions to enhance the network (Beilin et al., 2013; Fuller, Hermeston, Passey, Fallon, & Muyambi, 2012; Vance-Borland & Holley, 2011; Friedman et al., 2007; Cross & Parker, 2004). It can also ensure that interventions are based on the community's self-identified needs (Valente, 2012).

Furthermore, from a research perspective, seeking feedback on social network data is not only an empowering way to engage participants, but it can also provide an additional level of evaluation and results validation. For example, network members might be able to provide insight into why the network data exhibits certain characteristics and offer their opinions as to whether data accurately depicts what is taking place on the ground.

This study will document how applied SNA can be integrated into an adaptive co-management process that brings together communities across Bua Province for participatory ecosystem-based management planning. It investigates whether SNA data can be presented back to communities in a cross-cultural context, whether this data is useful to community members and/or NRM practitioners, and if their interpretation and feedback can be used to design network interventions based on self-identified needs that will then hopefully be implemented. An evaluation of this process will help provide insight into the usefulness of applied SNA in similar NRM contexts worldwide.

Chapter 3: Background Information on the Study Area (Bua Province, Fiji)

Customary institutions play a major role in how natural resources are managed in Fiji and must be considered alongside national policies when designing and introducing any management framework or research project. When working with indigenous communities, a clear understanding of traditional values and management practices should inform if and how appropriate conservation programs can build upon, not replace, these cultural foundations (Aswani et al., 2012). There is often a dichotomy between customary and ecological values, with customary values typically based on utilization. People-centered conservation has the challenge of balancing human needs with preservation of biological diversity (McShane et al., 2011). Indeed, Keppel et al. (2012) show that conservation initiatives in the Pacific have a high failure rate because they often do not account for the social, cultural, and economic values of the communities they intend to serve, nor do they adequately invest in long-term project sustainability through building local capacity and incentives for management.

The context in which this study takes place is extremely important. Practitioners and researchers who work in cross-cultural settings need to make concerted efforts to understand and respect the traditions and knowledge systems of indigenous peoples and focus their work on empowering communities (St. Denis, 1992). Although I lived in Bua for four years and made strong efforts for this study to be appropriate and participatory, it is important to recognize that there was likely more I could have done had I not been limited by time and resources. As an outsider, I was unable to grasp all the intricacies of Fijian culture and understand that my personal worldview creates an inherent bias to my perceptions and experiences. Nevertheless, I have a deep respect for the people with whom I engaged during this research project and am proud to share my limited understanding of their culture with those who will read this thesis. For those reasons, the following chapter provides background information on the political and customary governance arrangements present in Bua Province that have a direct effect on natural resources governance and the methods of this study.

3.1 Site Description

Bua Province, on the northern island of Vanua Levu, is one of the least developed regions in Fiji. The majority of communities lack electricity, paved roads, municipal water, and other infrastructure common in the developed world. There are fifty-four villages and approximately 14,000 people residing in Bua, the vast majority of whom are *iTaukei* (indigenous Fijians) relying heavily on farming and fishing for subsistence (Fiji Bureau of Statistics, 2007). The main industries are agriculture, fisheries, mining, and forestry. Bua is one of the four provinces that comprise the Vatu-i-ra Land and Seascape, a region renowned for its high levels of marine biodiversity and relatively intact terrestrial ecosystems (Jupiter et al., 2012).

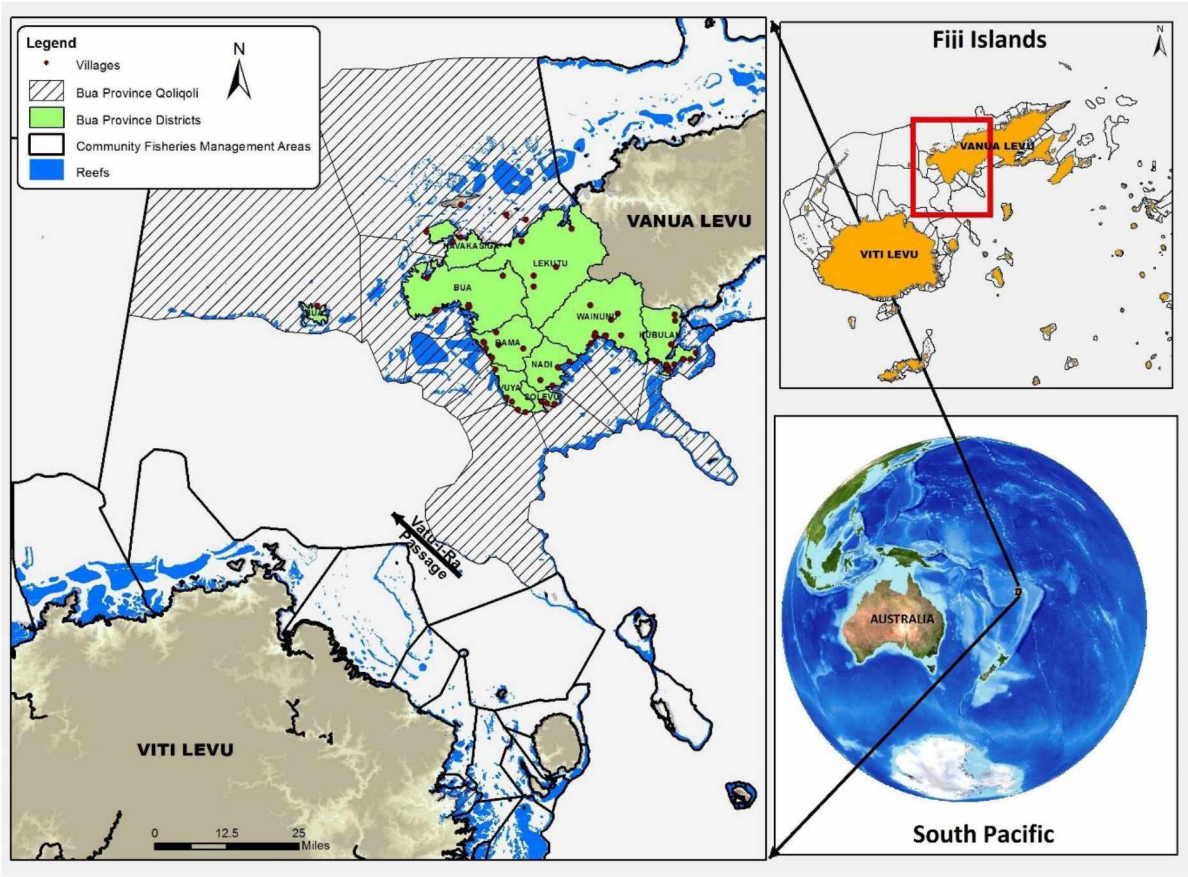

Figure 3.1 Map of Bua Province - Showing districts, *iqoliqoli* boundaries (traditional fishing grounds), and village locations (Map courtesy of WCS Fiji)

3.2 Customary Resource Governance

The *iTaukei* social system is based around a defined set of nested social units with protocol for interactions between and within these units (Veitayaki, 2002). Rural Fijians generally have a deep understanding of and respect for the *vanua*. The word *vanua*—though sometimes literally translated as "land"—symbolizes how people are related to each other and to the place which they are from; a beautiful concept that includes humans as part, not separate from, the natural world (Ravuvu 1983). *Vanua* also represents the largest social unit within Fijian culture, containing a number of related tribes (*yavusa*) from the same geographic location. During the colonial administration, the demarcation of District boundaries and fishing grounds was associated with customary ownership by the *vanua* or *yavusa* (Veitayaki, 2002). Within each district, there are a number of villages with one or more *yavusa* per village. Within each village there are a number of land-owning clans (*mataqali*) consisting of related families. A smaller family unit is a *vuvale*. There is usually a recognized hereditary leader of each of these social units, with the paramount chief presiding over the whole *vanua* (Veitayaki, 2002; Ravuvu, 1983). Figure 3.2 below shows this hierarchy more clearly.

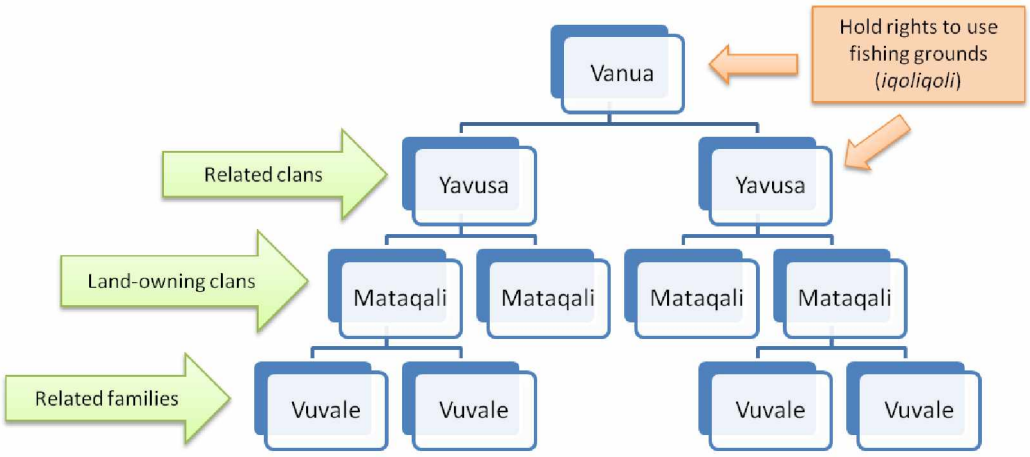

Figure 3.2 Indigenous Fijian Social Hierarchy – Land ownership/use is defined by one's *mataqali*, fishing ground access is determined by one's *yavusa* or *vanua,* and resource management decisions are generally the responsibility of the elders within these nested groups**.**

Prior to colonization, customary governance arrangements were the sole institutions regulating how land and marine resources were divided and used. In present day arrangements, national legislation co-exists alongside these traditional institutions that remain the prominent feature of community-based natural resource management in rural communities (Clarke & Jupiter, 2010a; Veitayaki, 2002; Overton, 1999). The two most prominent pieces of legislation affecting local resource governance are 1) the Native Lands Act (ed. 1978) which retains land ownership rights with registered *mataqali* members, and 2) the Fisheries Act (rev. ed. 1991) which removed customary marine tenure but maintained the right for *iTaukei* to use their customary in-shore fishing grounds (*iqoliqoli*) (Clarke & Jupiter, 2010a). In Bua, there are nine districts and eleven *iqoliqoli* (Jupiter et al., 2012).

There are separate decision-making hierarchies and conflict resolution processes for land and marine resources. Since land is owned communally by members of a *mataqali* (clan), issues and decisions affecting a single *mataqali*'s land can be decided amongst clan members without convening the entire community. At the village scale, the traditional leader has the ability to convene a council of clan leaders (*na bose vanua vakoro)* for special matters involving the community at large. Generally, matters concerning the use of the fishing ground are settled by the paramount chief (*liuliu ni vanua*) who has final decision-making power and the special right to recommend approval for people seeking commercial fishing licenses. Traditional leadership roles are hereditary and in the majority of cases are filled by elder men, although women may also inherit the position if there is no male successor (Ravuvu, 1983). In some of the more progressive Districts, paramount chiefs have convened committees to approve fishing licenses.

In parallel to this traditional hierarchy is an administrative structure introduced by the Fijian Affairs Act (rev. ed. 2006). Villages are now required to hold a regular Village Council that all

community members are supposed to attend and where matters relating to the development or well-being of the community are to be discussed and addressed (Fijian Affairs Act rev. ed. 2006). The Village Council can appoint sub-committees to focus on specific aspects of village life, such as a Development or Environment Committee. The proceedings of these meetings, the frequency of which they are actually held, and the ability for everyone in the community to participate meaningfully varies from village to village; and in the author's opinion, can be a reflection of power relations or degree of organization within the community. It seems that certain traditional leaders are reluctant to give up control, feel affronted by what they see as the government interfering in village life, or perhaps are just more resistant to changes within their communities in general. This may also be more common in rural areas where the traditional values are strongest (pers. comm. iTaukei Affairs Board Staff, 2013). WCS has observed during their work in Bua that a higher level of involvement and interest by traditional leaders in undertaking conservation efforts in their respective Districts is generally a good indicator of how smoothly and effectively the management process will go (pers. comm. WCS staff, 2014).

3.3 Integrated Coastal Management Planning for Bua Province

In 2011, a national *Integrated Coastal Management (ICM) Framework for the Fiji Islands* was adopted in adherence to the *Environmental Management Act of 2005*. It recommended that ICM plans be developed for each of the fourteen provinces in Fiji, and then compiled into a national ICM plan (Department of Environment, 2011). According to the national framework, ICM is "a process by which decisions are taken for the sustainable use, development, and protection of coastal and marine areas and resources" with a key component being to integrate management across sectors, stakeholders, scales, disciplines, and space (Department of Environment, 2011; Cicin-Sain, Knecht, Jang, & Fisk, 1998). Herein, the necessity of economic development is recognized but not at the cost of ecological processes, life support systems, and biological diversity (Cicin-Sain & Belfiore, 2005). Provincial ICM planning is currently being piloted in a select few provinces, with WCS spearheading the process in Bua (Jupiter et al., 2012).

WCS's work in Bua dates back over a decade to when they piloted an ecosystem-based management (EBM) program in Kubulau District. At the time, community-based natural resource management (CBNRM) that involved local people in grassroots planning was being widely promoted through the Fiji Locally Managed Marine Areas Network (FLMMA). While the CBNRM approach was successful in helping a large number of communities designate locally-managed marine areas, concerns were raised that the local scale at which management was being institutionalized did not correspond to the landscape scale of ecological processes (Seivanen et al., 2013; Jupiter & Egli, 2010). The Kubulau EBM project sought to overcome this by bringing together representatives from the ten villages in Kubulau

District along with local government and private sector stakeholders to partake in a participatory management planning process that attempted to scale-up CBNRM to encompass the District and its ecosystem as a whole. The process (Clarke & Jupiter, 2010a; Jupiter & Egli, 2010) endeavored to:

- Raise awareness of ecological connectivity and building capacity for good land and fisheries management practices
- Use conceptual modeling methods to identify targets, threats, and set management strategies that were then incorporated into a management plan
- Establish a network of terrestrial and marine protected areas selected using both scientific data and traditional ecological knowledge
- Establish a district Resource Management Committee endorsed by the paramount chief and complete with protocol for working within the traditional governance structure
- Monitor and evaluate plan implementation and adaptation as needed

The Kubulau Ecosystem Based Management (WCS, 2012c) plan has been actively implemented for about ten years now; the latest revisions were made during a comprehensive review in 2012 (WCS, 2012a). This project produced many useful lessons about engaging communities in EBM and is considered by some to exemplify successful EBM practice in the Western Pacific (Sievanen et al., 2013; Jupiter & Egli, 2010). WCS incorporated this experience, along with project partner input, into a guidebook titled *Principles and Practice of Ecosystem-based Management: A Guide for Conservation Practitioners in the Tropical Western Pacific* (Clarke & Jupiter, 2010b). Due to the project's perceived success in Kubulau, WCS was approached by the Bua Provincial Office to replicate the process by engaging each of the other districts in Bua in EBM planning as a way to build up to a Provincial ICM Plan (pers. comm. WCS Staff, 2012).

At the start of 2015, three of nine districts in Bua had management plans in place with the remaining six in progress or awaiting formal approval (WCS, 2014). The status of each district's EBM plan is shown in Figure 3.3 below.

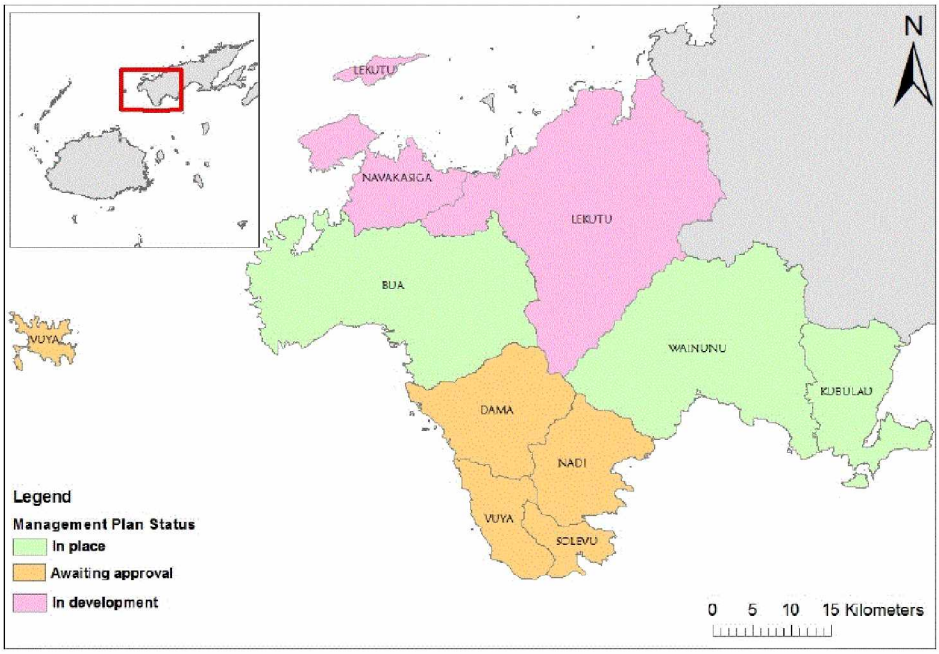

Figure 3.3 Ecosystem-based Management Plan Status by District – Three districts had plans in place, four were awaiting approval, and two were currently in development at the time of this study (Map courtesy of WCS Fiji)

The relatively smooth and successful process that took place in Kubulau has not been easily duplicated in the other Districts. In some situations conflicts between communities and lack of support by traditional leaders has stalled progress (pers. comm. WCS Staff, 2014). Even though WCS first seeks permission from traditional leaders, conducts awareness in communities about EBM principles and the planning process, and has communities elect their own representatives to participate in planning workshops, this does not ensure unanimous support or equal levels of participation from every community. WCS does not have the capacity to carry out conflict resolution, nor is it appropriate for them to become entwined in community affairs of this sort. While they could potentially refer to the Ministry of iTaukei Affairs for assistance, this government agency has limited financial resources and few personnel with the ability to effectively facilitate conflict resolution. Despite these obstacles, WCS is doing their best to build consensus for management plans in these remaining Districts. All nine District EBM plans are expected to be place by the end of 2015 so that work can begin for Provincial ICM planning. Having the District EBM plans in place first will help ensure that community priorities are included in higher level planning (Figure 3.4).

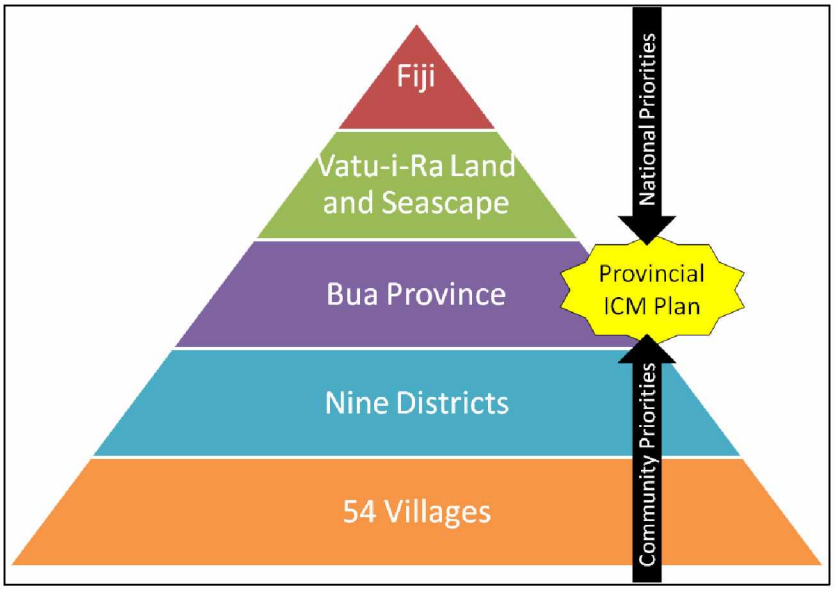

Figure 3.4 Provincial ICM Planning – Combining both top-down and bottom-up priorities

3.4 Developing Appropriate Cross-scale Governance Structures

Management plans are only one of the desired outcomes of the EBM and ICM planning processes. Another major goal is to develop appropriate cross-scale governance structures that also account for traditional hierarchies. The various nested social and political scales and corresponding NRM frameworks that must be considered are shown in Figure 3.5 below.

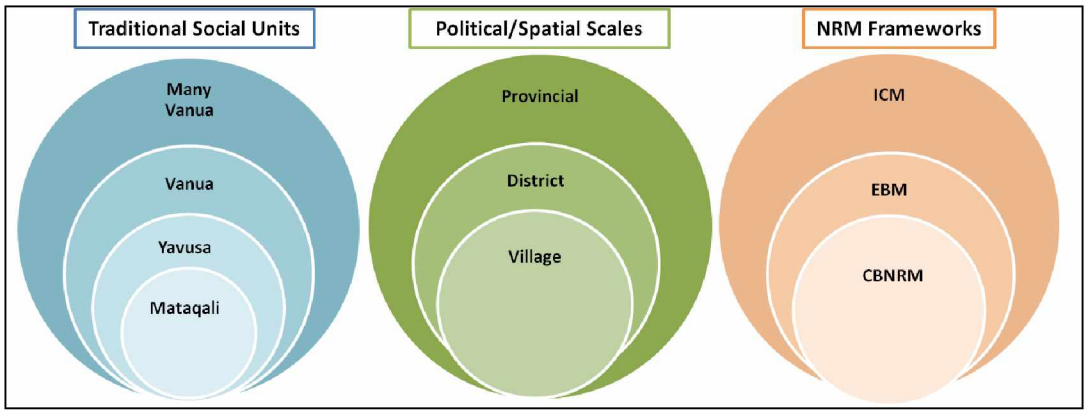

Figure 3.5 Nested Social and Political Scales with Corresponding NRM Frameworks – Cross-scale governance must take each of these structures into consideration

Yaubula Management and Support Teams (YMSTs) are promoted by the Fiji Locally Managed Marine Area (FLMMA) Network as a strategy to improve resource governance at the island or provincial scale. *Yaubula* is a Fijian word that literally means "all the living things" but is often used for English words like "environment", "natural resources", or "conservation". YMSTs are essentially a network of

stakeholders working to coordinate NRM efforts between communities, government, and other private and non-profit agencies in a particular province or region (FLMMA, 2011). The Bua Yaubula Management and Support Team (BYMST) was formed in November 2012 as an outcome of a Bua Province FLMMA partners' workshop (WCS, 2012b). Since its formation the BYMST has developed a governance structure, terms of reference, and developed an action plan. The BYMST structure is shown in Figure 3.6.

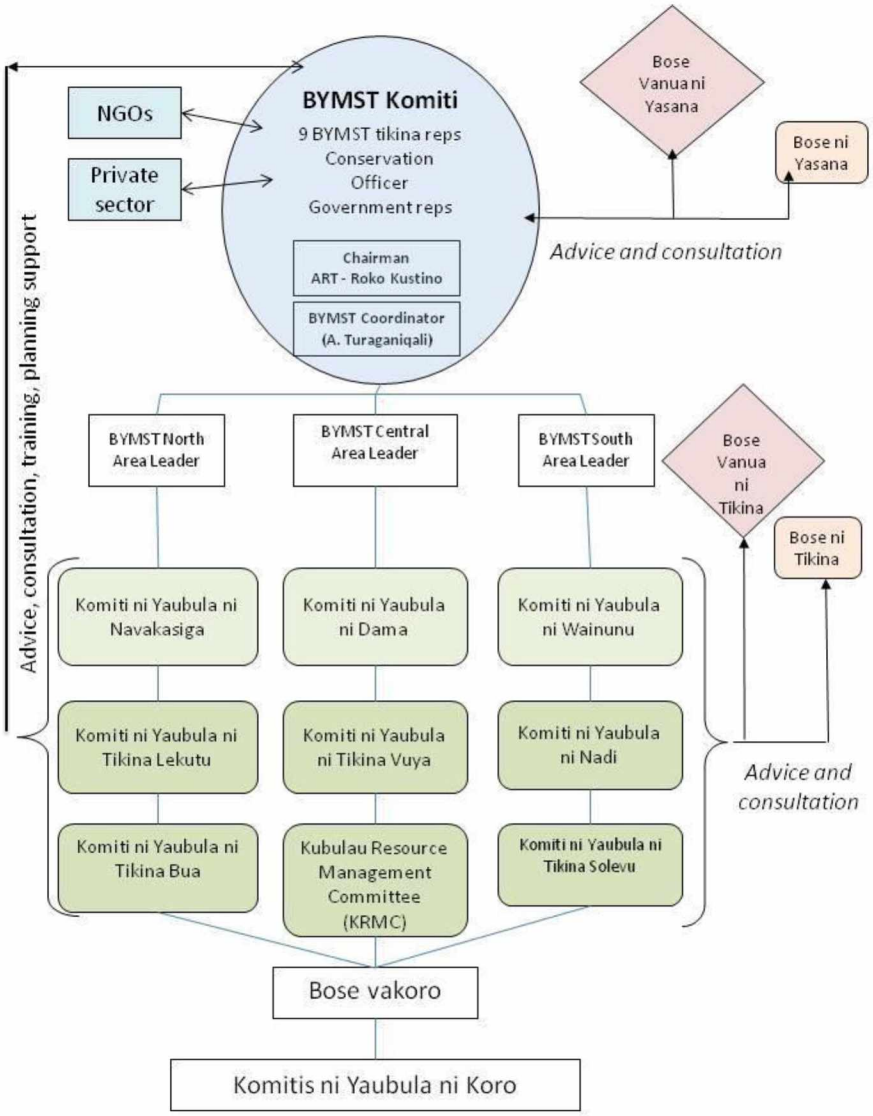

Figure 3.6 Bua Yaubula Management Support Team Structure – Outlines how the BYMST is supposed to link committees from the provincial-level to nine districts and fifty-four villages for natural resource governance (Source: WCS Fiji, 2012b)

BYMST members are tasked to play key roles in raising awareness and communicating about environmental issues as well as participating in planning, enforcement, and monitoring of management strategies. To date, BYMST members have only been involved in planning activities, but have recently

received funding to implement their action plan. When the BYMST was formed, members were selected in an ad hoc fashion based on who was present at the 2012 FLMMA workshop. The opportunity now exists to review membership and to elect new District representatives based on a set of criteria that could help better ensure that those elected are committed and well-suited to fulfill their remit. Thus far, the BYMST has not been active and some local people have questioned its effectiveness.

The BYMST and District Resource Management Committees (RMCs) can be thought of as the intentional networks for natural resource management in Bua, but it is essential that they link into the existing social fabric of the communities they serve. This study seeks to use social network analysis to enable stakeholders, like members of the BYMST or RMCs, to better understand the relationships between these formal and informal structures. The results may also provide information about central actors in the network who may be good candidates for participation on management committees or who it may be strategically worthwhile to invest in further training. By presenting results back to the communities involved in the study, it may also be possible to use their feedback to identify their network's needs and to design capacity building activities for addressing these needs. The methods used to do this will be outlined in the next chapter.

Chapter 4: Methods

During my Peace Corps service I developed a close working relationship with several WCS staff who were working in Bua Province. In 2011, they invited me and a few members of my community to learn about the participatory EBM planning process they were then facilitating in Wainunu District. Eventually they began working in Vuya District in 2013 and our community was able to easily link our previous sustainable development work into the EBM planning process. We formed a new village Yaubula Management Committee with whom I was able to assist with writing a village NRM plan that since has received funding and is in the implementation stage.

When I discovered that WCS wanted to conduct applied social network research in Bua, I thought it would be a wonderful opportunity for my Master's research because of its potential to empower communities and perhaps help aide the "scaling-up" to District EBM. WCS and I established an agreement that outlined my responsibilities for taking the study forward. I was responsible for questionnaire design, data entry, network mapping, and all analyses -- but this research would not have been possible without a core team from WCS who provided constructive criticism of the study design and fulfilled the crucial roles of translators, interviewers, facilitators, and workshop coordinators.

Each component of this study was designed with full consideration of the unique culture and characteristics of rural Fiji. The questionnaire was tested with Fijian colleagues and community members prior to replication across the study area, and much time was spent designing community sessions and training facilitators to lead these sessions. Initially, we intended to convene a project steering committee comprised of local representatives from Bua Province to assist in the design and implementation of this study, but that was unsuccessful due to the limited resources available to build interest in and coordinate a steering committee.

One of the primary objectives of this study was to develop a method for conducting participatory social network research in the context of rural Fijian communities. It was my hope that this research would help close the existing research-implementation gap in social network studies used in natural resource management by taking the social network data back to the communities for the respondents to interpret and use network evaluation to inform capacity-building activities. The following sections will describe this process, from survey design through participatory analysis, highlighting important considerations for others wishing to use SNA as part of an adaptive co-management program in Fiji or elsewhere, and will end by depicting the methods used for descriptive analysis of the social network data.

4.1 Sampling Design & Delivery

I created a social network questionnaire to collect both social-relational and additional attribute data from respondents. It consisted of six open-ended relationship questions, listed in Table 4.1 below.

We asked respondents via the recall method to name individuals they obtain information or advice from, who important decision-makers are for natural resource management, and who they have worked with or want to work with on natural resource management. An additional series of questions asked respondents for demographic information and about barriers to communicating about NRM. A complete copy of the questionnaire is included in Appendix A. The chosen method of questionnaire delivery was face-to-face paper surveys. The questionnaire was translated into the local *iTaukei* language. The interviews were carried out by a team of WCS Fijian facilitators that I helped to train to administer the questionnaire.

Table 4.1 Relationship Questions from the Network Questionnaire

Q1	Who do you get information or advice from concerning farming practices or land use?
Q2	Who do you get information or advice from concerning fishing practices or fisheries management?
Q3	Who do you get information or advice from concerning conservation or sustainable natural resources management?
Q4	Who are the most important decision makers for natural resources management?
Q5	Which organizations or people do you work with regarding natural resources?
Q6	Which other organizations and people would you like to work with regarding natural resources?

A draft questionnaire was tested by interviewing attendees at an introductory presentation about ecosystem-based management principles in Lekutu District in October 2013. It was originally planned to conduct semi-random interviews with individuals in each village in each district of Bua, but after the trial in Lekutu, this method was abandoned. Community members were not ready to answer questions about natural resource management when it was the first time they were introduced to this concept. Additionally, this sampling design would have made the sample size unnecessarily large by including people who may not have any involvement or interest in natural resource management. Hence, a revised methodology was developed based on the outcomes of this trial.

Since the process of social network analysis begins by collecting social-relational data about the population of interest, it requires a clear definition of just who the population is -- also known as "bounding the network" (Borgatti et al., 2013). The target population of this study was "individuals involved in natural resource management or conservation in Bua Province." This potentially included anyone who lives in any of the fifty-four villages or other settlements within Bua who has been involved in natural resource management or planning, who makes decisions about land or customary fishing ground use, who holds traditional or experiential knowledge about fishing, farming, or conservation practices, and/or who is employed by an organization or government department that works with communities on conservation. This network comprises a large number of people across a large geographical area who do not necessarily have membership in a formal group.

This type of scattered informal network makes it almost impossible to create a pre-defined list of individuals to interview. Therefore, this study used modified snowball sampling methods, sometimes

referred to as respondent-driven sampling, to overcome this issue. Snowball sampling allows a researcher to begin by interviewing an initial set of respondents, and then interview the people who were mentioned in the first interviews and so on, up to a pre-determined point (e.g. a desired number of responses, x rounds of surveying, a date, etc) or until no new people are named (Borgatti et al., 2013; Doreian & Woodard, 1992).

4.1.1 Data Collection Interviews

The initial respondents in this study were community members who participated in District-level resource management planning workshops facilitated by local WCS staff. A second wave of interviews was conducted with people who were named by the initial respondents, with emphasis on interviewing those who were named most frequently by others. Data collection was limited to only two rounds of interviews because of the limited resources available to track down and interview people living in remote rural communities that were difficult and time consuming to access.

The revised methodology incorporated a two-hour session on social networks into resource management planning workshops in each of the eight districts. Participants at these workshops were chosen by their villages to represent their communities in the participatory ecosystem-based management planning process as described in Chapter 3. The SNA session was conducted on the third and final day of the workshops once there was ample time for participants to develop a general understanding of natural resource management concepts and for a certain level of trust to be built among participants and facilitators. The sessions began with an introduction of basic social network concepts, by explaining networks within a Fijian cultural context, and then introducing the research.

Next, facilitators led breakout groups of 8-12 people through the questionnaire. Although respondents filled in their own answers, they followed prompts from the facilitator who led them through each question one at a time. For each question, respondents were prompted to consider and then list the names of people from their community, then their district, and lastly from elsewhere that they typically obtain information from or work with on NRM. A group setting was more comfortable for participants given the cultural context and less time consuming for facilitators than one-on-one interviews. While answering the questionnaire, respondents could ask for clarifications, but they were asked not to share answers.

4.1.2 Post-Interview Group Discussions

Upon completion of the questionnaire, the facilitators led a short focus group discussion about communication and collaboration for natural resource management in the participants' communities. This was intended to help participants see how the information gathered in the questionnaire may be relevant for collaborative planning and management in their District. The discussion prompts and questions

discussed are shown below in Table 4.2. After the discussion, participants were also informed that the social network data would be made available to them at a later date.

Table 4.2 Group Discussion Outline

Topic 1: Communication and Collaboration
Facilitator prompt: *Effective NRM requires communities to work well together. Effective NRM also requires communities to work well with other communities and organizations. Good communication is important for this to be able to happen.*
Q1: What are some of the barriers to communicating about NRM that you listed?
Q2: Can you think of any ways to overcome these barriers?
Q3: What are some of the barriers to sharing information or working with other communities or organizations?
Topic 2: Roles and Relationships
Facilitator prompt: *Networks, communities, and organizations can benefit from having diverse people working together. Different kinds of people can play different roles in the network. Some people are good leaders, some have a lot of knowledge about a particular practice, and others are important for traditional reasons. Think about the people you listed on your questionnaire.*
Q1: Who are key people that need to be involved in local natural resource management activities to help ensure its effectiveness?
Q2: How can we be sure to include them in future workshops/activities if they are not here today?

In Districts where management plans were already established, data collection was completed in a similar process but either at scheduled District Resource Management Committee meetings or Management Support Workshops. Interviews with government or NGO employees working with communities in Bua were either conducted face-to-face as permitted or over the phone. When government or NGO employees were interviewed an additional series of questions asked "to whom do you *give* information or advice?" After the initial wave of data collection was completed in each District, a list of names was compiled consisting of people who were named more than one time by others. The facilitators then tried to seek out and interview these "named" people during subsequent workshops or in special trips made to their communities. The number of people interviewed in each District and over how many sessions/trips is shown in Table 4.3 below. (Note: Two districts, Lekutu and Navakasiga, are completing a joint Ecosystem-Based Management plan because they share traditional fishing grounds and are therefore considered together throughout this study.) In some districts it was not possible to schedule subsequent interview sessions because of logistics and sudden changes in community availability (e.g. the death of a prominent community member). We decided to complete a third round of interviews in Dama and Kubulau Districts since these two districts were where we decided to conduct community feedback sessions and present the network maps. Representatives from a couple of communities in these districts were not available to be interviewed during the first two sessions and we wanted to have more complete data that represented all the villages for when we discussed the maps.

Table 4.3 Interview Session Count

District	# Interviews in First Session	Second	Third
Dama	24	8	11
Kubulau	10	42	8
Lekutu/Navakasiga	33	11	--
Nadi	37	19	--
Solevu	21	--	--
Vuya	26	9	--
Wainunu	17	--	--
Gov't/NGO	24	--	--

4.2 Network Mapping and Participatory Analysis with Communities

Questionnaire data was imported into *visone* version 2.8 (http://visone.info/) network mapping software for visualization (Brandes & Wagner, 2004). A set of four network maps were produced for each district representing the responses to the first four relationship questions on the questionnaire (Table 4.1 above). These maps were intentionally created to be presented back to community participants. Maps for the last two relationship questions were not produced because there was limited amount of time available to go over the data with the participants. The data for these questions was analyzed and shared with WCS so that they may share it with participants at a future date, particularly when beginning to consider network weaving and capacity building activities.

On the maps, node color was set to display the actor's village, or indicate the node as an organization. Maps were prepared without name labels in order to keep participants' discussions focused on network structure instead of the individuals involved. While most SNA studies never show actor names for sensitivity and/or confidentiality reasons, maps with actor names were made available in this study on a case-by-case basis with respondent consent. For instance, in Kubulau District, where there has been no history of conflict between communities and where there is a core group of people involved in an active Resource Management Committee, maps with name labels were made available to participants at the end of the session to determine if they could generate any additional or useful information.

Results were presented back in two Districts, Kubualu and Dama, in two separate full-day workshops. These two Districts were at different stages of involvement in resource management planning and had the potential to provide an interesting comparison of how SNA might be useful at different stages of the management process. Kubulau has been participating in ecosystem-based management (EBM) activities for the past decade. They have ratified a District EBM Plan and have an active Resource Management Committee. Dama District, in contrast, was in the earlier stages of EBM planning and was just beginning to consider adopting a governance structure and selecting resource management committees.

Considerable time was put into designing a session format in which to present data back to participants in these Districts. Not only was it necessary to consider how to best translate and explain technical concepts to participants, it was equally necessary to first build the capacity and confidence of the local facilitators who would lead the workshop in order for them to provide input into the session design and ultimately deliver it effectively. In the end, a one-day workshop format was chosen in order to allow enough time to present the data for interpretation, but more importantly, to assist participants in evaluating their networks and begin considering how they might apply network concepts to improve communication and governance.

The "Participatory Network Analysis" workshop had four main objectives: 1) develop participants' understanding of network concepts and why they are relevant to NRM, 2) elicit participant interpretation of the network maps from their districts, 3) help participants evaluate their network's health and function, and 4) gather participant ideas for how to strategically improve the network. A sample workshop agenda and detailed facilitator guidelines are provided in Appendix C. *The Network Weaver's Handbook* (Holly, 2012) was an extremely useful reference during this session design and several of the activities therein were adapted to the local context. One such activity was a participatory network mapping exercise (Holly, 2012). This activity was included to enable participants to demonstrate their understanding of networks by drawing their own as a precursor to analyzing the network maps produced from the questionnaire data. Furthermore, it seemed an interesting way to test another method of network mapping and compare it to the data collection method used in this study. Another participatory network mapping resource worth looking into, which I did not discover until after we had already completed these workshops, is Eva Shiffer's Net-Map Toolbox (https://netmap.wordpress.com/) which she developed as a tool for mapping influence networks with communities.

During the map analysis session, participants were divided into small groups and each group was given one of the four network maps to review. For example, one group looked at the farming information and advice network, another at the fishing network, etc. Groups were given one hour to familiarize themselves with and interpret their map. Facilitators used a list of prearranged questions to prompt participants to think about different network characteristics and made themselves available to provide clarifications as needed. At the end of the hour, each group was asked to share their interpretation of the map with the larger group.

In a session after the map analysis, participants used a five-point Likert scale, to score their network in against six healthy network criteria shown in Table 4.4 below (Holly, 2012). This exercise led into a plenary discussion of the perceived strengths and weaknesses of the network, which were recorded on flipchart paper for everyone to see. Lastly, small groups worked to create strategies for improving the network and again shared these ideas with the larger group. Throughout the workshop, audio and video

were recorded to document group discussions and presentations, and written group work was also collected for later reference.

Table 4.4 Healthy Network Evaluation Criteria

1	Works closely with other local groups, government, and NGOs (collaborative)
2	Does not rely too heavily on outsiders to organize or implement actions (self-sufficient)
3	Equally represents men, women, youth, traditional leaders, people from all communities/settlements
4	Responsibilities are shared; there is not a heavy reliance on only a few individuals
5	Has access to and the ability to share new ideas and information about best practices
6	Regularly reviews progress and is able to make changes as needed (adaptive)

4.3 Results Debrief and Map Analysis with WCS staff

I met with five WCS staff and one additional project partner (from SeaWeb Asia-Pacific - http://www.seaweb.org/initiatives/asiapacific.php) in January 2015 to discuss the outcomes of the community feedback sessions and begin developing plans for further capacity building and network weaving activities to be carried out in Bua. These participants took time to analyze and compare network maps from each district in Bua, highlighting information that was useful or interesting to their work in facilitating natural resource management. Finally, we reflected on the entire research project, noting study limitations and suggestions for how to improve the methodology of similar future studies.

4.4 Quantitative Network Analysis

I used UCINET version 6.504 (Borgatti, Everett, & Freeman, 2002) to quantitatively analyze characteristics of for networks in each of the seven districts (twenty-eight networks total). For each of these networks, cohesiveness within and between districts, age classes, and genders was assessed using density, average degree, and E-I Index measures. Using *visone* version 2.8, I assessed network fragmentation by calculating the number of components within each district in each network. For all six relationship questions, indegree analyses for each network identified individuals and organizations most frequently named by others, and outdegree analyses produced a list of individuals who named the most others. A basic description of these measures (Borgatti et al., 2013) is shown in Table 4.5. The results of these measures will be discussed in the next chapter.

Table 4.5 Network Measures Used in This Study

Network Measure	Description
Density	Number of ties in proportion to the number of possible ties
Average Degree	Average number of ties per node in the given network
E-I Index	Ratio of within group ties to outgoing ties for a defined subgroup (e.g. District, gender, age-class); also known as cross-boundary analysis
Fragmentation	A count of the number of components, or distinct groups that are not connected to others, within the network
Indegree	The number of incoming ties for a given node (how many others named a particular individual)
Outdegree	The number of outgoing ties for a given node (how many others were named by a particular individual)

Chapter 5: Results

Section A: Social Network Analysis

5.1 Questionnaire Results

A total of 284 individuals residing or working in eight districts in Bua Province were interviewed and reported an additional 336 individuals from whom they receive information or work with on NRM. This totals 620 members of the Bua-wide network as defined by the respondents. There were a total of 2367 ties reported across the Province in response to the six relational questions. The majority of survey respondents were community members from eight districts in Bua (n=276), with an additional 8 respondents representing government departments or non-governmental organizations. The number of respondents from each district ranged from a low of 17 in Wainunu to a high of 60 in Kubulau. Response details for the first four network questions are shown in Table 5.1. Lekutu and Navakasiga Districts share a customary fishing ground and work together for EBM planning purposes, therefore they have been grouped together during analysis. The varied response rate reflects the sampling design which did not seek a uniform sample from each District. It also reflects the differing sizes and number of villages in each district. Additionally, varying level of involvement in the EBM planning process in each district and community may have resulted in some communities being better represented than others in the sample.

Table 5.1 Questionnaire Results by District and Network – n= the number of respondents from each district; Add'l = the number of additional people who were named by the respondents but were not interviewed; Nodes = the total number of actors in the network; and Ties = the total number of links or relationships named by respondents

	Network															
	Decision				Farm				Fish				Yaubula			
District	n=	Add'l	Nodes	Ties	n=	Add'l	Nodes	Ties	n=	Add'l	Nodes	Ties	n=	Add'l	Nodes	Ties
Dama	42	18	60	73	42	15	57	63	31	12	43	38	39	16	55	61
Kubulau	51	24	75	99	60	7	67	64	56	11	67	71	58	17	75	76
Lekutu/ Navaksiga	39	25	64	60	44	41	85	88	42	35	77	67	43	24	67	89
Nadi	57	15	72	78	58	24	82	74	58	14	72	65	55	9	64	66
Solevu	19	11	30	32	18	16	34	35	19	10	29	27	18	15	33	35
Vuya	35	7	42	56	26	10	36	38	34	10	44	43	38	13	51	105
Wainunu	15	8	23	22	17	10	27	26	18	5	23	19	18	6	24	33

Modified snowball sampling methods allowed the network to grow organically based on the individuals respondents named on the questionnaire. Therefore, the response rate in a network study such as this has a slightly different meaning than that commonly used in other social science methodologies. There were no non-respondents in this study. There were only people who were named by others that we

were unfortunately unable to interview (a total of 336 of them). Limited resources paired with the challenges of seeking people out in remote communities resulted in only 45.8% of people within the Bua network having completed the questionnaire. Social network researchers often find it difficult to elicit responses from all network members, especially in unbound networks, and a response rate of 80-90% is considered a sensible goal for which to strive (pers. comm. K. Vance-Borland, 2014). Caution should always be used when interpreting network analysis results for any incomplete network (a network where less than 100% on the members are surveyed), noting that the reported relationships only represent a portion of the total relationships in the network (Borgatti et al., 2013).

The rate at which community respondents named other local individuals or local resource management committees (RMCs) versus employees of outside organizations is shown in Table 5.2 below. Within the NRM decision-making network, community respondents reported very few ties to outsiders suggesting a respect for local traditional hierarchies. Within the advice networks, responses indicate that information is solicited at an almost equal rate both from locals and outside organizations for farming and fishing practices, but for NRM in general (*yaubula*) there is a slightly higher deference to outside organizations. Respondents reported that the majority of all current and desired future collaborations are with outside organizations. These results could be interpreted as an indication of the degree of dependence on outsiders in the various aspects of NRM, which we hope will lessen in time as capacity building work continues with local people and committees.

Table 5.2 Respondent Ties to Locals vs. Outside Organizations – Percentage of ties reported by community members to other local people or resource management committee (RMC) versus to outside organizations within each of the six networks

Network	Local Person or RMC	Outside Organization
Decision	95%	5%
Farming	50%	50%
Fishing	49%	51%
Yaubula	37%	63%
Current Collaboration	11%	89%
Desired Collaboration	6%	94%

In addition to reporting social-relational data on the network questionnaire, respondents also answered questions about the venues from which they typically receive information regarding NRM and what issues make communicating about NRM difficult. Responses indicate that individuals are more likely to receive information about NRM during their village council meetings or when attending a workshop or training (Table 5.3). They also indicated that being too far away from sources of information is the largest barrier to communication (Table 5.4). As transportation options are very limited in Bua, it can take several hours round-trip for community members to visit government offices in the Provincial

seat. While extension officers are able to travel to a certain degree, they are limited in their ability to engage with all communities. Telephone service is also very spotty, and many people cannot afford phones or have no way to charge them if there is accessible service. These seem to be good reasons for building the capacity of local people to become more respected sources of information and advice, so that isolated communities have easier access to information closer to home.

Table 5.3 Venues for Receiving Information about NRM – Showing the percentage of respondents in each District who indicated the choice as a usual venue for receiving information about NRM (n=256)

Q. How do you usually get information about natural resource management?							
District	Village Council Meeting	District Council Meeting	Ask a community member	Social conversation	Workshop or training	Visit a Gov't Office or NGO	Call a Gov't Office or NGO
Dama	62%	33%	38%	29%	64%	40%	14%
Kubulau	81%	36%	15%	32%	40%	30%	15%
Lekutu/ Navakasiga	70%	18%	28%	23%	55%	40%	8%
Nadi	66%	38%	30%	29%	75%	36%	21%
Vuya	88%	29%	47%	38%	76%	53%	21%
Wainunu	94%	81%	69%	75%	81%	75%	63%
Solevu	85%	60%	45%	75%	80%	55%	35%
Total	**75%**	**37%**	**34%**	**36%**	**64%**	**42%**	**20%**

Table 5.4 Barriers to Communicating about NRM – Showing percentage of respondents in each District who indicated the choice as a barrier to communicating about NRM (n=247)

Q. What issues make it difficult to communicate or receive information about natural resource management?						
District	Don't know where to get information	Right people and information are too far away	Not able to ask the right people because I don't know them very well	Takes a long time to get the information I need	No phone	No internet
Dama	56%	61%	39%	34%	20%	32%
Kubulau	30%	76%	35%	33%	28%	24%
Lekutu/ Navakasiga	38%	73%	35%	23%	20%	15%
Nadi	53%	65%	33%	29%	39%	27%
Vuya	41%	47%	44%	28%	34%	31%
Wainunu	71%	94%	59%	88%	65%	88%
Solevu	53%	79%	42%	47%	37%	53%
Total	**47%**	**68%**	**38%**	**35%**	**32%**	**32%**

5.2 Network Mapping

A set of network maps corresponding to each of the three advice and one decision-making network were produced for each of the Districts (twenty-eight maps total). These maps are shown on the following pages (Figures 5.1-5.4). For each map, the various node colors represent the respondent's village and grey nodes represent organizations.

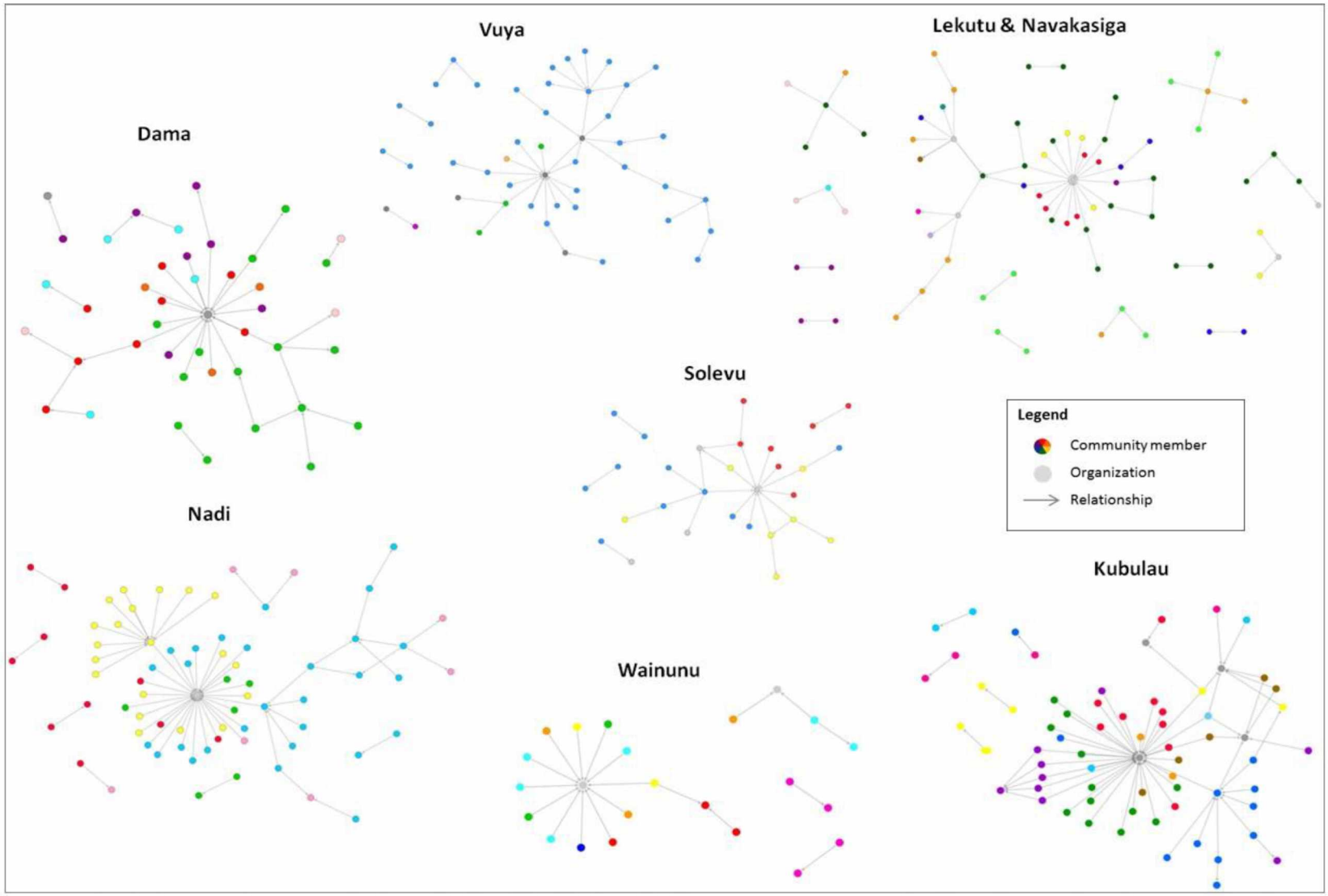

Figure 5.1 Farming Advice Networks for Eight Districts in Bua - Depicts responses to the question "Who do you get information or advice from about farming practices?" Node color represents the actor's village; grey nodes are organizations.

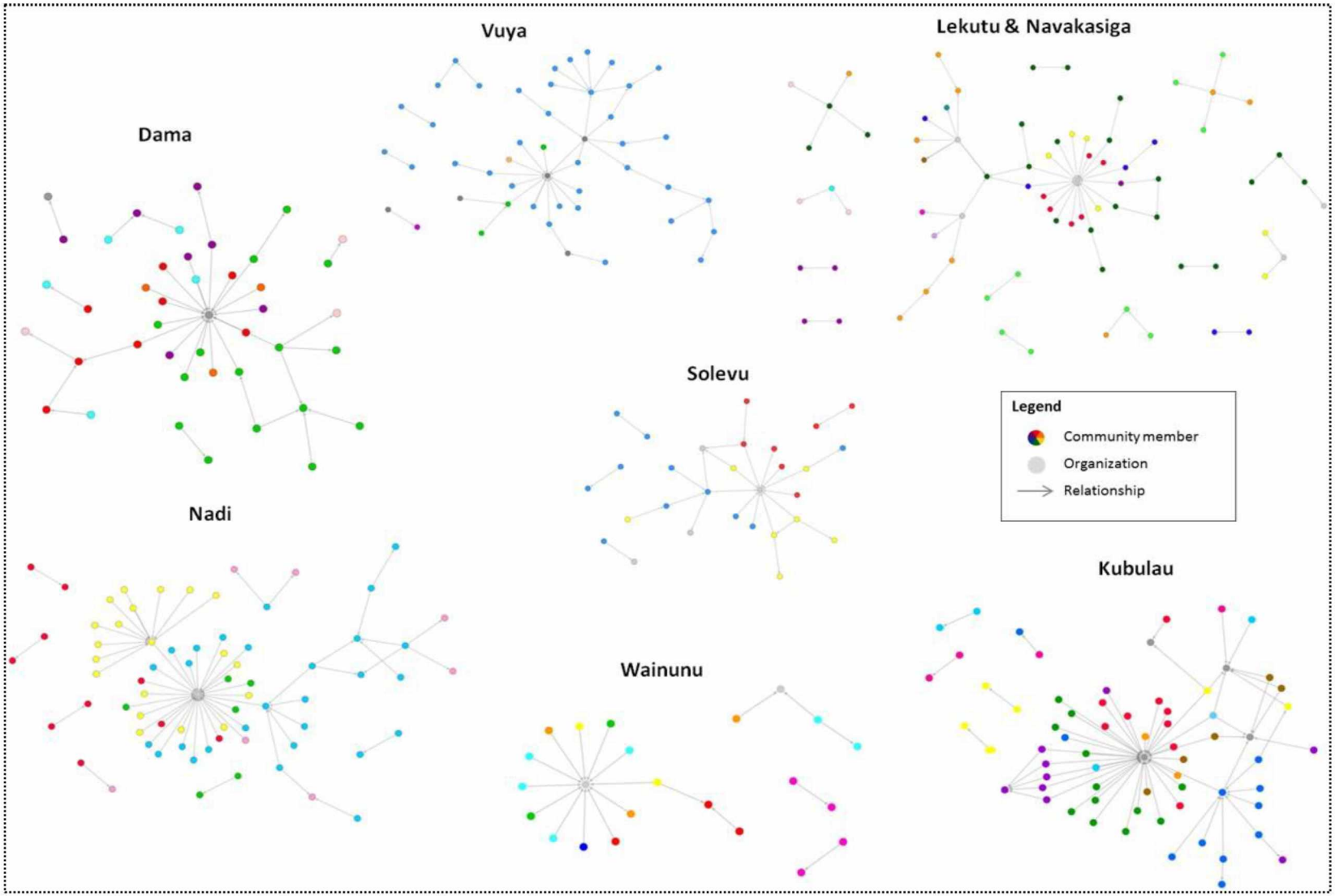

Figure 5.2 Fishing Advice Networks for Eight Districts in Bua – Depicts responses to the question "Who do you get information or advice from about fishing practices or fisheries management?" Node color represents the actor's village; grey nodes are organizations.

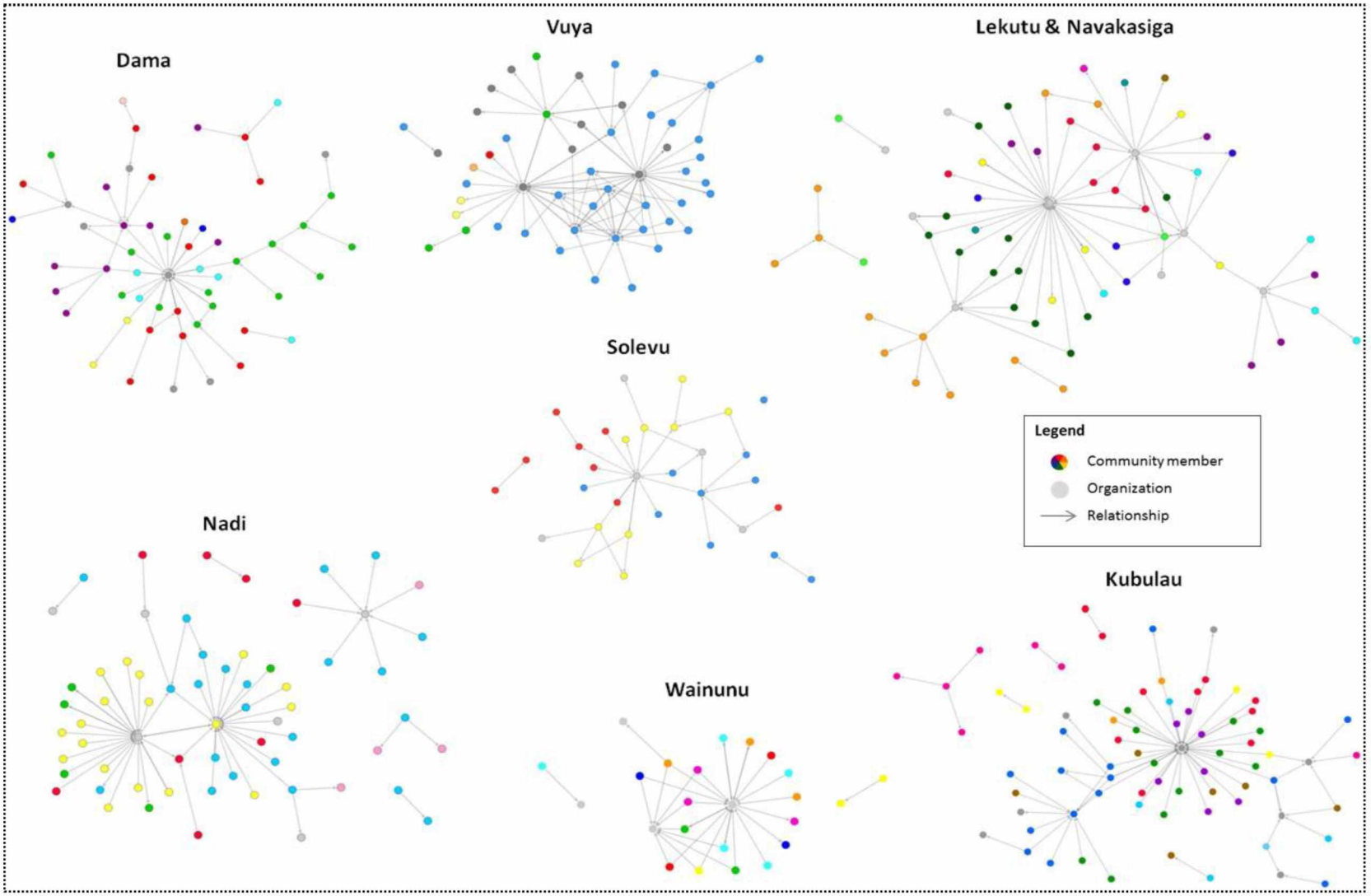

Figure 5.3. *Yaubula* Management Advice Networks for Eight Districts in Bua – Depicts responses to the question "Who do you get information or advice from about *yaubula* management in general?" Node color represents the actor's village; grey nodes are organizations.

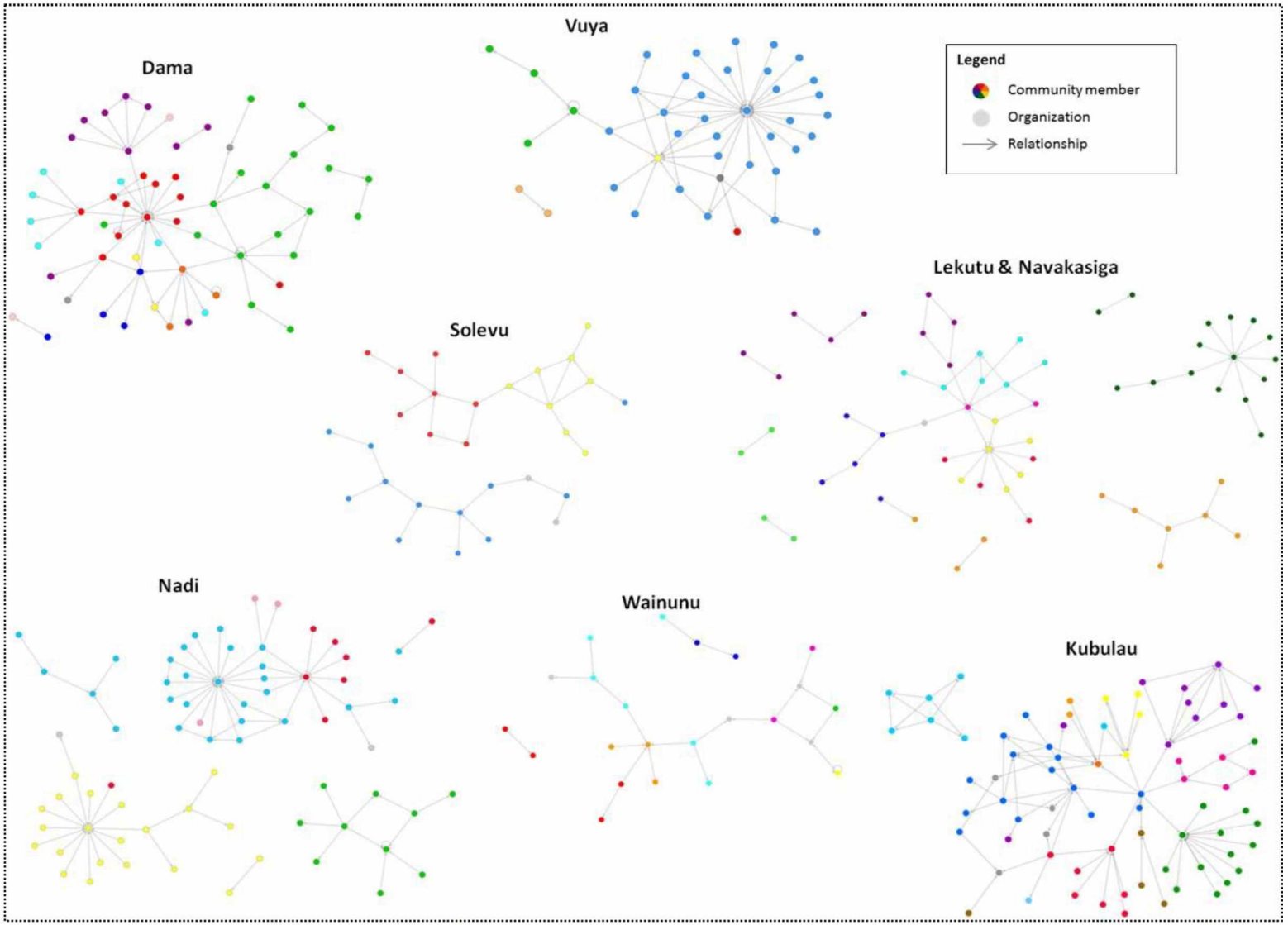

Figure 5.4 Decision-making Networks for Eight Districts in Bua – Depicts responses to the question "Who are the most important decision makers for natural resource management?" Node color represents the actor's village; grey nodes are organizations.

5.3 Network Analysis

A number of descriptive metrics were used to quantitatively analyze the network data gathered from the six relationship questions. Network analysis took place on three levels: whole-network, group, and actor. These metrics and what they measure are listed in Table 5.5 below.

Table 5.5 Quantitative Network Metrics Used

Descriptive Metric	Measure of:	Networks Analyzed
Whole Network Level		
Density	Cohesiveness	Province-wide advice & decision networks grouped by District
Average Degree	Cohesiveness	Province-wide advice & decision networks grouped by District
Number of Components	Fragmentation	District advice and decision networks
Group Level		
E-I Index for District	Cross-Boundary Collaboration	Province-wide advice & decision networks grouped by District
E-I Index for Gender	Cross-Boundary Collaboration	Province-wide advice & decision networks grouped by Gender
E-I Index for Age Class	Cross-Boundary Collaboration	Province-wide advice & decision networks grouped by Age Class
Density	Cross-Boundary Collaboration	Province-wide advice & decision networks grouped by Age Class
Actor-Level		
Indegree	Actor position	District advice, decision, and current/desired collaboration
Outdegree	Actor position	District advice, decision, and current/desired collaboration

5.3.1 Cohesiveness

5.3.1.1 Density

Density is a proportion of the number of ties present to the number of ties possible. A network in which all actors are connected would have a value of one. Density measures tend to be lower in larger networks, as it is less likely for any one node to be tied to all others (Borgatti et al., 2013). Density measures do not offer much direct comparison value between networks of varying sizes, such as between the various districts in Bua, but the measures are still useful as a general indication of network cohesion. Within-group density was calculated at the Provincial whole-network level (each district was included) for each of the three advice and one decision-making networks (Table 5.6). These calculations were repeated three times to analyze three different sub-group categories: District, age class, and gender[1].

The results in Table 5.6 generally indicate that the networks are not very dense or that individuals are not connected to many others, a conclusion that can also be readily made when viewing the network maps. However, there are still a few interesting findings to note. Because almost all connections occur within rather than between districts, the age class and gender sub-group densities are particularly low. The

[1] For age class and gender density measures, organizations were not included as part of the network

decision networks tend to be denser than the farming, fishing, and yaubula advice networks. I assume this is due to the significance of traditional decision-making hierarchies in these rural communities, whereas advice networks for natural resources management are less formalized and not as integral a component of Fijian culture. With this in mind, the low densities of the advice networks could potentially indicate that a less than desired amount of information exchange is happening between local people and that information is generally being received only from a few sources or primarily from outside one's own group. It will be interesting to note the community members' perspectives on this in Section B.

Table 5.6 Provincial-level Within-Group Density – Density values within District, age class, and gender sub-groups for four networks

	Network			
District	**Decision**	**Farm**	**Fish**	**Yaubula**
Dama	0.021	0.007	0.010	0.009
Kubulau	0.018	0.002	0.006	0.005
Lekutu/Navaksiga	0.015	0.009	0.006	0.003
Nadi	0.016	0.007	0.007	0.008
Solevu	0.038	0.023	0.018	0.019
Vuya	0.030	0.013	0.014	0.034
Wainunu	0.035	0.032	0.012	0.003
District Average	**0.025**	**0.013**	**0.010**	**0.012**
Age Class	**Decision**	**Farm**	**Fish**	**Yaubula**
15-24	0.000	0.002	0.001	0.001
25-39	0.000	0.003	0.001	0.004
40-54	0.002	0.006	0.005	0.023
55+	0.007	0.002	0.000	0.000
Gender	**Decision**	**Farm**	**Fish**	**Yaubula**
Female	0.004	0.003	0.007	0.009
Male	0.004	0.003	0.004	0.006

Also of interest is that the density for the two youngest age classes in the decision making-network is zero, a result that shows the deference to elders for management decisions and alludes to the importance of tying traditional governance structures into the management framework. Of less clarity is why the densities for the fishing and yaubula advice networks are zero for the over 55 age class. I speculate that this could be due to the strenuous nature of fishing which often entails travel by a small boat to offshore reefs and free-diving with a spear-gun and limits the involvement of older individuals who also are not culturally expected to participate in such activities. Fishing knowledge and advice is likely shared more frequently between active or recently active fishers as it is a slightly more specialized activity. Most men are involved in farming, while only some men and some women participate in fisheries (with roles varying by gender). Similarly "yaubula management," or conservation, is a recently

introduced concept and older individuals may not be as exposed to it or may not be as readily accepting of new Western concepts. The data in no way validates this; I have only provided my informed guesses to serve as ideas that may warrant further exploration.

5.3.1.2 Average Degree

Average degree is simply the average number of ties for all nodes in a network (twice the total number of ties divided by the number of nodes). It does not take into account the direction of the ties. It is a useful measure of cohesion because, like density, it indicates whether actors are generally tied to few or many others (Borgatti et al., 2013), but does so in a less abstract way. The average degree results calculated for the district networks in Bua are shown in Table 5.7. The values ranged from a low of 1.65 in the Wainunu fishing advice network to a high of 4.12 in the Vuya yaubula advice network. These values are averages and therefore hide the large variations in the number of ties for each actor (including those who reported none because they did not take the survey). The subsequent indegree and outdegree calculations will provide a more detailed insight into just which actors are reportedly the most highly connected.

Overall, the average degree was greatest for the yaubula networks (2.57) and lowest for fishing networks (1.84). Although these averages are not varied across a wide range, notable variations could speak to the degree of cohesiveness within the districts. For example, district networks with higher average degrees could be considered "more connected". This would generally be considered a positive characteristic for NRM because best practices and management decisions may be shared and discussed more readily. A case to point out here is that of the Vuya yaubula network, which has a much higher average degree than any of the other networks. Personal knowledge allows me to verify that the Vuya Village Yaubula Committee was the most active management committee in the Province. A higher response rate to the questionnaire would likely have shown more of the varying characteristics between the different districts that people working in Bua know to exist.

Table 5.7 Average Degree – The average number of ties per actor within each District in four networks

	Network			
District	**Decision**	**Farm**	**Fish**	**Yaubula**
Dama	2.43	2.21	1.77	2.22
Kubulau	2.64	1.91	2.12	2.03
Lekutu/Navaksiga	1.88	2.07	1.74	2.66
Nadi	2.17	1.80	1.81	2.06
Solevu	2.13	2.06	1.86	2.12
Vuya	2.67	2.11	1.95	4.12
Wainunu	1.91	1.93	1.65	2.75
Average	**2.26**	**2.01**	**1.84**	**2.57**

5.3.2 Fragmentation

The number of separate components, or distinct groups not connected to each other, in a network suggests the degree to which a network is fragmented (i.e. more components equal more fragmentation). The number of components in each of the three advice and one decision-making networks in Bua range from 2-16 indicating that there is at least one or more segment of each network "cut off" from the rest (Table 5.8 and Figures 5.1-5.4). The presence of separate components denotes gaps in the network that may be of concern to network function. Although it should not be expected that everyone receives information or advice from the same sources or defers to the same individuals for decision-making, fragmentation could mean that not everyone has access to certain kinds of information (e.g. good management practices), or that there may be some discord within the traditional hierarchy. While some fragmentation may be a result of a low network response rate, the higher levels of fragmentation in some of the networks warrant further investigation into why they have shown up in the data and whether or not they are a concern for governance. Highly fragmented networks can impede the spread of information about good NRM practices, especially in rural areas where information tends to travel by word of mouth. Fragmentation is important to address within and between communities because good communication and collaboration are necessary components of good governance and successful management plan implementation. Fragmentation could be addressed through strategic network weaving, such as described by Holley (2012) in the *Network Weaver's Handbook*.

Table 5.8 Number of Components per Network – Higher numbers of components suggest higher degree of fragmentation and less cohesiveness within the network

	Network				
District	**Decision**	**Farm**	**Fish**	**Yaubula**	**Average**
Dama	3	5	6	3	**4.25**
Kubulau	2	3	6	6	**4.25**
Lekutu/Navaksiga	10	7	14	4	**8.75**
Nadi	6	16	8	6	**9.00**
Solevu	3	2	5	4	**3.50**
Vuya	2	4	5	2	**3.25**
Wainunu	3	2	4	3	**3.00**
Average	**4.14**	**5.57**	**6.86**	**4.00**	

The fragmentation results throughout Bua Province ranged from a low of 2 to a high of 16. Lekutu/Navakasiga networks likely have higher fragmentation due to the fact that they are two separate districts. However, they must work together to manage their shared fishing ground and will likely need innovative solutions to fragmentation issues as this is the most remote and inaccessible region in Bua. The highest fragmentation was recorded within the Nadi farming network. There is a history of conflict

between communities in Nadi that may be reflected here, though why the farming network in particular is so much more fragmented is worth further investigation. I speculate it is because the system of communal land ownership does not require as much collaboration between clans in a village or between villages in a district and that the conflict exacerbated this pattern. Surprisingly, the Kubulau networks do not have the lowest fragmentation level even though they have been involved with NRM activities for a decade. This is likely due to the low response rate to the questionnaire, but could potentially highlight a need for actions there to be reinvigorated.

5.3.3 Cross-Boundary Collaboration

5.3.3.1 E-I Index

E-I Index measures were calculated to determine within-group cohesion for District, age class, and gender sub-groups. E-I Index can be interpreted as a measure of homophily (Borgatti et al., 2013), or alternatively, "cross-boundary collaboration" (Vance-Borland & Holley, 2011). Values range from -1 to 1 with negative values denoting relationships primarily within the group and positive values indicating more relationships with actors in other groups. The E-I Index calculations shown in Table 5.9 reveal that, for the most part, there is a higher likelihood that individuals obtain information within their own Districts rather than from other Districts or outside organizations. The Kubulau Farm Network, Wainunu Fish Network, and Lekutu/Navakasiga and Wainunu Yaubula Networks are the only ones to exhibit a higher proportion of cross-boundary ties. Of these four networks with a higher proportion of cross-boundary ties, they are primarily to outside organizations and not to individuals in other districts. A higher proportion of ties reported to outside organizations may indicate that these networks may have good access to information or other resources and collaborate well, but this could also raise concerns about over-reliance on outsiders.

Table 5.9 E-I Index Measures for District Sub-groups by Network – Negative values indicate higher proportion of ties within rather than between Districts

	Network			
District	**Decision**	**Farm**	**Fish**	**Yaubula**
Dama	-0.940	-0.143	-0.185	-0.114
Kubulau	-0.917	0.606	-0.080	-0.040
Lekutu/Navaksiga	-0.966	-0.522	-0.409	0.389
Nadi	-0.933	-0.416	-0.204	-0.215
Solevu	-0.902	-0.481	-0.231	-0.268
Vuya	-0.982	-0.280	-0.521	-0.612
Wainunu	-0.455	-0.787	0.167	0.857

E-I index measures for four age class sub-groups indicated that the proportion of within-group ties was less than the proportion of ties between groups, suggesting individuals tend to seek advice from those outside their own age class (Table 5.10). Respondents in the 40-54 age class had the largest number of within-group ties (or alternatively, the smallest number of ties to other groups) across each of the networks. This was particularly the case for their yaubula advice network, which was close to zero and indicates an almost equal amount of sharing within and between groups. It is not terribly surprising since out of the four age classes those in this range might be considered among the most active members of the community. Most would be old enough to fill positions of respect but also still young enough to be actively involved. Respondents aged 55+ showed a similar though not as drastic pattern in the decision-makers network. However, these results should be interpreted with caution as age data was not available for non-respondents (more than half of the network). Communication between age classes was a topic of discussion during community feedback sessions, and will be explored further in the next analysis.

Also shown in Table 5.10 are E-I index measures for gender sub-groups. Results suggest males are more likely to obtain information from fellow males, with females also tending to seek information from males. These results reflect gender roles in the Fijian culture, with men generally being regarded as the authority figures. However, it is interesting to note that for the fishing advice network the women's E-I value is close to zero, meaning an almost equal proportion of advice is sought from both genders. This result is consistent with women's prominent role in fisheries which is much more substantial than farming or NRM. Unlike for age, data on gender was available for all actors in the network, even non-respondents, although there were far less females in the network than males.

Table 5.10 E-I Index Measures for Age Class and Gender Sub-groups by Network – Positive values indicate higher proportion of ties between rather than within sub-groups

	Network			
Age Class	**Decision**	**Farm**	**Fish**	**Yaubula**
15-24	0.951	0.849	0.915	0.889
25-39	1.000	0.719	0.860	0.745
40-54	0.778	0.500	0.625	0.040
55+	0.414	0.892	1.000	1.000
Gender	**Decision**	**Farm**	**Fish**	**Yaubula**
Female	0.460	0.805	0.059	0.429
Male	-0.706	-0.769	-0.673	-0.659

5.3.3.2 Density between Age-Class Groups

Density between age-class groups was calculated as a way to further investigate patterns of exchange between people of different ages and is shown in Table 5.11 below. During participatory

analysis and network evaluation, participants raised concerns that traditional knowledge was not being passed from older to younger generations. While the questionnaire did not explicitly ask about the exchange of traditional knowledge, this analysis is an attempt to uncover whether any type of intergenerational knowledge exchange is happening. The results indicate that younger people generally seek advice from those older than them. For the decision making network, the largest proportion of ties were to the eldest age-class (55+). However, for the three advice networks, the largest proportion of ties was to the second eldest age-class (40-54).

Table 5.11 Knowledge Exchange Between Age-Class Groups – The number of ties from the age-class on the left to the age-class on top

Decision Network				
Age Class	15-24	23-39	40-54	55+
15-24	1	2	6	16
23-39	0	0	10	24
40-54	1	2	7	16
55+	0	2	5	23
% of Total Ties	2%	5%	24%	69%
Farming Network				
Age Class	15-24	23-39	40-54	55+
15-24	2	5	5	4
23-39	1	4	2	6
40-54	0	2	11	5
55+	0	0	2	1
% of Total Ties	6%	22%	40%	32%
Fishing Network				
Age Class	15-24	23-39	40-54	55+
15-24	1	5	10	3
23-39	0	2	12	3
40-54	0	0	6	3
55+	0	0	1	0
% of Total Ties	2%	15%	63%	20%
Yaubula Network				
Age Class	15-24	23-39	40-54	55+
15-24	1	2	15	4
23-39	0	3	14	0
40-54	0	6	24	4
55+	1	1	4	0
% of Total Ties	3%	15%	72%	10%
All Ties				
Age Class	15-24	23-39	40-54	55+
15-24	5	14	36	27
23-39	1	9	38	33
40-54	1	10	48	28
55+	1	3	12	24
% of Total Ties	3%	12%	46%	39%

As with the E-I Index measures above, these patterns mimic the roles of different age-groups within the community. But why, assuming that younger people acknowledge that their elders are able to teach them valuable information, is traditional knowledge being lost as suggested by participants? Based

solely on personal observations, I would agree with this concern and suggest it be further investigated. It seems that advice seeking would be selective, based on what the seekers deem relevant or useful. Loss of traditional knowledge, customs, and even languages is not limited to Fiji but an issue indigenous peoples are grappling with around the world as their lifestyles change.

5.3.4 Actor Position

5.3.4.1 Indegree

Indegree was calculated for actors in each of the three advice networks, producing a list of the people and organizations with the most incoming ties -- those actors most frequently named by others. Actors with the ten highest combined indegrees from across the three advice networks are shown in Table 5.11. The information provided in Table 5.11 is shown here purely as an example of the indegree analysis results. Indegree was actually calculated separately for each of the networks, but those detailed results have not been included for the sake of maintaining respondent confidentiality. A total of 60 people or groups were named at least three times by others across all the advice networks.

The most frequently named actors by far were either extension officers working for government departments in Bua or staff from Wildlife Conservation Society who have been lead facilitators during community engagement for EBM, however, local people also made the list. Not surprisingly, each of the community members who made this list have played key roles in resource management planning in their respective district or community by leading or being involved in their local resource management committee (RMC). It was pleasantly surprising to discover that three individuals from Vuya Village (including myself) made this list. At the time the interviewing took place in Vuya District I was traveling on another island, but I had been continuously working in Vuya Village for three years. Perhaps my inclusion on this list, and that of two members of our Yaubula Committee, can stand as a small testament to the effectiveness of facilitating a truly capacity-building process for community-led conservation.

Table 5.12 Advice Network Indegree Scores – Ten highest combined indegree scores from the three advice networks (fishing, farming, and yaubula) in Bua Province

Actor	Indegree
Department of Agriculture	199
Wildlife Conservation Society	162
Department of Fisheries	157
Community Member – Nadi District	32
Community Member – Kubulau Distirct	21
Community Member – Vuya District	21
Peace Corps Volunteer – Vuya District	17
Community Member – Vuya District	15
Kubulau Resource Management Committee	13
Conservation Officer – Bua Province	13

Actors with high indegree can be considered "opinion leaders" or people that others look to for advice and information (Borgatti et al., 2013; Flodgren et al., 2011). These individuals can be considered to have some level of influence over those who named them. "Opinion leaders" with high indegree scores could be ideal individuals to engage in trainings or other capacity building activities to improve communication about NRM since they are already respected by community members as sources of information and are likely to have interest or experience in NRM. In the medical field, studies have shown that interventions which engage opinion leaders to disseminate information throughout the network show positive patient health outcomes (Flodgren et al., 2011), and one may be able to elicit similar positive outcomes by engaging opinion leaders in conservation. This is not, however, meant to say they are the only individuals to engage within the networks -- healthy networks are generally composed of individuals with a varied assortment of characteristics.

The numbers of local opinion leaders or decision-makers (excluding organizations) with indegree measures of two or greater are shown in Table 5.13. The values range from a low of zero in the Wainunu yaubula advice network to a high of seventeen in the Kubulau decision-makers network. Very few opinion leaders in a network may mean there are not many local people viewed by others as reliable sources of information. Having several opinion leaders in a network may be desirable if those opinion leaders are indeed sources of good information on management practices, or alternatively it could be problematic if, for example, actors respect different traditional leaders and there is conflict among the leadership – which is the case in some districts. This speaks to the need to have solid background information on the communities studied, especially if the questionnaire response rate is not sufficiently high. Qualitative information is necessary to supplement the quantitative results.

Table 5.13 Number of Opinion Leaders/Decision Makers per Network – The number of actors with an indegree value of two or more

	Network			
District	**Decision**	**Farm**	**Fish**	**Yaubula**
Dama	13	4	3	5
Kubulau	17	8	3	3
Lekutu/Navaksiga	11	6	7	6
Nadi	9	4	4	3
Solevu	7	2	1	5
Vuya	6	1	9	9
Wainunu	2	3	1	0

In rural Fiji, the concept of opinion leaders is bit complicated. Because of the social hierarchy, traditional leaders can be respected in a way that is somewhat without question. While most leaders truly want what is best for their people, instances of corruption do exist. When someone disagrees with a chief or elder's decisions, it is extremely difficult for them to speak out against it. Depending on the situation, there may be a certain cultural protocol for dealing with these kinds of situations, but most people are not experienced or confident enough to engage in conflict resolution. I see conflict resolution as an area where capacity-building is definitely needed. Especially considering that several districts have internal conflicts that have stalled or halted their progress in forming or implementing their management plans.

Most of the highest scoring actors in the advice networks were not traditional leaders. Opinion leaders do not need to have a formal role such as a position on a council or management committee, they can still have a positive impact by sharing knowledge with their fellow community members. On the other hand, traditional leaders may hold very valuable knowledge but are not necessarily approachable by everyone and sometimes special protocol is required to do so. This might account for one reason they did not show up more on the advice networks. However, there are also cases where traditional leaders may hold valuable local knowledge but are not necessarily receivers of up to date information about good management practices. This is the case in our village, where the *Marama ni Yavusa* (chiefly elder woman) welcomed advice from the Yaubula Committee about management decisions.

Recognizing governance structures already present within communities and districts is extremely important. If proposed resource management governance structures go against or are perceived to challenge existing leadership, they can do more harm than good. In some cases, traditional leaders may want to be directly involved on a management committee. In others, they may merely want to be consulted and updated. Some traditional leaders may want to choose committee members themselves, while others may think it most fitting to elect them in village council meetings. The most appropriate

governance structure will vary from district to district, although each should be adaptive and able to respond to changing circumstances.

Indegree was also calculated for actors in the current and desired future collaboration networks (Q5-6 on the network questionnaire). High indegree scores for actors in the current collaboration network indicate that these are individuals or organizations that respondents work with the most on NRM in Bua (the ten most frequently named are shown in Table 5.14). It should be noted that this question was likely interpreted more as "who do you work with on NRM projects" and day to day NRM activities such as fishing and farming. As these actors are all working with communities on NRM, it is important to have an understanding of the goals and objectives each are striving towards. There may be opportunities for collaboration between these actors to help further build local capacity for NRM. This will be discussed further in the following chapter.

It is great to see that two locally-led committees are on this list: the Kubulau District and Vuya Village committees. Both of these committees had high levels of capacity-building (one by WCS, the other by myself) and are now actively implementing EBM/NRM management plans and projects. This investment clearly paid off in that it helped local people become more self-sufficient and reduced their reliance on outsiders to keep momentum going.

Table 5.14 Indegree Measures for Current Collaboration Network – Ten most frequently named actors that respondents currently collaborate with for NRM

Rank	Actor	Indegree	Rank	Actor	Indegree
1	Wildlife Conservation Society	172	7	Coral Reef Alliance	11
2	Department of Fisheries	42	8	Partners in Community Development Fiji	9
3	Department of Agriculture	38	9	SEEP	6
4	Department of Forestry	28	10	Bua Provincial Office	4
5	Kubulau Resource Management Committee	16	10	Conservation Officer	4
6	Vuya Village Yaubula Committee	15	10	Peace Corps Volunteer	4

WCS, who is facilitating EBM across the province and whose staff also conducted interviews for this study, was clearly reported by the most people. However, respondents were not asked to provide a measure of how often they collaborate with these reported actors and it can only be assumed that the ones with whom they work most often were reported more frequently. A measure of collaboration frequency would be interesting to study because even WCS, the organization with the highest indegree, is located in Suva and not actually present in Bua the majority of the time. This is important to note because if capacity building is a major goal, frequent contact with community members is necessary and may require facilitators to be actually based in Bua Province to be most effective.

Table 5.15 below shows the actors who were reported at least twice by respondents regarding whom they would like to work with (collaborate with) in the future for NRM. Most of the top ranking actors were NGOs based in Suva or government departments with local extension officers, but some local organizations made this list as well: the Kubulau Resource Management Committee, the *Soqosoqo Vakamarama* (Indigenous Women's Organizations), *Soqosoqo ni Tabagone* (Youth Organizations), and farmer's schemes. Actors who appear on this desired future collaboration list, but not on the current collaboration list above are shown in bold in Table 5.15. These actors are of particular interest when considering possibilities for network weaving since respondents have already indicated that they would like to work with these individuals or organizations. Efforts could be made to strategically build relationships with them. Also, the people who want to work with each of these particular organizations might have something in common and might be work connecting for collaboration as well.

Table 5.15 Indegree Measures for Desired Future Collaboration Network – Actors named at least twice that respondents would like to work with in the future on NRM; actors named on this list but not on the "current collaborators" list above are shown in bold

Desired Future Collaboration					
Rank	**Actor**	**Indegree**	**Rank**	**Actor**	**Indegree**
1	Wildlife Conservation Society	142	10	Conservation Officer	4
2	Department of Fisheries	57	10	**Provincial Administrator**	4
3	Department of Agriculture	33	11	**BYMST**	3
4	Department of Forestry	28	11	SEEP	3
5	**Department of Environment**	16	11	**Soqosoqo ni Tabagone (Youth Groups)**	3
6	Kubulau Resource Management Committee	9	12	Peace Corps Volunteer	2
7	**Government (not specified)**	9	12	Coral Reef Alliance	2
8	Bua Provincial Office	6	12	Partners in Community Development Fiji	2
9	**Seaweb Asia-Pacific**	5	12	**Farmer's Schemes**	2
9	**Soqosoqo Vakamarama (Women's Group)**	5			

5.3.4.2 Outdegree

Outdegree is a measure of the number of outgoing ties for a given node, or how many times an actor named others. Outdegree suggests the extent to which an actor is well connected with others and can imply certain characteristics such as "outgoingness" or "willingness to engage with others" (Borgatti et al., 2013). Actors with the ten highest outdegrees from across the three advice networks are show in Table 5.16. Community members with high outdegrees may be well suited to become active network weavers if they are provided with the proper training. Note that for "outside organizations," the outdegree values

also include the number of ties for who they give information or advice to, an additional question that was asked during their interviews. As for the previous indegree tables, comprehensive outdegree lists were produced for each of the networks and Table 5.16 is provided here as an example of the more lengthy information available.

Table 5.16 Outdegree Measures for Advice Networks – Actors with ten highest outdegree scores from across the three advice networks

Rank	Actor	Outdegree	Rank	Actor	Outdegree
1	WCS	58	6	Community Member – Vuya	12
2	Peace Corps Volunteer	27	7	WWF	11
3	Partners in Community Development Fiji	23	8	Community Member – Dama	10
4	Community Member – Navakasiga	17	8	Community Member – Nadi	10
5	Community Member – Solevu	14	8	Community Member – Lekutu	10

Section B: Participatory Analysis and Feedback

5.4 Presenting SNA Results Back to Communities

One of the primary objectives of this research was to determine if social network analysis could be useful to local community members involved in EBM in Bua. To fulfill this objective, I worked with WCS staff to design and deliver two one-day workshops where the social network maps were presented to participants for their interpretation and feedback. In November 2014, trained WCS staff facilitated these workshops in Kubulau and Dama Districts (workshop details can be found in Appendix C). I was present during each of these workshops to observe and take notes. The results of the four main components of the workshop are described below.

5.4.1 Develop Participants' Understanding of Network Concepts and Relevance to NRM

After an introductory presentation relating basic network concepts in the context of Fijian culture and a discussion of healthy network characteristics, participants were led through a participatory mapping exercise. Each participant was given stock cards and asked to write one name per card, with a limit of five responses per person per question. They were asked to write their name and the names of individuals or organizations that they frequently talk to or work with on natural resource management practices or activities. Almost every participant easily named five individuals, and the individuals they reported were mostly fellow community members. Next, they placed these cards on a large sheet of paper, removed duplicate names, and drew lines between themselves and those who they named. The facilitators indicated that this was the "core" of their network.

Participants repeated these steps, this time naming those they work with on a less frequent basis on a different colored card. The facilitators indicated that this was the "periphery" of their network. Lastly, participants listed individuals or organizations that they would like to work with in the future, and were asked to think about how they might build relationships with them. The results of this activity are shown in Figure 5.5 below. This exercise did not produce a well-organized or easy to read map, but it helped participants understand how their network could be mapped prior to having them review the network maps produced from the questionnaire data.

Figure 5.5 Participatory Mapping Exercise

5.4.2 Participant Interpretation of Network Maps

Workshop facilitators revisited the previously administered social network questionnaire with workshop participants to refresh respondents' memories and to provide a reference for where network information was obtained for those who had not completed the questionnaire. Participants were then divided into four groups to interpret and discuss the network maps I had prepared. Only network maps from their respective districts were provided (the Dama and Kubulau maps in Figures 5.1-5.4). Each small group reviewed a separate network (e.g. farming, fishing, yaubula, or decision-making[2]). First, facilitators

[2] Note: In Dama, the decision-making network map was not shown. Feedback from the process in Kubulau suggested that decision-making network maps had potential to be misinterpreted or cause disputes.

simply asked, "What does this map show?" In good Fijian humor, some participants noted, "Circles and lines!" Jokes aside, group discussions were not quick to take off, and facilitators were needed to initially walk participants through how to "read" the diagrams.

Facilitators asked participants to first identify the question that the map was answering (Q 1-4 from the questionnaire), what the node colors represented (villages or organizations), and what the directional lines represented (who someone seeks advice from). With continued prompting, participants were then able to answer more in depth questions about the networks' structures (see Appendix C). At the end of the session each group did a quick presentation on what their map showed and what they thought was most interesting about it. Through the group discussions and presentations, participants were able to identify actors or communities cut-off from the central component (fragmentation), central actors (actors with high degrees), over-reliance on outsiders (government departments or NGOs), a general lack of ties (low density, no "core"), and patterns of nodes grouped by village (within-group cohesion).

For the most part, network jargon was intentionally left out of discussions. The one term that facilitators introduced was "core," a portion of the network with dense ties. Extra care had to be taken to ensure this was not translated or misunderstood as "center", which was frequently the case. As many of the maps exhibited a "hub and spoke" structure, the "hub" node was easily misidentified as the core of the network.

5.4.3 Participant Evaluation of Network Health

A network evaluation exercise was conducted to help participants continue to build on ideas that came out of the map discussions (modified from Holly, 2012). Participants were asked to consider their actual experiences working together on natural resource management in their districts. The facilitators then passed out a worksheet and asked participants to score their network on a scale of 1-5 (1-low, 5-high) based on six healthy network characteristics (Table 5.17). While the scores are somewhat arbitrary, the activity was intended to stimulate discussion of the strengths and weaknesses of local networks for NRM. Interestingly enough, the average scores for Kubulau District, where communities have been involved in EBM planning for about a decade, are marginally higher.

Table 5.17 Healthy Network Evaluation Exercise Scores

Healthy Network Characteristic	Kubulau Avg. Score (n=21)	Dama Avg. Score (n=16)
1) Works closely with other groups or organizations	3.3	2.6
2) Does not rely too heavily on outsiders to organize or implement actions	3.8	3.2
3) Equally represents men, women, youth, traditional leaders, people from all communities/settlements	4.0	2.3
4) Responsibilities are shared; there is not a heavy reliance on only a few individuals	4.0	3.3
5) Has access to and the ability to share new ideas and information about best practices	4.1	4.1
6) Regularly reviews progress and is able to make changes as needed	4.9	3.4

After the scoring exercise, participants were asked to weigh in on why they scored their network the way they did. This transitioned into a discussion of the network's strengths and weaknesses. These strengths and areas in need of improvement were documented on flipchart paper by the facilitators as they were mentioned by participants and are summarized in Table 5.18 below. This activity was designed to be a more concrete assessment of the network which could be used to launch into further discussion of how to address the noted issues and utilize the strengths.

Table 5.18 Network Strengths and Weaknesses Suggested by Participants

Strengths	Areas in Need of Improvement
1. The collectivism of indigenous Fijian communities with strong traditions of working together on projects (*solesolevaki*) 2. Strong familial-social networks that could be used for sharing information 3. A traditional governance structure already in place 4. In Kubulau, the fact that an EBM plan is already being implemented	1. Strive to have more active committees and traditional leader councils with clearly defined roles and responsibilities 2. Better understanding of traditional roles and relationships especially among younger generations 3. More sharing between generations and between men and women 4. More sharing and partnerships between communities in the District 5. Improved communication with government officers 6. Better dissemination of knowledge acquired during workshops or trainings to the community at large

5.4.4 Strategies for Improving the Network

The list on the flipchart paper was then divided between small groups who were asked to develop strategies for improving the network by either building on the strengths or addressing the identified weaknesses. Facilitators gave little prompting during this exercise to avoid influencing the outcomes. At

the end of the exercise, participants presented their strategies for enhancing the network to the larger group. Those strategies are summarized here:

1) Conduct good governance and leadership training for traditional leaders
2) Share key messages from workshops or trainings with community at large
3) Share information during social gatherings
4) Build stronger relationships with government officers and invite them to visit less connected villages
5) Transfer knowledge from elders to younger generations
6) Build relationships between communities through site exchanges
7) Establish or revitalize committees at both village and district level
8) Develop alternative livelihood projects

Although some of these strategies would need outside assistance to implement, participants were encouraged to put these ideas to work and actually try their suggested strategies when they returned to their communities after the workshop. In subsequent workshops, facilitators will follow-up with participants to see if any were attempted.

This was the last major session of the workshop before participants were asked to provide feedback through a short evaluation form, as discussed in the next Chapter. This feedback was later reviewed and compiled by one of the WCS facilitators.

5.5 Map Analysis and Results Debrief with WCS Staff

In January 2015, I presented the network maps shown in Figure 5.1-5.4 to WCS staff for their interpretation. They answered a series of questions similar to the ones that were used with the small community groups during map analysis. The purpose of this activity was not just to share the results of the research with WCS, but to determine if the network maps provided any useful information for their work in facilitating natural resource management planning in Bua. Participants first practiced analyzing a single network map from one district and then moved on to comparing network maps from different districts.

WCS staff noted that there were not that many significant differences between the maps of the various districts, namely that none of the maps really stood out as "healthy" and well-connected, and that most exhibited a "hub and spoke" structure with an organization in the center. They did note that government extension officers and WCS staff were highly centralized actors in all of the districts, and while this raised concerns for self-reliance, it did not surprise them. They also noted that most members of the BYMST and staff from the Provincial Office, both of whom have a remit to be leaders in natural

resource management in Bua, did not show up as central actors -- or in some cases even show up at all -- on the network maps. This finding is similar to that of Cohen et al., (2012) who analyzed social networks in the Solomon Islands LMMA Network (SILMMA) and discovered a very limited number of relationships between the provincial agencies and local communities or other SILMMA partners. Their absence on the map helped WCS realize the need to encourage a review of BYMST membership and perhaps develop some criteria for future member selection. It also suggests the need for capacity building with Provincial government, although this is not really an appropriate activity for WCS to carry out. Another observation that was brought up was that traditional leaders did not show up much in the advice networks and therefore it may be worth developing capacity building activities targeted specifically for them.

WCS staff were quite hesitant to draw conclusions about the structures of each network because of the low questionnaire response rate. What they did find useful, however, was that a few local individuals from different districts stood out as being connected to many others. They were keen to know more information about these individuals who could be potential candidates for network weaver training. Many of these individuals who exhibited a high indegree were those who have been active throughout the EBM planning process and are individuals that WCS staff would have likely nominated to receive additional training without having viewed the network maps. Nevertheless, it was discussed that the lists of individuals with high indegree and outdegree could potentially be shared with districts that are in the process of selecting representatives for resource management committees. When providing these lists of names, it could be explained that these names were acquired via the questionnaire and that these individuals may be good candidates for committee selection. Participant consent would need to be obtained before sharing these lists. Ultimately, local knowledge should be used to determine who would make the best committee members.

Outcomes from the community feedback sessions held in Dama and Kubulau were also shared during this meeting. I presented a summary of the network strengths and weaknesses that participants came up with, as well as the strategies they suggested for how to improve their networks. This information, combined with their own experiences from working in Bua, allowed WCS staff to brainstorm some additional feasible activities that could serve as network interventions. Their ideas included:

1) Work with Seaweb Asia-Pacific to develop communications and network weaver trainings and deliver trainings to "opinion leaders", both community members and government extension officers
2) Make it easier for isolated communities to have access to information about natural resource management practices (e.g. radio programs, local information libraries)

3) Partner with the iTaukei Affairs Board to develop and deliver good governance and conflict resolution trainings with relevance to NRM
4) Partner with another organization or government office to develop inter-generational knowledge sharing activities

WCS will develop trainings and capacity building activities throughout 2015 with the hope of beginning a series of trainings with selected stakeholders later in the year. The activities and trainings listed above will need to be further thought out, including considerations for whom they should target and at what scale.

Chapter 6 will further discuss the results presented in this chapter and present recommendations for methods of future studies, network weaving, and capacity building activities.

Chapter 6: Discussion

This study set out to evaluate the value of social network analysis when used as part of a participatory community-based natural resources management process in rural Fiji. Did network maps and analyses provide community members and NRM practitioners with useful information about social networks for NRM in Bua Province? Were they able to use that information to develop strategies for improving their networks? This chapter will try to answer these questions.

6.1 Network Mapping and Descriptive Analysis

There were two distinguishable components of this study. The first was network mapping and analysis conducted by the researcher without community involvement. The data gathered through the questionnaire was used to produce forty-two network maps (six for each of seven districts). Then, descriptive metrics were used to assess network cohesiveness, fragmentation, cross-boundary collaboration, and actor position. Since only 284 individuals were able to be interviewed out of the 620 total individuals identified by the snowballing methodology, the results of these analyses only represent a portion of the total network. Therefore, these results cannot be used to assuredly describe the actual networks in Bua. Nevertheless, a few patterns still stood out in the data and are summarized in Table 6.1 below.

Table 6.1 Patterns Found in Network Analysis

Measure	Pattern
Cohesion	• Higher density in decision-making networks compared to advice networks may reflect knowledge of and adherence to traditional networks over recently adopted NRM governance structures
Fragmentation	• All networks exhibited fragmentation of at least two components; most highly fragmented networks were ones with a history of conflict or geographic isolation
Cross-Boundary Collaboration	• A higher proportion of individuals seek advice from others within their district as opposed to people in other districts or organizations • Individuals are more likely to seek information from someone older than them • Both genders tend to seek advice from men
Actor Position	• Individuals from three outside organizations (Dept. of Agriculture, Dept. of Fisheries, and WCS) were named the most often by others (high indegree) but a handful of local individuals in different districts were named by several others as well (these people can be considered opinion leaders) • Most collaboration for NRM is currently being done with outside organizations, but several local organizations or groups were listed for desirable future collaborations • A handful of local individuals were indicated as having a relatively high outdegree (they named many others they work with or seek information from) and could be considered "willing to engage with others", a desired characteristic for network weavers

It is interesting that many of these patterns reflect Fijian social structures and norms. Anyone who has spent time in rural Fiji will quickly recognize the presence of the traditional hierarches -- for example, the first thing one must do upon entering a village for the first time is to present yourself and a traditional offering to the village chief or headman. Of course it is necessary to consider these people and protocols out of respect, but they also play an important part in NRM. The network analysis results re-emphasize this by showing us that the traditional decision-making networks are "more dense" than the others. In other words, respondents on average have more connections to decision-makers, or at least can more easily recall them, than people they seek advice or information from about NRM.

Trying to create new governance structures for NRM that do not relate to the traditional structure would likely be problematic. It is clear that understanding who the traditional leaders are is important, but this is really only an issue for outsiders. Going in as an outsider for the first time and immediately asking to map the traditional networks wouldn't be appropriate; you cannot skip over the relationship building part of working with communities. Through the building of relationships one will gain insight and understanding, and then perhaps the trust of the community. Once this has taken place, then network mapping might be an appropriate means of visualizing the community in a new way. This study followed that process, since WCS had been working in Bua for a decade and most people recognized me as a local Peace Corps Volunteer.

The fact that all the networks exhibited at least some fragmentation (two or more separate components) was not surprising given the lower than desired response rate, but many of the networks had higher rates of fragmentation (five or greater components) and two districts had as high as 10-16. These deserve further investigation, because if communities within a district are not well connected both internally and with each other, then collaboration and communication are not likely to happen at the scales needed for effective ecosystem management to take place. Indeed, it is much easier for communities to implement management actions or projects on their own than to go through the trouble of coordinating with other villages that may be far away, hard to reach, or not on good terms. This cannot be ignored if implementation of larger-scale Ecosystem-based Management plans at the District-level and a Provincial ICM Plan are to take place effectively. Having a plan on paper does not make communities work together to put it into action. A catalyst is needed to keep the momentum going and hold together or build working relationships. This is where network weavers could really have an impact. If local people could be empowered to fulfill the role of community catalyzers, then it may be possible for effective management goals to be met over the long-term.

The results from cross-boundary collaboration (E-I index measures) also reiterated certain realities of rural Fiji. It is simply much easier to get information and work with those people who live with and near you, and may be the only option for many individuals. This is a good reason to ensure

information about best practices is available and accessible locally. It was a bit less intuitive that the results indicated people are more likely to refer to someone outside their general age group for information, but in some ways it makes sense. Younger people generally seek advice from their elders, but younger people also possess different kinds of information than people from older generations (for example, about new technologies or changes in practices or conditions).

Both genders tended to go to men for information and advice, which reflects the more authoritative role of men in the communities. However, it would be interesting to learn more about women's roles in fishing advice networks, where women had a closer to equal chance of being consulted for information. Women tend to be active users of the inshore fisheries and have the potential to play an important role in management and sharing of best practices. This study did not focus specifically on women's networks and only about 20% of respondents were women. Future studies may wish to look at women's networks separately.

The indegree and outdegree measures may have had the most practical results as far as future conservation and network weaving might be concerned. These results primarily indicated actor position within the network; in other words, who the individuals with the most connections were. This is useful information because these individuals could be good candidates to receive further training or to engage in management committees. Indegree measures also helped to indicate who communities are collaborating with and who they would like to collaborate with in the future. Developing specific strategies for how to engage the suggested actors -- from local, government, and non-local NGOs -- could be a good way to enhance collaboration and local capacity. Specifically engaging local groups could help build more local support for management and enhance local collaboration. It could also engage a more diverse demographic that includes women and youth, and pair conservation with sustainable livelihoods projects.

The quantitative analyses used in this study were relatively standard, but they were not completed for the sake of pushing the limits of analytical network metrics -- they were used solely for the purpose of describing the networks in Bua in ways that might be meaningful for community conservation, and for that end they served their purpose. Unfortunately, because of the low percentage of network members who actually took the questionnaire, the results must be interpreted cautiously. This should be an important point of consideration for future research focused on studying large, rural networks. The amount of data needed may be more difficult to obtain than expected, as was the case in Bua.

Reflecting on the descriptive metrics used to analyze the networks, I recognize that I learned an interesting and useful tool. It was fascinating to be able to quantify relationships and diagram their patterns, a unique method for social science research. However, I am a bit skeptical, as some of the community members were, about the direct usefulness of these maps and analyses to the communities. Perhaps this feeling merely stems from having limited data that required a good deal of effort to obtain

but nevertheless left the network maps somewhat sparse. Perhaps I am also biased from having lived in Bua for a good deal of time in that most of the patterns that came to light through the analyses did not surprise me. This would obviously be different for someone who was less familiar with the area. In my perspective, the most useful data obtained through the formal analyses were the names of individuals or groups and the frequency they were named. This data highlighted key opinion-leaders, collaborators, and potential future collaborations and could help narrow the focus on who might be good to engage in future capacity building programs. Despite this minor skepticism, I do feel that the network maps provided a wonderful foundation to help participants launch into more in-depth evaluations of their networks and improve their communication and collaboration. But I am not convinced that this type of participatory evaluation absolutely requires the use of computer-produced network maps and analytics. Nonetheless, their inclusion did enable the networks to be "viewed" in ways that using only low-tech methods would not have permitted. The following sections will highlight how the participatory methods were able to build upon and enrich the quantitative results discussed above.

6.2 Participatory Mapping, Analysis, and Community Feedback

The second major component of this study was to take the network maps back to the communities and engage them in evaluating their networks. This took place in a workshop format that began with a participatory mapping exercise that resulted in a map much different than the ones produced from the data. During this exercise participants named greater numbers of fellow community members with ease than during the interviews. Here, facilitators asked participants to note the people they talk to or work with regarding NRM activities, while the questionnaire asked respondents to name who they "seek information or advice from." This latter phrasing implies some type of formal approach or questioning on behalf of the respondent toward the advisor, and therefore responses may not have included less formal, un-staged discussions or *talanoa* (storytelling). Asking about "management and management practices" may have veered respondents away from considering those individuals who share customary knowledge and practices with them, or from naming those they learned fishing or farming practices from through observation. It likely inferred we were asking about science-based knowledge and not traditional or local knowledge.

Results of a participatory mapping exercise could potentially be used to supplement or replace questionnaire data if they could be systematically recorded. In our exercise there were too many actors and lines on the final map to decipher them. Although Holley (2012) suggests hand-drawn network maps as one method available for mapping networks and Eva Schiffer has developed a similar process with the Net-Map Toolkit (Schiffer & Hauck, 2010), I am not aware of any studies that have analyzed hand-drawn map data for larger networks such as the one in Bua. It would be useful for the participatory mapping

process to be refined to enable data to be collected and analyzed in this way, especially for social network studies in rural, developing regions of the world. Perhaps it could be as simple as conducting participatory mapping in smaller groups, then compiling the data for further analysis. It might not be possible to obtain as much attribute data about each actor in this way and that information makes for richer analyses. On the other hand, a methodology using only participatory mapping might choose to forego the computer-based network analytics for participatory ones and this might not be as large a concern. One concern that might arise if participatory mapping were the only method used, however, is that participants could be highly influenced by other individuals present during the exercise whereas with a questionnaire there is some level of anonymity. For example, if a question had anything to do with the level of influence or power in NRM, there could be some controversy over who should traditionally be considered most influential versus who is in actuality.

Next, participants were given a chance to review the network maps that I produced from their data. This session was labor intensive because it took considerable clarification by the facilitators to help the participants understand how to read the diagrams. In other words, the maps were not intuitive. When asked if they thought the network maps accurately represented relationships within their districts, most participants quickly questioned the limited number of respondents from their communities and the general lack of ties within the network. The facilitators reminded the participants that the maps reflected the sampling methodology and only represented how people responded to the questionnaire. The participants expressed that while they most likely rely more than they should on government officers and other organizations, that this seemed over-emphasized by the diagrams. There were concerns that the maps did not really indicate the sharing of information amongst community members, especially among farmers and fishermen. That these relationships did not widely appear in the data set could indicate a response bias due to situational factors during the interview or questionnaire phrasing. These concerns also reinforce the need to collect detailed data that accurately represents the network.

Traditionally, it is common practice for older Fijians to pass on knowledge to younger generations through storytelling and for younger Fijians to learn by observing practices used by their elders. This information could not be depicted well on the maps because age data was only available for less than half of the actors. Regardless, participants were concerned that this type of knowledge transfer may not be happening to the degree that it did historically, and that traditional knowledge, particularly in regard to roles and relationships within one's *vanua*, may be disappearing.

During quantitative analysis, E-I index measures showed that individuals of all age-classes seek some degree of information or advice from people of different ages. Delving further into these patterns, density between age-classes was determined and showed that the largest proportion of ties were to the eldest age-class for decision making and to the second eldest for advice about NRM practices. It is still

difficult to establish to what degree traditional knowledge is being transferred from older to younger generations because the questionnaire did not specifically focus on this kind of knowledge. Through general community observation, it does seem that many changes are happening in the communities and that changes in lifestyle may be contributing to loss of traditional knowledge. To help clarify this important issue, future studies should distinguish between information about management and local knowledge.

One last point participants in Kubulau noted was that coastal villages appeared to interact/ communicate more closely with each other than interior villages did, and they thought this is likely true due to coastal communities' heavier reliance on and sharing of the *iqoliqoli* (fishing ground). With more data, it might have been easier to visualize these patterns on the network maps.

Upon completion of both the hand-drawn mapping exercise and discussion of the network diagrams from the research, participants were asked to weigh in on which exercise they found more useful or interesting: the participatory mapping exercise or analysis of the maps from the dataset. The majority opinion in both districts where this was tested was that the participatory mapping exercise was more fun and engaging, and that it helped them to think more about how they work together as communities.

In my opinion, this preference for the participatory mapping was predictable. It was an inclusive group activity, like most aspects of their society, and was easier to see how it related to their lives. Since this diagram was drawn on the spot, participants could also "trust" it more. It eliminated the lengthy gap between the time the interviews took place and the time the network maps were ready to be presented back. While there seem to be many positives to this participatory approach, it does not forgo the fact that the hand-drawn maps were messy and patterns were difficult to pick out. A solution to this could be for participatory mapping to be completed in smaller groups, where ties could be more easily distinguished and later recorded in a spreadsheet, similar to the process used by Schiffer and Hauck (2010).

Participant feedback on their evaluation forms indicated general agreement that the day's activities were useful in helping them think about the importance of governance and communication for reaching their natural resource management goals. While this feedback expressed an overall positive sentiment, it is important to recall the skepticism as to whether the maps accurately represented relationships in their districts. In other studies where network maps were presented back to participants for discussion, the study authors note positive feedback from participants in regard to the usefulness of the network maps and the maps' ability to represent their networks accurately (Beilin et al., 2013; Fuller et al., 2012). Vance-Borland and Holley (2011) did note there were a few skeptics in their group, but that most people appreciated the "bird's-eye-view" of the relationships. With more data, the maps would likely have been deemed more useful in and of themselves.

The two district workshops ultimately resulted in a list of strategies developed by the participants for ways to improve their networks. Many of the strategies participants came up with, although good ideas, were vague. For example, the recommendation to develop more alterative livelihoods is a great suggestion, but what types of projects and how they would be implemented and funded would be necessary to sort out. Time did not allow each strategy to be broken down further or for any action planning to happen. There were already a lot of exercises and discussions packed into one day, and it was necessary to set a stopping point. If the strategies they listed are to be carried out, which is the hope, there will undoubtedly need to be additional training and support in order to move toward actual implementation. This clearly stresses the importance of a having a dedicated facilitator who can guide participants not only through network analysis, but on into network interventions or weaving as well.

As for the activities carried out thus far, it seems participatory network analysis can only be considered to have been an empowering activity to the degree that it helped community participants begin to understand network concepts and why they are relevant to NRM in their communities. While the degree to which this took place was not explicitly measured, feedback through workshop evaluation forms was positive. Presenting and analyzing the networks may have gotten the wheels turning with ideas for how to improve collaborative conservation within these districts, but much more effort will be required for the networks to become self-organizing and action-oriented in practice.

6.3 Recommendations for Community Capacity Building

This study was undertaken with the goal of producing practical results for conservation work in Bua Province. Using a network approach that engages stakeholders in evaluating their own network seems like a promising way to build local capacity for improved natural resource governance. But how does that actually translate into practice post-analysis? Table 6.2 below combines the quantitative and qualitative results of this study and translates them into recommended actions for capacity building in communities.

The majority of these recommendations require WCS or another organization to continue investing in and facilitating capacity building for natural resource management in Bua. In order to help facilitate a transformation to self-organizing, action-oriented networks there will be considerable commitment needed from a network facilitator (or facilitators) who have sufficient training in network leadership and network weaving, and who are available and committed to regularly checking in with trainees and committee members in order to build more accountability in carrying out their remits. Being a network facilitator will require a near full-time commitment to the people of Bua and will be difficult for someone working in Suva or for someone with a number of other responsibilities to undertake. As local people receive more training and gain more experience, they can and should be expected to assume

more responsibilities, bearing in mind that they are likely to do so only if they perceive clear benefits for themselves or their communities.

Table 6.2 SNA Outcomes and Recommendations for Community Capacity Building

Outcome/Finding	Recommendation
Low density of ties	• Train network weavers who can work to increase the quantity and quality of ties in their local networks
List of individuals with high indegree and outdegree scores (included very few traditional leaders or women)	• Target highly connected individuals for network weaver training and other capacity building activities • Use this data to help inform BYMST and district Resource Management Committee (RMC) member selection; attempt to incorporate diverse personalities and skill sets • Develop and deliver appropriate governance and EBM trainings for traditional leaders • Network weaver trainings should include and strategically engage women
District network fragmentation	• Seek additional community feedback to better understand causes of fragmentation and develop strategies for bridging gaps, especially between villages in the same district • Develop and deliver appropriate conflict resolution training • Ensure management actions can also be implemented at the community-level and that there is a clear remit to do so
Many of the networks exhibit "hub-and-spoke" structures with outside organizations at the center; possible over-reliance on outsiders	• Establish action-oriented management committees in each district *and* village along with protocol for working with the traditional hierarchy and criteria for member selection • Build RMCs' capacities for self-organization, project planning and implementation at both district and village level
List of desired future collaborations	• Network weaver training can help participants develop strategies and confidence to bridge new connections with these people, groups, or organizations; organizations could also take the initiative to reach out to people or communities who want to work with them
Low numbers of ties between different groups	• Network weavers to work to increase the links between older and younger generations, between men and women, and between different communities
Many NGOs and government departments collaborating with communities throughout Bua	• Build healthy relationships between these organizations • Share work plans and training resources to maximize efficiency and reduce overlap • Conduct capacity building with government officers where appropriate
Distance to information the most frequently named barrier to communicating about NRM	• Make good management practice resources easier to access locally (e.g. through libraries or radio programs) • Train local people to effectively communicate about good NRM practices (e.g. using Sea-Web's communication training resources)
Limited financial resources are a barrier to RMC operations and plan implementation	• Build capacity for local people to develop sustainable income generating projects which can support RMC operations in the longer term • Network weavers should work to link individuals with common interests, for example, to set up a farming cooperative

In my opinion, WCS has done some great groundwork in Bua, but there is still much to do in order to reach the point where locals are actively implementing management plans across the province. I recognize that organizations have limited resources at their disposal, but it would be a shame to see the

investment that has already been made not reach its full potential because of decreasing support. Change happens slowly-- Berkes (2004) suggests that practitioners should expect it to take at least ten years before behavior changes become lasting. This is the kind of commitment that was given to a decade of work in Kubulau District, and it would be amazing to see the rest of the Province benefit from a similar level of support.

Trainings and workshops are wonderful capacity building tools, but more is needed to affect change. Participants need someone to follow up or check-in with them regularly; not every few months, but every other week. It cannot be forgotten that conservation is not the number one priority of the individuals in these rural communities. Most of them are living a largely subsistence-based lifestyle and have pressing matters to take care of on a daily basis, such as providing food for their families. Regular phone calls to ask about progress, to brainstorm ideas, or to drop a friendly reminder about goals can go a long way toward keeping momentum going. Once committees become active and there is community support for management actions, the level of involvement of the facilitating organization can taper off.

The true essence of capacity building cannot be forgotten either. Since district-level management planning in Bua has skipped the grassroots level where each village has their own plan, it is critical to find other means of ensuring bottom-up awareness and support and avoiding only having a "paper plan". Even when district plans are ratified, implementation still effectively takes place at the village level. District management committees would benefit greatly from being taught how to gather community input and write management plans, as opposed to just being presented with documents that do include their ideas but which were assembled elsewhere. The majority of local people do not care to see plans on paper -- that's a Western thing. What they want to see are projects that are improving their lives, their communities, and their environment. Therefore, capacity building needs to go beyond just trainings. Network leadership and network weaving should ideally be paired with actual community projects in which participants can put their new skills to the test, gain confidence, and see things happening.

Such an approach might resemble a process such as this: select several individuals from each district and provide them with project management training where they could learn to plan a simple village or district project from start to finish, and then actually coordinate their implementation. This training could be paired with network weaver training, and these individuals could actively work to build connections between community members and with other collaborators throughout each phase of project implementation. Facilitators could regularly check in with these "network leaders/weavers" and provide advice and guidance while also helping create some type of accountability for remaining action oriented. An example project could be something like starting a young farmer's group, or "farmer's scheme" as they are called in Fiji, where a group of young men take turns working on each other's plantations in order to share the workload and provide some camaraderie. The network leader could work with these

men to also teach them about and supervise some conservation activities such as interspersing nitrogen-fixing trees with crops, or marking off buffer zones along waterways.

This chapter reflected on two questions related to the overall research goal of this study. Did network maps and analyses provide community members and NRM practitioners with useful information about social networks for NRM in Bua Province? Were they able to use that information to develop strategies for improving their networks? After expounding upon the results and taking an in depth look at how they might benefit communities and NRM practitioners, it is apparent that both types of analyses (computer-based and participatory) were able to provide a good deal of useful information. Not only were patterns found in the data that have direct implications for natural resources governance, but by engaging participants in mapping and analyzing the networks themselves, important discussions resulted about areas in need of improvement for NRM communication and collaboration be more effective. Participants were even able to recommend strategies for improving resource governance that facilitators like WCS could now help them implement.

Chapter 7: Conclusion

7.1 Aims of the Research

This thesis began by identifying the need to overcome challenges to implementing effective conservation in adaptive co-management settings at multiple scales in Fiji, specifically highlighting the need for more systematic conservation planning and evaluation processes that are inclusive of local peoples and that build their capacity for self-organized management. Capacity building needs to be at the center of all management actions as it has been shown to be the number one contributing factor to positive conservation outcomes (Brooks et al., 2013). Local people need information and tools to be able to make informed decisions about how to balance their conservation and development needs. Applied social network analysis has been shown to help enhance desired outcomes in other fields such as community health, and a handful of studies have now emerged within the realm of natural resources management -- although none in a setting similar to the one in Bua.

This study set out to test how participatory social network analysis might be integrated into District-level ecosystem-based management planning being facilitated by WCS in Bua Province and to determine what useful information, if any, could be gained by community participants and conservation practitioners. In theory, increased understanding of the relationships within local natural resource management networks can help inform the design of network interventions aimed at building capacity for community-led conservation (Vance-Borland & Holley, 2011). Theories do not often translate easily into practice, their applications often require repeated testing and refinement. Although this study built upon applied methods used by others, it was the first to take place in the context of community conservation in a rural developing area, and therefore its methods can serve as a point of reference from which future researchers can learn and hopefully improve.

7.2 Key Findings

This study collected data from across a large and rural geographic area. It proved to be more challenging than expected to obtain a high response rate to the network questionnaire because of the logistics of sampling and then following up face-to-face with community members. It seems that future studies would do well to focus on a more manageable geographic area (such as a district or rather than a province) and that it might enable interviews to be conducted with more people. This would also result in more detailed network maps and more telling analyses. Despite a lower than anticipated network response rate, the network analyses still appeared to highlight some interesting patterns in the relational network data. For example, there was a higher density of ties in the traditional decision making networks than in the other three types of networks (farming, fishing, or yaubula), which suggests the prominence of this

social structure in the communities and the need to consider it when considering new types of governance arrangements for natural resources management. Fragmentation within all District-level networks (varying numbers of communities cut off from the rest) and the presence of more ties within than between communities suggests a great deal of work left to be done for effective and collaborative EBM to happen at this scale. Actor position analyses using indegree and outdegree measures resulted in lists of opinion leaders who may be good candidates to receive network weaver trainings, as well as highlighted current NRM collaborators and groups who communities would like to work with in the future.

The methods developed for this study included the use of participatory mapping and participatory analysis as a way to replace "research about a network" with "research involving the network members". As part of applied SNA, participatory analysis is somewhat inherent in the process, but participatory mapping is an option that future researchers may wish to consider either in conjunction with or in replacement of more standard data collection methods (e.g. only surveys or interviews). However, methods for participatory mapping with larger groups need to be refined as we were unable to "unscramble" the maps for use in addition to the data collected via the questionnaire. There should be thorough consideration when choosing either or a combination of these two methods since they could produce different results. For example, participatory mapping may make it more fun and easier for participants to understand the research, but it also takes away a level of confidentiality that comes with a survey and the maps may not be able to be analyzed using descriptive analytics.

If standard network mapping on a computer is the chosen method, care should be taken to keep the turn-around time short between data collection and sharing the maps back with participants. This could help participants more easily recall the questionnaire and rationale of the research. Regardless, strong facilitators will be needed to translate and convey network concepts, and coach participants through the process of "reading a network diagram". In cultures who traditionally have an oral history, reading such abstract figures is not likely to be intuitive.

Even though the network maps in Bua were not that detailed, the involving participants in interpreting them was still a great way to jump into an evaluation of strengths and weaknesses of the "real" network. It felt like this was the part of the study where participants really became engaged and interested. The discussion came away from the network diagrams, and began to focus on real issues the communities are facing in organizing and implementing natural resources management. Ultimately the community feedback workshops resulted in recommendations for capacity building which focused on some community needs that expand beyond WCS's focus. This potentially suggests a strong need to involve and collaborate with other organizations for capacity building. For example, if other community issues are not being addressed sufficiently (e.g. community conflict, development needs), conservation efforts are not likely be successful.

7.3 Implications

Since there are no published studies that have documented the outcomes of network weaving or changes in conservation networks over time, this is a major gap that this study will help address. While this study alone is insufficient to fill this gap, it is able to nevertheless serve as an important starting point for what will hopefully be a longitudinal study continued on by WCS. The recommendations for network weaving and capacity building that resulted from this study will need to be implemented and the outcomes documented before it can be determined if applied SNA can indeed help to improve conservation outcomes. The methods for this longitudinal study could be based on an evidence-oriented framework for applied conservation network projects proposed by Ken Vance-Borland (personal communication, 2014) and shown in Table 7.1 below.

Table 7.1 Proposed Evidence-Oriented Framework for Applied Conservation Network Projects

1.	Identify two or more communities that face similar social-ecological challenges
2.	Recruit advisors from each community
3.	Identify and record indicators of social and ecological conditions
4.	Collect and analyze network data
5.	Report results back to communities
6.	Spend six months to a year on network weaving activities with one of the communities, but not both
7.	Re-survey, re-map, re-analyze, including indicators
8.	Repeat 5-7 over a socially and ecologically meaningful time period

But there are still some components of this process to sort out: In which districts or communities should network weaving take place? What capacity building suggestions should WCS help to facilitate? If districts and communities are not homogenous, should care be taken to choose ones that are relatively similar? After re-surveying, how will we determine if changes in network structure can be attributed to network weaving, capacity building, or other causes? Should the same participants be interviewed as in this study? If not, how will it affect the ability to compare the before and after network structures? All of these questions will require thorough consideration, and their answers might have to come through a trial-and-error approach.

7.4 Limitations of the Study

It is important to highlight the potential factors that may have had an impact on the results of this study. The most influential factors include: the selection of a Provincial-wide population for network analysis; using a modified snowball sampling method which began by interviewing workshop

participants; achieving only a 45% network response rate for the questionnaire; questionnaire wording; and using WCS staff as interviewers.

Selecting a target population that included individuals from fifty-four rural communities across an entire Province was an ambitious aim, especially considering that there was no predetermined list of individuals to interview. This issue was addressed by first interviewing participants at resource management workshops in each of the Districts. It was felt this was an appropriate group to target for the first round of interviews as they already had some known involvement in NRM. Snowball sampling methods allowed the network to grow organically as interviews were able to continue with additional individuals named by the initial respondents. However, finite resources only allowed data to be collected in two limited rounds. Data collection was further hindered by a variety of factors that made it difficult to seek out individuals in their far-flung and remote communities. Also many people were unavailable when we held the workshops and interviews. It was not appropriate to conduct interviews over the phone with community members even if they may have had mobile phone service, and electronic questionnaires were not an option; they had to be interviewed in person. Additionally, many of the individuals named by others were traditional leaders who required another degree of sensitivity and protocol in order to approach and interview them. These factors were the main contributors to a low response rate. Future studies could potentially overcome these limitations by conducting additional waves of data collection to achieve a higher response rate, or by focusing the study within a smaller geographic area that would help overcome resource constraints.

Since this study had a below 100% response rate, network analysis results cannot be used to definitively describe network structure or its implications. In large networks, and particularly in "unbound" networks, it is particularly difficult to achieve a 100% response rate, but this does not mean that the data obtained is without value. The results still highlighted existing relationships between many actors in the network and indicated patterns that may be useful for capacity-building. This is one reason SNA is best complimented with qualitative or participatory methods that can produce additional insights about the network, and is why this study chose to present the network mapping results back to communities for their interpretation.

Questionnaire wording and facilitator prompting had the potential to bias questionnaire responses. This was addressed by working with local WCS staff to critique the questionnaire and translate it into the Fijian language. Convening a project steering group including representatives from Bua could have made further contributions to study design and questionnaire development, but this proved to be infeasible in our case. We did not have the resources needed to garner enough interest in the project for active participation from local members. I think the "network diagraming" seemed a little too abstract to attract potential members. Despite this, we continually updated the Provincial Council throughout the course of

this study and gave them the chance to provide feedback if they had any suggestions or concerns. This should not deter future studies from considering using a steering group as part of their methodology.

While trial interviews of an earlier version of the questionnaire led to many updates, another trial of the updated questionnaire could have led to further edits, especially in regard to question phrasing. WCS staff were provided with interviewer training but may have still used potentially leading prompts in some instances. Indeed, the mere fact that WCS staff conducted the interviews and that many interviews were conducted at workshops where government officers or NGO employees were present, could have resulted in a higher proportion of "outsiders" being named on the questionnaire. Participants might have assumed that is the type of information outsiders would be looking for. Future studies would benefit from addressing these limitations during study design, perhaps by contracting a third party interviewer.

7.5 Recommendations for Future Research

As the field of applied SNA in natural resources management is quite young, there are many opportunities for future research to help broaden the knowledge base surrounding its use. As mentioned previously, longitudinal studies will be extremely helpful for determining changes in networks over time and the outcomes of network weaving or capacity building on communities and conservation. Community-based research studying knowledge exchange networks could be targeted toward traditional knowledge exchange in addition to science-based knowledge. Measuring the degree or frequency of information exchange could allow for a more in-depth understanding of the relationships studied. For example, in this study it was evident that younger people obtain information from their elders, but participants were still concerned that traditional knowledge is being lost --further investigation of the amount, type, and/or frequency of this information might uncover other patterns not shown in unweighted ties. Another aspect worth studying could be gender specific networks, and in particular women's networks since they were under-represented in the sample. Men and women typically have different roles in resource use (e.g. women's prominent use of inshore fisheries in Fiji) and better understanding these differences might be beneficial for NRM.

A search of academic literature resulted in almost no explicit recommendations for how to design participatory social network research in the context of multi-level community-based natural resource management. This is not to say that many studies have not taken place in community-based settings, but that almost none have presented data back to the communities they studied. The one exception seems to be Eva Schiffer, who has created a career out of conducting participatory "influence mapping" with communities primarily in West Africa. However, her participatory methods are not paired with descriptive metrics. Therefore, based on the lessons learned in conducting this research in Bua and drawing from a limited number of other applied studies, I suggest the following recommendations for

designing participatory SNA in community settings and invite future researchers to critique and build upon them:

1) *Plan for applied, longitudinal research.* Do not conduct a study just for the sake of research. The communities involved deserve more than to just be subjects of research; they should be considered co-researchers and involved in the study over the long-term. A properly designed applied and participatory study may potentially lead to improved conservation or governance outcomes through network interventions. Applied studies can help bridge the research-implementation gap and longitudinal studies will help determine whether or not applied SNA can actually lead to improved management outcomes.
2) *Convene a local steering committee to assist with study design.* Although this did not work out for us in Bua because of logistical problems and a lack of interest, working with a steering committee of people from or familiar with the study population could help researchers design more relevant and appropriate studies by providing insight into question wording and translation, data collection logistics, and the interpretation and use of the results.
3) *Develop a culturally appropriate methodology that includes not only quantitative, but qualitative and participatory methods*. While this study focused more on participatory analysis of maps created by the researcher, future studies may wish to test and refine a participatory mapping process as a means for data collection. The hand-drawn mapping process tested in this study was indeed useful for garnering participant understanding, but the results were too messy for formal network analysis. I would argue that participatory analysis helped greatly with the interpretation and validation of network data. It helps take those "circles and lines" and turn them into something more meaningful.
4) *Closely involve facilitators fluent in the local language*. The local facilitators from WCS were one of the greatest assets to this study. A significant amount of time was dedicated to building their understanding of network concepts, training them to conduct interviews, and working with them to design appropriate sessions in which to present and analyze the data in participatory sessions. This study would not have been possible without them, and if we could do it over again, I would try to involve them even more in the earlier stages of research design starting with the first draft of the questionnaire. They will also play crucial roles in training network weavers and providing continual support for community over the long-term.
5) *Consider the timing of SNA in the planning process*. In our study, each district was at a different stage of the management planning process and so a broader approach was taken to the questions so the survey could be used across each. SNA can, however, be tailored to the more specific

needs of smaller networks. For example, survey questions that may be used for stakeholder or management committee selection would be different than those tailored for a more seasoned committee looking to form task forces of members with similar interests.

6) *Choose a network that is small enough to study in depth.* In my opinion, this study in Bua was too ambitious in choosing a Province-wide target population that included people from fifty-four villages. We learned a little about a large network. While it seems a little discriminating, it may have been a better choice to select two or three districts to study closely. If the BYMST provincial management committee was more active and established, its members may have been a great starting list for snowball sampling. In this case, however, maybe the results of this study can be used to help better elect new BYMST members in the next election cycle.
7) *Translate questionnaires into native language and conduct trial interviews*. To be respectful and to collect more accurate data, questionnaires and interviews should be completed in the native language of the population studied whenever possible. In this study, testing an earlier version of the questionnaire led to changes to the questions asked and the methods of delivery. Holding another trial after changes were made could have led to even more improvements, but time was a limiting factor.

There are many different settings in which SNA might be used in natural resources management, and as more studies come forward, varying methods are likely to be refined for each circumstance. It would be very interesting to see different combinations of participatory methods arise and more in-depth comparisons of the benefits communities or organizations receive from each of them. For instance, are participants who complete participatory mapping and analysis more likely to implement self-organized projects as a result versus those who just review network maps provided by a researcher? Is their grasp of network concepts and how they apply to real-world situations any greater? In cases where the technology is available, it is even possible for surveys and participatory mapping be completed through a computer interface to allow participants to view and discuss network structure almost instantaneously. Which methods work best for different types of networks (large/small, formal/informal)? How does one choose at which stage of the management process to conduct a network study or network weaving activities? Would the process be more useful or yield different results if a local community or committee leaders facilitated participatory mapping and analysis for their own networks? I cannot answer these questions but hope that they may stimulate discussion and maybe even inspire others to investigate them.

This study was able to show some of the ways in which applied SNA can be a useful tool for understanding relationships between actors involved in collaborative NRM and informing the design of capacity building activities. Engaging locals in the design and interpretation of this research was a

challenging but rewarding process, and the application phase is likely to be even more so. Communities like those in Bua could use a variety of tools to help them deal with the complex social-ecological issues they face. The true value of applied SNA for enhancing community-led conservation will only begin to be determined if its application is seen through over the long-term.

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Appendix A

Social Network Questionnaire for Bua Province (English Version)[3]

Introduction:
Effective resource management requires a range of people and organisations to plan and take action together. These stakeholders relate and interact with each other through networks. This questionnaire will enable us to better understand local networks so they can be supported to promote effective communication and collaboration for natural resource management in Bua. Completing this questionnaire should take approximately 20 minutes. All information you give will be treated as confidential.

Directions:
We will go through each question as a group but you will fill your answers on your own form. Please do not copy other people's answers and please ask questions if you do not understand a question. There are no right or wrong answers, it is your opinion. After you have completed your questionnaire, we will discuss the questions as a group and you will be able to share your answers if you wish.

Your Name: _____ **Date of interview**: _____

[3] Facilitator notes are displayed in italics.

**For questions 1-4, first ask the respondents to write names for their village only. Wait for them to finish, then ask them to add names for people in their whole Tikina. Finally, ask them to think if there is anyone else (in/out of the province, from an organization, etc). No limit on the # of names.*

	NAME(s)	***Where person is from*** *(village or organization)*	***What is your relationship?*** *(family, tauvu, friend, other)*
1) Who do you get information or advice from <u>about FARMING PRACTICES</u>?			

	NAME(s)	***Where person is from*** *(village or organization)*	***What is your relationship?*** *(family, tauvu, friend, other)*
2) Who do you get information or advice from about <u>FISHING PRACTICES</u> or <u>FISHERIES MANAGEMENT</u>?			

	NAME(s)	***Where person is from*** *(village or organization)*	***What is your relationship?*** *(family, tauvu, friend, other)*
3) Who do you get information or advice from about <u>YAUBULA MANAGEMENT</u> in general? (protecting rivers, native trees, mangroves, etc)			

4. Who are the most important decision makers for natural resource management? (*Ex: how the land and sea are used)*		
Name(s)	**Their title or position**	***Where they are from*** *(Village)*

**For question 5, ask respondents to consider only with whom they have worked directly in the last 2 years. For each organization and/or person they list, ask them to provide details on the relationship and activities. If unable to remember individual names, the organization or department name will suffice but personal names are preferred.*

5. Working with Organizations (NGOs, Government, Others)						
a) Which organizations and people do you work with <u>regarding natural resources</u>?	***Organization and/or personal name***	***Where person is from***	***How have you worked together? (tick)***			***Details*** *i.e. on what? (farming, forestry, fishing, establishing management rules/ protected areas)*
			Sharing information	Planning together	Doing things together	

b) Which other organizations and people would you like to work with <u>regarding natural resources</u>?	***Organization and/or personal name***	***Where person is from***	***Why/on what?***

1. **Personal Details**	
Name of Respondent:	
a) **Male/Female**	b) **Age:**
c) **Village:**	d) **District:**
e) **Mataqali:**	f) **Yavusa:**
Your original village:	*g)* **Where are your *tauvu* from?** (*Please list as many as you know*)
Your original district:	
Your original Province:	

2. Community Involvement			
a) **How are you involved in your community**? (check all that apply)			
	Village or District Chief		*Committee/Soqosoqo Leader*
	Clan Leader		*What committee?* _____
	Extended-Family Leader		*Committee/Soqosoqo Member*
	Church leader		*What committee?* _____
	Village Headman (TNK)		*Business person*
	Provinical District Represetative (MNT)		*Other:* _____

b) **Which of the following if any do you participate in:** (check all that apply)	
	Village Council (Bose Vakoro) -
	District Council (Bose ni Tikina)
	Provincial Council (Bose ni Yasana)
	Traditional Leaders Council (Bose Vanua)
	Workshops or Trainings (Please list): _____

3. How are you involved in managing natural resources?			
	Y/N	*Notes on involvement*	*If no, would you like to be involved? (Y/N)*
I plant or harvest natural resources for food/use			
I sell natural resources for income			
I have a small business involving natural resources			
I take part in community projects related to NRM			
I help make decisions about how the land or sea is used			

**For questions 4 & 5, ask respondents to mark the most important answer with a number 1. Pause, then ask them to mark the next most important with a number 2. Pause again, then ask them to mark the third most important with a number 3. Respondents can tick up to three responses, but are not required to tick all three.*

4. How do you usually get information about natural resource management?	
	During the Bose Vakoro
	During the Bose Tikina
	Ask someone in my community
	Through social conversation (talanoa)
	From a workshop or training
	Visit a government office or NGO
	Call a government office or NGO

5. **What issues make it difficult to communicate or receive information about natural resource management?**	
	Don't know where to get the information
	The right people/ information are too far away from my community
	Don't feel able to ask the right people because I don't know them very well
	It takes a long time to get the information I need
	Lack of access to phone
	Lack of access to internet

"Thank you for your participation. We will analyse this data to see how information flows in Bua and to help improve communication for sustainable NRM."

Interviewer Name: _____ *Location:* _____
Notes:

SNA Questionnaire – (Fijian Version)

Na Vakadikevi ni Veisemati Tukutuku ena Yasana ko Bua

Na kenai kau:

Ena laurai na vatuka ni kena maroroi nai yaubula ena dua na vanua kevaka era cakacaka vata ka veirogoci na veitabana duidui era duavata ena tikina oqo. Ko ira na veitabana oqo era veitalanoa ka veiwekani ena nodra semata nai tukutuku duidui eso ena kedra maliwa.

Nai lavelave ni vakatataro oqo ena vukea na matata ni veisemati ena kedra maliwa nai veitabana duidui, ka rawa talega ni vukea na kena vakadewataki nai tukutuku ena kena tovolei me vakayagataki vakamatau nai yaubula ena loma ni Yasana ko Bua.

Ena rauta ni 20 na miniti na kena vakaleweni nai vola lavelave ni vakatataro oqo. Nai tukutuku kece ena vakasokumuni ena vakadidike oqo ena okati vaka i tukutuku maroroi.

Veika ena Vakayacori:

Eda na raica vata vakaiwasewase nai lavelave ni vakatataro ka ko ni na dui sauma ga me vaka na veika dina ko ni kila. Meda kakua ni lavetaka mai na nonai sauni taro edua tale; sa ka bibi na noda solia kina na veika eda nanuma. E sega ni dua nai sau ni taro e cala, e gadrevi ga kina na noda vakasama.

Eda na qai veitalanoataka nai sauni ni taro vaka i wasewase; ka rawa ni da veiwaseitaka kina na nodai sau ni taro.

Yacamu: _____ **Tikini Siga ni Vakatataro**:_____

	Yaca	*E cavu tu mai vei (Koro, Soqosoqo se Tabana vaka Matanitu*	*Na cava na nomudrau veiwekani (Wekamu, Tauvu, Tokani)*
1) Ko cei ko dau kau i tukutuku se taro i vakasala mai kina me baleta na <u>TEITEI keina VAKAYAGATAKI QELE</u>			

	Yaca	*E cavu tu mai vei (Koro, Soqosoqo se Tabana vaka Matanitu*	*Na cava na nomudrau veiwekani (Wekamu, Tauvu, Tokani)*
2) Ko cei ko dau kau i tukutuku se taro i vakasala mai kina me baleta nai <u>WALEWALE ni QOLI</u> se <u>VAKAYAGATAKI VAKAMATAU ni QOLIQOLI?</u>			

	Yaca	*E cavu tu mai vei (Koro, Soqosoqo se Tabana vaka Matanitu*	*Na cava na nomudrau veiwekani (Wekamu, Tauvu, Tokani)*
3) Ko cei ko dau kau i tukutuku se taro i vakasala mai kina me baleta na <u>VAKAYAGATAKI VAKAMATAU ni YAUBULA</u>			

4. Ko cei era dau vakatulewataka na kena vakayagataki nai yaubula ena nomu vanua (Koro, Tikina, Yasana) ena vakayagataki ni qele keinai qoliqoli?		
Yaca	**Nonai tutu**	***Nona koro***

5. Na cakacaka vata kei ira na Tabana vaka Matanitu keina Veisoqosoqo eso.						
a) Na cava nai soqosoqo se nai vakalesilesi ko cakacaka vata me baleta na vakayagataki vakamatau ni yaubula	***Yaca ni Soqosoqo/Vakailesilesi***	***E cavutu mai vei***	***Na Gaunisala cava ko ni cakacaka vata kina?***			***Veika e qaravi*** *teitei, veikau, qoliqoli, buli lawa, yavutaki ni vanua maroroi)*
			Veiwasei tukutuku	Lalawa ka vata	Cakacaka vata	

b) Ko cei ko via cakacaka vata me baleta na kena vakayagataki nai Yaubula ni nomu Vanua *(Tabana Vakamatanitu, Soqosoqo, Tamata yadua).*	***Yaca ni Soqosoqo se Tabana Vakamatanitu/Tamata Yadua***	***E tiko I vei***	***Na cava na vuna ko via cakacaka vata kina/ Na cava ko nanuma mo drau cakacaka vata kina.***

1. Kemuni Tukutuku	
Yacamu:	
h) **Tagane/Yalewa**	i) **Yabaki:**
j) **Koro:**	k) **Tikina:**
l) **Mataqali:**	m) **Yavusa**
Nomu Koro Dina:	**Ko cei na nomu koro tauvu?**
Nomu Tikina Dina:	
Nomu Yasana Dina:	

2. Cakacaka va Koro			
a) **Na cava na nomui tutu e na Koro**			
	Liuliu ni Yavusa se Vanua		*Liuliu ni dua nai soqosoqo se komiti*
	Liuliu ni Mataqali		*(Soqosoqo cava? _____)*
	Liuliu ni Tokatoka		*Lewe ni dua nai soqosoqo se komiti*
	Liuliu ni Lotu		*(Soqosoqo cava? _____)*
	Turaga ni Koro		*Daucaka bisinisi*
	Mata ni Tikina		*So tale nai tutu: _____*

b) Na cava so ko dau vakaitavi kina?	
	Bose Vakoro
	Bose ni Tikina
	Bose ni Yasana
	Bose Vanua
	Vuli (Vuli cava?): _____

3. Ko semati iko vakacava kina vakayagataki ni Yaubula?			
	Io/Sega	*Na cava so ko dau qarava*	*Ko bau gadreva mo vakayagataka nai yaubula?*
Au vakayagataka nai yaubula ena teitei, qoli.			
Au volitaka nai yaubula me sotavi kina na bula ena veisiga			
E dua tiko na noqu bisinisi lailai ka vakayagataki kina nai Yaubula.			
Au dau veivuke kina veiqaravi va koro ka veiwekani keina vakayagataki vakamatau ni yaubula.			
Au dau veivuke ena vakatulewataki ni Yaubula.			

4. Ko dau kauta mai vei nai tukutuku me baleta na vakayagataki vakamatau ni Yaubula?	
	Bose va Koro
	Bose ni tikina
	Taroga edua na lewe ni koro
	Ena gauna ni veitalanoa keina gunu yaqona
	Ena gauna ni vuli
	Ni ko sikova edua na tabana vakamatanitu se i soqosoqo
	Ni ko qirita edua na Tabana Vakamatanitu se i soqosoqo

5. **Na cava na veika e dau vakadredretaka na veitalanoa se na nomu ciqoma na vei tukutuku eso me baleta na vakayagataki vakamatau ni nomui yaubula?**	
	Sega ni kila na vanua me kau mai kina nai tukutuku
	E rui yawa mai vei au ko ira na dau ni vakasala keinai vanua e tiko kina nai tukutuku.
	Sega ni rawa ni'u tarogi ira na daunivakasala baleta ni'u sega ni kilai ira vakavinaka.
	Sa rui dau balavu na gauna au dau waraka kina nai tukutuku.
	Sega na talevoni
	Sega ni rawa na vakau I tukutuku ena misini mona livaliva

*"**Vinaka Vakalevu na nomuni vakaitavi. Ena qai vakasokumuni ka vakadikev inai tukutuku ko ni sa vakarautaka me rawa ni raici kina na drodro ni tukutuku ena Yasana ko Bua keina kena rawa ni vukei nai vakatagedegede ni veitaratara me vukea na kena maroroi ka vakayagataki vakamatau nai yaubula era tu vakavolivoliti keda".***

Dauni vakatataro: _____ *Vanua ni veitalanoa:* _____
Eso tale na ka ko gadreva mo vakaraitaka:

Appendix B

Post- Questionnaire Group Discussion Questions

1) Communication and Collaboration

Effective NRM requires communities to work well together. Effective NRM also requires communities to work well with other communities and organizations. Good communication is important for this to be able to happen.

- What are some of the barriers to communicating about NRM that you listed?
- Can you think of any ways to overcome these barriers?
- What are some of the barriers to sharing information or working with other communities or organizations?

2) Roles and Relationships

Networks, communities, and organizations can benefit from having diverse people working together. Different kinds of people can play different roles in the network. Some people are good leaders, some have a lot of knowledge about a particular practice, and others are important for traditional reasons. Think about the people you listed on your questionnaire.

- Who are key people that need to be involved in local natural resource management activities to help ensure its effectiveness?
- How can we be sure to include them in future workshops/activities if they are not here today?

Appendix C

Community Feedback Session Agenda and Facilitator Notes[4]

Time	Session	Notes	Length
8:30	1. Introduction	• Opening Prayer & Welcome • Overview of Basic Network Concepts • Healthy network characteristics	30 min
9:00	2. Participatory Network Mapping	Plenary activity using post-it notes 1. mapping the "core" 2. + those outside the core 3. + those who could be added to the network (would like to work with)	1 ½ hours
10:30	**Morning Tea**		
10:45	*Ice breaker*		
11:00	4. Analyzing network maps	• Review of questionnaire • Look at maps in 4 groups : Fishing, Farming, Yaubula, & Decisions • Feedback and discussion	1 ½ hours
12:30	5. Analyzing the whole network	• Present network map with all relationships shown • Compare it to the one they drew	30 min
1:00	**Lunch**		
2:00	*Ice breaker*		
2:15	6. Evaluating the network	• Use healthy network criteria to evaluate network • Discuss strengths and weaknesses	45 min
3:00	7. Improving the Network	Develop strategies based on the previous activities for enhancing the network	1 hour
4:00	8. Summary and close	Summary, evaluation, and close with hymn/prayer	15 min

[4] Compiled by Ged Acton, Stakeholder Engagement Officer at WCS

1. **INTRODUCTION** *(30mins)*

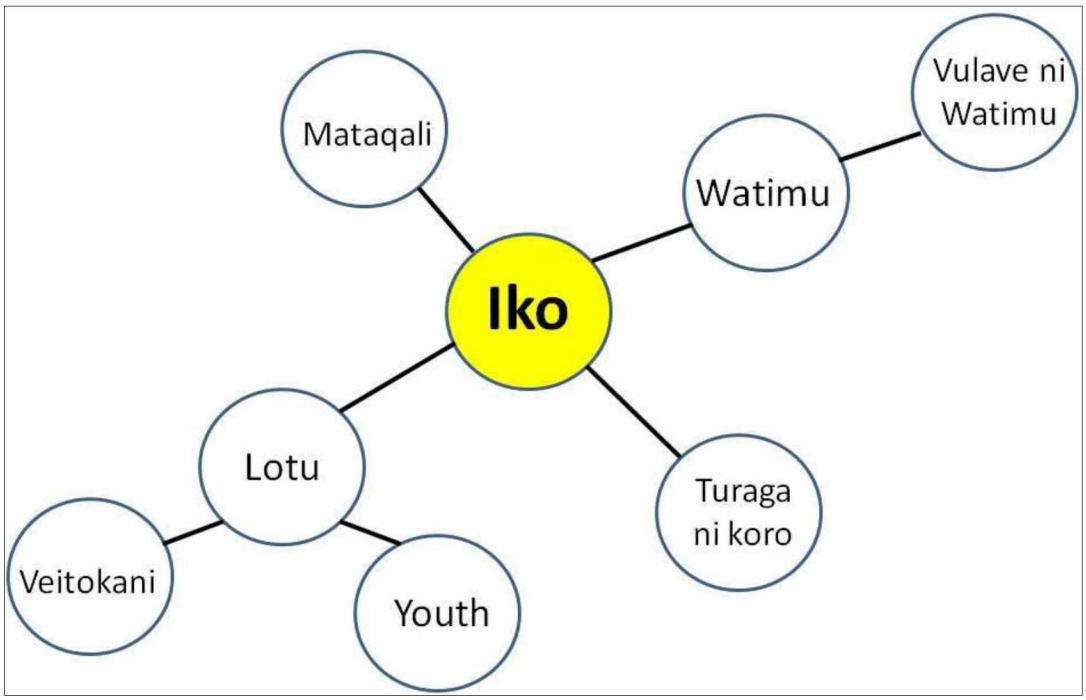
a) Objectives: Explain that the purpose of this workshop is to (a) review results and gather feedback on the survey results; and (b) see if we can improve the network for better management.

b) Explain what a network is and how we can visualize it:

***Draw a simple example like the one below that puts networks in a personal and cultural context:*

Key points:

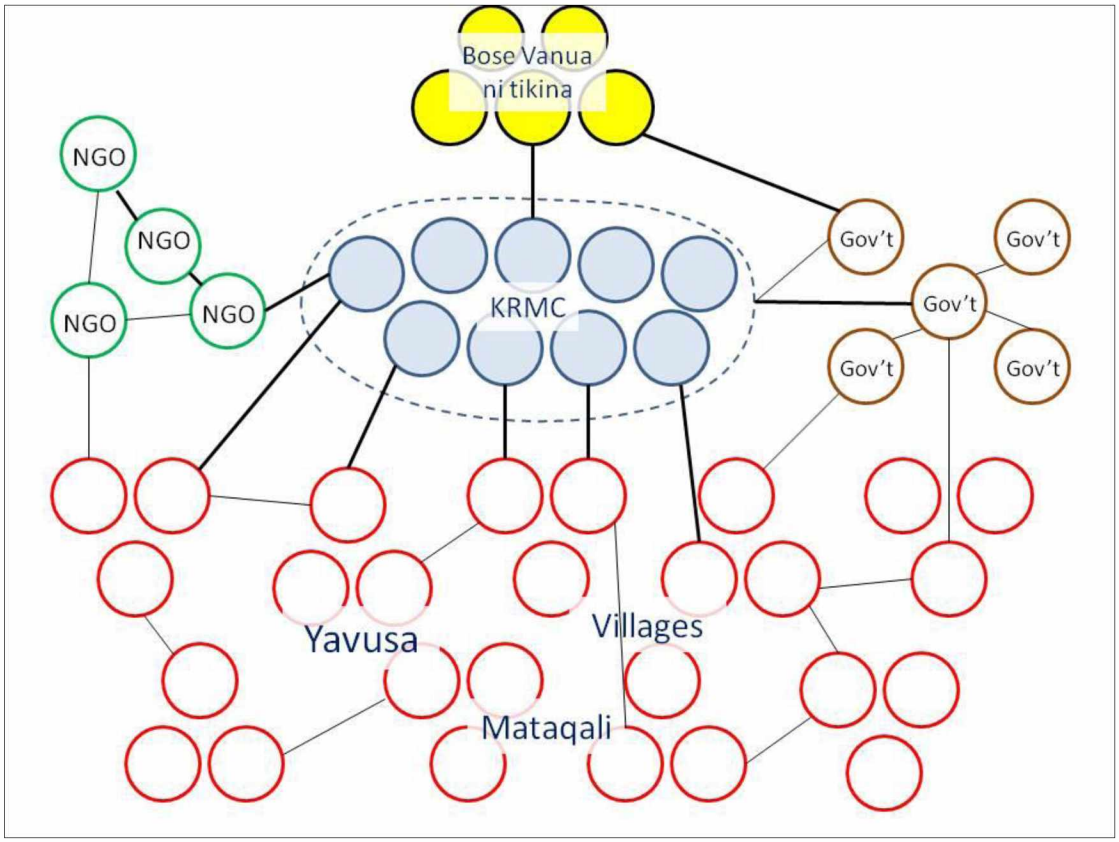
1) Circles= people or organizations
2) Lines = the connections between them
3) Networks provide support – we are stronger and can achieve more together!
4) Relationships matter and form an important part of our culture (e.g. wedding/birthday)



c) Illustrate District Resource Management Committee (RMC) and its network

***Start by drawing RMC , and then add the other types of people/orgs* (see example on next page)

- Explain that RMC is a formal network with a defined purpose – to promote good management of natural resources and oversee the management plan
- RMC links to bose vanua, gov't dpts and NGOs as well as the communities



d) Wider Networks

***Continue adding to the RMC network drawing: Add lines showing connections. Start with the formal connections then add 'other' informal connections.*

- RMC links to communities by a clear process (through village reps), but information spreads within and between those communities through lots of informal connections
- Although there are formal links and lines of communication, there are many more informal connections (use examples)
- By using informal connections, information can be spread further, quicker and more effectively. This can help achieve better management (better understanding of rules, reporting of breaches, adoption of good practices, etc)
- Networks are important for effective management.

e) Healthy Networks

- Talk about healthy networks, which include (*draw these to illustrate*):
  1) Lots of connections
  2) A dense core
  3) Everyone connected (not cut off)
  4) Many of types of people/orgs represented
  5) Not too reliant on a few individuals (or people/orgs from 'outside' the District)

- When we have healthy networks, they support good management, e.g.
    1) Effective communication (these should be on the wall already!)
    2) Self-reliance (prepare examples for each of these?)
    3) Innovation (new ideas)
    4) Collaboration (partnerships)
    5) Resilient (able to survive setbacks)

f) Network Weaving

- Explain that we can actively enhance networks - making new connections to create relationships that improve the network - better information flow, generating new ideas and partnerships, etc. This is called 'network weaving'.
- Ask them to think about whether they are 'network weavers'.
- Ask them to look out for network weaving opportunities during this workshop.

***Session Wrap-up**:*

- *Let people ask questions to clarify their understanding.*
- *Review what we've covered, with reference to your drawings.*
- *Highlight the main point that we want to help understand what the network looks like (who is connected to who) so that we can help improve yaubula management in the District*

2. PARTICIPATORY MAPPING EXERCISE *(1 hour & 30mins)*

***Materials**: Lots of small cards (4 colours); 4 flip chart paper (stuck together to make 1 big sheet); tape (cut into small pieces ready to use); felt/marker pens (1 each).*

a) Mapping the core

- Give everyone 8-10 small cards (all same colour). Ask them to write their own name in large letters on the first card (with felt/marker pens).
- Then ask them to write down the names of people they work with closely on yaubula management (*1 name per card, in big letters*).

Remember, they are doing this as individuals so ask them not to discuss, but to take time and think of people they work with closely. Helpful prompts include: 'Who in your village do you work with? Do you work with anyone from other villages?.. anyone in government/NGOs?'

- Participants stick them on the wall and read them out.

Clarify any names that are incomplete (e.g. 'Paulo who?') and write the full name (on a new card if necessary). Discard any names that are already on the wall.

- Participants draw lines between themselves and anyone else on the wall that they work with on yaubula management.

Explain: *This is the Core of their network!*

Key points about the core:

1) Core = where most focus and action on yaubula management
2) Core = more than just RMC
3) The extra people in the core bring a range of expertise, experience, resources, influence.

b) Mapping the periphery

- Give everyone another 8-10 small cards (different colour to the core). Ask them to write down other individuals and organizations they are working with on yaubula management, but less frequently.
- Participants stick them on the wall and read them out.
- Draw lines to the individuals in your project network who have the relationship with these people / organisations.

Explain: *This is the Periphery!*

Key points about the periphery:

- Periphery = where people are likely to have different views, experiences, contacts.
- This can bring new ideas, extra resources and innovation

Session Wrap up:

- *Review what they have just done, highlighting that they (RMC) are the core and that they access more resources and a greater reach because they are linked to other people/organisations*
- ***Give time for reflection and questions. Ask them "do you see any opportunities to enhance the network?"** - Note: this is not a yes/no, so try to get more details and discuss*
- ***Photograph their network map and keep it on the wall***

<<MORNING TEA>>

<<Ice breaker Bingo>>

3. ANALYZING NETWORK MAPS *(1 hour 30 mins)*

Materials *– A3 Maps:*

Map 1 - Who do you get info/advice from on fishing?
Map 2 - Who do you get info/advice from on farming?
Map 3 -Who do you get info/advice from on yaubula management generally?
Map 4 - Who are the key decision-makers on yaubula management locally?

a) Start by explaining the network survey we did. Go through the main questions – on flipchart on the wall. Highlight the limitations of the survey (and resulting network maps). Explain that they are intended to *inform a discussion* about local networks, not to be totally accurate.

b) Split into groups of 4-5 people. Ensure that each group is a mix of people from different villages and and divide youth and women among groups as appropriate.

c) Give each group a network map based on the results of one question. Ask them to look at the map and discuss the following (give them these one at a time):

1) What does this map show?

Facilitators may need to help the groups at this stage by prompting with questions, e.g.-What are the dots? What are the lines? What do the different colours show?

2) Is there anything interesting about the map, or anything that surprises you?
3) Do people get info/advice from one person or from several sources?
4) Do people get info/advice from within their own village or from outside?
5) Is everyone connected, or could they be more connected? (who is disconnected? Why?)

Facilitators should explain that these questions relate to the 'healthy network characteristics 'illustrated in session 1d (and on the wall).
Use helpful prompts but don't interpret the maps for them at this stage - you can add your own thoughts after they've presented back.

6) Is the network reliant on 1 or 2 key people? (if so, what would happen if they left?)
7) Do you think the map accurately represents relationships in your District?
8) Does the center of the network have enough people? Enough diversity?
9) Any other observations?
10) Do you see any opportunities to enhance the network? *(e.g. new relationships that could improve the flow of information/advice?)*

d) Ask groups to feed back their answers to the whole room. Encourage questions and input from the whole group after each presentation.

Encourage questions and input from the whole group after each feedback. Then clarify the main points after each group presents (at this stage facilitators can also add anything they might have missed that the map is showing). ***Ask them again "do you see any opportunities to enhance the network?"***

****Remember to record all feedback, questions & discussion on video & audio! ****

Note:

Throughout the day, look out for people who understand the concepts, are enthusiastic about the topic, and/or who you think would make good Network Weavers. Record their names.

4. ANALYZING THE COMPLIED NETWORKS[5] *(30min)*

***Materials**: Maps of all connections (1 per group x 4 groups)*

a) In plenary, present the map of all connections by gender.

- *Explain what it shows, starting with the basics, i.e. The dots are people who took the survey or were named in the survey… lines represent who named who (for all the questions)…… colours are men/women/RMC members/NGO or gov't..*

b) In their breakout groups, ask them to discuss (one question at a time – *these should be on the wall*):

1) What does this map show?
2) Is there anything interesting about the map, or anything that surprises you?

Facilitators can help groups by prompting with questions, e.g.-What are the dots? What are the lines? What do the different colours show?

3) Which people are giving the most info/advice?
4) Do most people get info/advice from within their own village or from outside?
5) Is anyone disconnected? (who ? why?)
6) Who is in the core of the network?
7) Is the network overly reliant on 1 or 2 people? *If so, who are they? are they accessible? do they give good info/advice? what if they left?*

[5] Note: After we tested this session in Kubulau we found it to take too long, be too repetitious, and not helpful. Upon further review, we decided the maps showing all connections in districts did not show any patterns worth analyzing.

8) Do you think the map accurately represents relationships in your district?

c) Ask groups to feed back their answers to the whole room.

d) In plenary, ask and discuss the following questions:

1) Compare the survey approach and the 'cards' approach (used in the morning)? Which is better? Why Does one tell you more than another? Which is more useful? Why?

2) Any other observations?

3) Do you see any opportunities to enhance the network? (*e.g. new relationships that could improve the flow of information/advice?*)

Encourage questions and input from the whole group after each feedback. Then clarify the main points after each group presents (at this stage facilitators can also add anything they might have missed that the map is showing). ***Ask them again "do you see any opportunities to enhance the network?"***

****Remember to record all feedback, questions & discussion on video!****

<<LUNCH HERE>>

<<Human knot icebreaker>>

5. EVALUATING THE NETWORK *(45 mins)*

Materials*: Network evaluation scoring sheets (1 each)*

a) In plenary, ask them to score their network on the sheet provided.

Explain the scoring system and refer to the 'healthy networks' criteria (on wall). Explain there are no 'right or wrong' answers – it's just their opinion about the network.

Go through the questions one at a time (without conferring). Scoring will be as follows:

Not at all/Dredre		Somewhat/va gauna		Very Much/Taucoko
1	2	3	4	5

1) Works closely with other organizations (collaborative)/Ena nomu cakacaka vata kei ira na Veisoqosoqo eso (vakamatanitu se taudaku ni matanitu)

2) Does <u>not</u> rely too heavily on outsiders to organize or implement actions/Na kena vakararavitaki na veiqaravi keina veika me vakayacori vei ira mai tuba.

3) Equally represents men, women, youth, traditional leaders, people from all communities/settlements/E semati kina na Turaga, Marama, Tabagone, Liuliu vakavanua keina lewenivanua mai na veikoro.

4) Responsibilities are shared; there is not a heavy reliance on only a few individuals/E dau veiwaseitaka nai tavi ka sega ni vakacolati vakatabakidua vei dua.

5) Has access to and the ability to share new ideas and information about best practices/Na vanua ko sema kina erawa ni wasei kina na veivakasama vinaka ni tataqomaki

6) Regularly reviews progress and is able to make changes as needed (adaptive)/E dikevi lesu nai vakarau ni toso ka rawa ni veisautaka kevaka e gadrevi.

b) Go through the questions together again. Ask people to put up the # of fingers that they scored (make it fun!). Ask high (5) and low scorers (1) to explain why they scored that way.

***Session Wrap-up**:*
Facilitators summarise what you see (if they are mostly high (e.g. 5), low or in the middle).
If anyone scored 5 or 1, ask them to explain why ... and use this to prompt discussion. 'What do others think?....'

****Remember to collect the score sheets & record all discussion****

6) IMPROVING THE NETWORK *(1 hour)*

***Materials**: Flipchart and marker pens (1 per group x 4 groups)*

a) Given what we have just discussed, **brainstorm what they think are the main strengths and weaknesses of the network** (in plenary).
- Record these in 2 lists (strengths and weaknesses) on flipchart.

b) Breakout into 4 groups (2 looking at strengths and 2 at weaknesses).
- Ask them to complete the following exercise to identify strategies that could overcome weaknesses and build on strengths:

Strength/Weakness	Strategy	Who and when

c) Groups feedback and explain their strategies.

****Remember to record all their feedback and comments****

Encourage questions and input from the whole group after each feedback. Facilitators can also prompt with questions like:
**Can they think of any other strategies?*

**Which strategies do they think are the best or most important?*
**Are they (RMC) delivering the strategies? Or have they named other people?*
Only at the end should facilitators suggest other strategies they might have missed (asking the group if they think these are good strategies - likely to succeed? Do they want to include them?).

7. SUMMARY

- What have they found useful from the day?
- What else would you like to find out about your network?
- Does anyone want to be trained as a Network Weaver?
- Any other feedback or comments